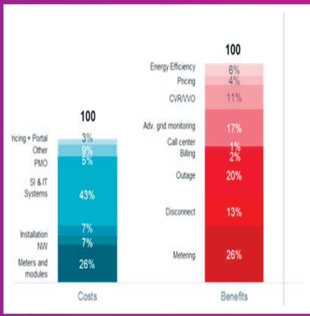
PPA

A PACIFIC POWER ASSOCIATION PUBLICATION

VOLUME 33 ISSUE 4 - DECEMBER 2025




CONTENTS



PPA

December 2025, Volume 33 Issue 4

Head office: Ground Floor, Naibati House, Goodenough Street, Suva, Fiji Islands
Mailing Address: Private Mail Bag, Suva, Fiji Islands.
Telephone: (679) 3306 022
Email: ppa@ppa.org.fj
www.ppa.org.fj

Chairman
Mr. Wallon Young,
Executive Director
American Samoa Power Authority

Executive Director
Gordon Chang

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.

PACIFIC POWER magazine is published four times a year.

Advertising
Reena Suliana
Pacific Power Association, Suva, Fiji Islands

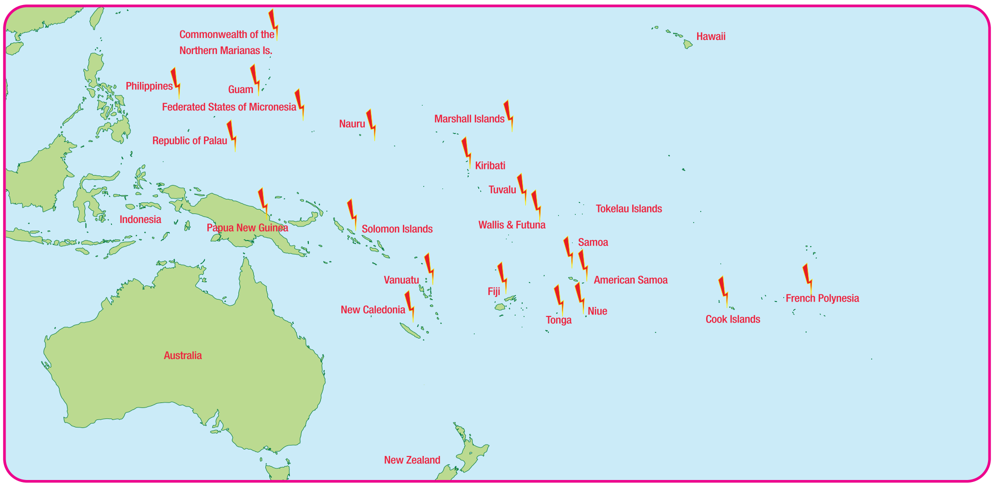
Layout & Design
Printhouse Pacific Pte Limited

This magazine is read by an audience of opinion leaders in governments, development partners, the public service, the academic community, the media in the Pacific and members of the Pacific Power Association. Subscription to Pacific Power magazine is available at US $60 a year from the association.

Correspondence should be addressed to:
The Pacific Power Association, Private Mail Bag, Suva, Fiji Islands.

ACTIVE MEMBERS

1. AMERICAN SAMOA POWER AUTHORITY, American Samoa
2. CHUUK PUBLIC UTILITY CORPORATION, Chuuk
3. COMMONWEALTH UTILITIES CORPORATION, Saipan
4. ELECTRICITE DE TAHITI, French Polynesia
5. EEC, New Caledonia
6. EWF, Wallis & Futuna
7. ELECTRIC POWER CORPORATION, Samoa
8. ENERCAL, New Caledonia
9. ENERGY FIJI LIMITED, Fiji
10. GUAM POWER AUTHORITY, Guam
11. KOSRAE UTILITIES AUTHORITY, Kosrae
12. KWAJALEIN ATOLL JOINT UTILITY RESOURCES, Marshall Islands
13. MARSHALLS ENERGY COMPANY, Marshalls Islands
14. NIUE POWER CORPORATION, Niue
15. NAURU UTILITIES CORPORATION, Nauru
16. PALAU PUBLIC UTILITIES CORPORATION, Palau
17. PNG POWER LTD, Papua New Guinea
18. POHNPEI UTILITIES CORPORATION, Pohnpei
19. PUBLIC UTILITIES BOARD, Kiribati
20. SOLOMON POWER, Solomon Islands
21. TE APONGA UIRA O TUMU-TE-VAROVARO, Cook Islands
22. TUVALU ELECTRICITY CORPORATION, Tuvalu
23. TONGA POWER LIMITED, Tonga
24. UNELCO VANUATU LTD, Vanuatu
25. YAP STATE PUBLIC SERVICE CORPORATION, Yap



ALLIED MEMBERS

1. ACCELLERON INDUSTRIES, Australia
2. ACO PTY LTD, Australia
3. AGGREKO (NZ) LIMITED, New Zealand
4. AINSBURY T/A BARCLAY ENGINEERING, Australia
5. AMERICA'S BEST ELECTRICAL MART, USA
6. ANKUR SCIENTIFIC ENERGY TECHNOLOGY PVT LTD, India
7. AR INDUSTRIAL, Australia
8. ARTHUR D RILEY & CO LTD, New Zealand
9. AUSTRALIAN WINDERS, Australia
10. AVO NZ, New Zealand
11. BENSON GUAM ENTERPRISES, INC., Guam
12. BEIJING EASTWEST ENERGY CO. LTD, Fiji
13. BOROKO MOTORS POWER GENERATION, PNG
14. BRUSH SWITCHGEAR, Australia
15. CAMCO PACIFIC LIMITED, New Zealand
16. CANADIAN SOLAR, Australia
17. CARPTRAC, Fiji
18. CBS POWER SOLUTIONS, Fiji
19. CHANNELL PTY LIMITED, Australia
20. COMAP PTY LTD, Australia
21. CRISIL, India
22. CUMMINS SOUTH PACIFIC, Australia
23. DATELINE EXPORTS INC, USA
24. DELSTAR NZ LTD, New Zealand
25. DHIFRASTRUCTURE, United States of America
26. ECOSUN INNOVATIONS, France
27. EDF RENEWABLES, Australia
28. EIF INTERNATIONAL, New Zealand
29. ELECTRATHERM, USA
30. ELEMENTAL GROUP, New Zealand
31. EMACS ELECTRICAL & MECHANICAL REPAIRS, Australia
32. ENERGY POOL DEVELOPMENT, France
33. ENTURA, Australia
34. E RAIL TRANS PTY LTD, Australia
35. ESSENTIAL ENERGY, Australia
36. ETEL LIMITED, New Zealand
37. EVERLLENCE AUSTRALIA PTY LTD, Australia
38. FSM PETROLEUM CORPORATION, Pohnpei
39. GENERATOR RENTALS SERVICES LTD, New Zealand
40. GEOGAS PACIFIC PTY LTD, Australia
41. HADRON ENERGY, USA
42. HAWTHORNE POWER SYSTEMS, USA
43. HDF ENERGY, Australia
44. HITACHI ENERGY NZ LTD, New Zealand
45. HNAC TECHNOLOGY, China
46. HUBBELL POWER SYSTEMS, INC. (ASIA PACIFIC), Philippines
47. I S SYSTEMS, Australia
48. I-ENVIRONMENT INVESTMENTS PACIFIC PTY LTD, Australia
49. INHANCE UTILITIES, United States of America
50. INTRACOR COMMODITY EXPORTS LTD, Auckland New Zealand
51. ITP RENEWABLES, Australia
52. ITRON AUSTRLASIA PTY LTD, Australia
53. JAPAN ELECTRIC POWER INFORMATION CENTRE, Japan
54. KARPOWERSHIP, France
55. KOPPERS WOOD PRODUCTS PTY LTD, Australia
56. MANA PACIFIC, United States of America
57. MARINSA INTERNATIONAL, USA
58. NAN ELECTRICAL CABLE AUSTRALIA PTY LIMITED, Australia
59. NIUPOWER LIMITED, PNG
60. NOJA POWER SWITCHGEAR PTY LTD, Australia
61. OHM INTERNATIONAL CORPORATION, USA
62. PACIFIC ENERGY SWP LIMITED, Vanuatu
63. PACIFIC ENGINEERING PROJECTS, New Zealand
64. PACIFIC POWER SOLUTIONS, Australia
65. PALLADIUM INTERNATIONAL PTY LTD, Australia
66. PERNIX GROUP, INC, USA
67. PETROLEUM & GAS COMPANY (FIJI) LTD T/A BLUE GAS, Fiji
68. PETRO OCEANIA ENERGY PTE LIMITED, Fiji
69. POWER & MARINE ENGINEERS LTD, New Zealand
70. PRAMAC GENERAC AUSTRALIA PTY LTD, AUSTRALIA
71. RADIAN RESEARCH, USA
72. S&C ELECTRIC COMPANY, Australia
73. SELECTRONIC AUSTRALIA PTY LTD, Australia
74. SICUROUSA, USA
75. SINO SOAR HYBRID TECHNOLOGY CO. LIMITED, China
76. SMA AUSTRALIA PTY LTD, Australia
77. SOLAR PACIFIC ENERGY CORPORATION, PALAU
78. SOUTH AUSTRAL PTY LIMITED, Australia
79. SOUTHERN CALIFORNIA EDISON, USA
80. SULZER DOWDING & MILLS, Australia
81. SUSTAINABLE ENERGY INDUSTRY ASSOCIATION OF THE PACIFIC ISLANDS, Fiji
82. SUNERGISE INTERNATIONAL LTD, Fiji
83. SUPREME GROUP GUAM LLC, Guam
84. SYNTELL CO, South Africa
85. THE ENERGY NETWORK (AUST) PTY LTD, Australia
86. TOTALENERGIES, Fiji
87. TOTAL ENGINEERING SOLUTIONS (AUST) PTY LTD, Australia
88. TRANSNET NZ LIMITED, New Zealand
89. UNION PETROCHEMICAL (HK) CO. LTD,
90. UTILLIGENCE LTD T/A PACIFIC ISLAND RENEWABLES, Palau
91. VERGNET SA, France
92. WARTSILA AUSTRALIA PTY LIMITED, Australia
93. YACHIYO ENGINEERING CO. LTD, JAPAN

Editor’s Note

Gordon Chang
Executive Director

Ni Sa Bula vinaka and Greetings from Suva.

2025 is rapidly drawing to a close and yet there still appears to be so much more to achieve for our Association. This year saw the World Bank fund the important PPA Strategic Plan and Implementation Approach which the PPA Secretariat has distributed to Development Partners. In addition, The PPA Board members have agreed and signed an MOU for Project Management Unit Supplement (PMU-S) with the ADB. The World Bank in November has contracted a consulting firm Vision RI to assist and support PPA to establish and operate a regional training centre in the region. These projects would not have been achieved without the recognition and financial support from our donor agency partners. Our sincere gratitude is extended particularly to the World Bank and ADB. Without their support these projects would not have been attempted. In addition, the Secretariat would like to recognize the ROC Taiwan, DFAT Australia, Department of Climate Change, Energy, the Environment and Water (DCCEEW), ADB and the World Bank for funding utility CEOs & Engineers to attend the PPA Annual Conference in Palau.

The PPA Secretariat would like to welcome the new Allied members, Total Engineering Solutions (Aust) Pty Ltd, Supreme Group Guam LLC, E Rail trans Pty Ltd, Ainsbury Holdings Pty Ltd T/A Barclay Engineering who joined this last quarter. In additional, the PPA Secretariat would like to remind the allied members who have withdrawn their membership that they can rejoin their membership any time appropriate to them. The Secretariat acknowledges continuous support of those members that provided their articles and advertisements for this issue

Clearly 2025 was another busy year and all indications are that 2026 will be even busier if we are to achieve for our members the services that are needed and the projects that have been approved. So, over the festive season I would like to extend my best wishes to all our members a relaxing break, safe travelling, and God’s blessings to you and your families.

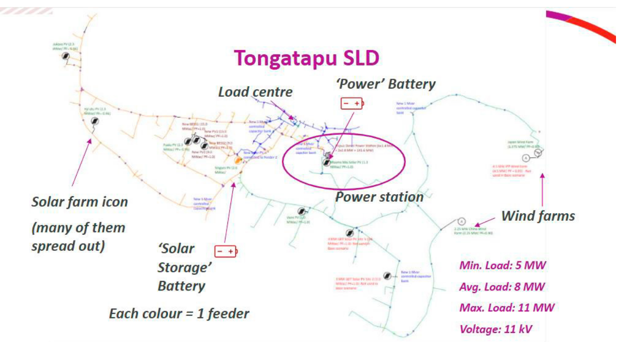
Tonga Renewable Energy Project (TREP) – Lessons learnt: BESS and SCADA implementation

David Skinner, Principal Renewable Energy Engineer, Entura

Introduction

As renewable energy contributions in larger power system networks increase, so too does the variability of generation outputs and the need to balance supply and demand. Managing the balance becomes increasingly important when renewable energy sources are distributed within a network, have uncontrolled output levels, and the overall distributed power generation available begins to exceed the demand. Maintaining system frequency, and in turn security, requires careful planning to ensure that sufficiently fast-acting grid-forming generation units are in place, along with overall system controls to coordinate scheduling of non-renewable generation, fast-acting battery energy storage systems (BESS) and longer duration energy storage.

Tonga's ongoing energy transition provides an example that highlights the technical challenges and successes of decarbonising a large island power system.



Above – The Tongatapu network SLD showing the various proposed and existing renewable generation sources along with the two BESS installed as part of the Tonga Renewable Energy Project (TREP)

Background

Tonga comprises 171 islands in the South Pacific, 45 of which are inhabited, with a population of a little over 100,000. Like most Pacific Island nations, Tonga is threatened by rising sea levels and intense storms. Tonga aims to be powered by 70% renewable energy by 2030, reducing its reliance on imported diesel.

Entura has been supporting the 'Tonga Renewable Energy Project' (TREP) since 2017 with an Owner's Engineer suite of services. The project was established to provide renewable energy generation and energy storage to increase electricity access, improve service quality and reliability, and support Tonga's energy transition, climate resilience and environmental sustainability.

TREP was funded by the Asian Development Bank (ADB), Green Climate Fund (GCF) and Australia's Department of Foreign Affairs and Trade (DFAT) as part of the Pacific Regional Development Partnership Plan.

The project included installing new renewable energy and battery storage systems (BESS) on Tongatapu, grid-connected renewable energy on 'Eua and Vava'u islands, renewable-based mini-grids for electrification on 9 outer islands, as well as delivering capacity building and project management support.

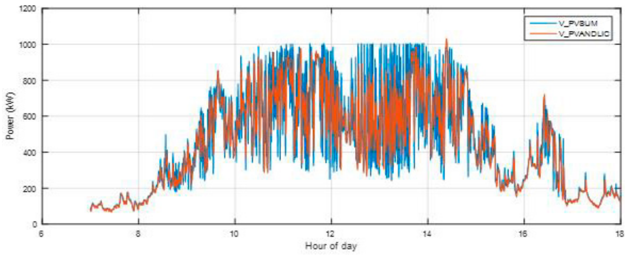
The installed capacity for the Tongatapu BESS is 7.2 MW / 4.1 MWh and 7.2 MW / 20.88 MWh. The first BESS is for grid stability through frequency support, voltage control and renewable energy smoothing. The second BESS is primarily for load-shifting excess solar generation to the evening peak load. The remaining total installed capacity across 11 island grids is approximately 1.3 MW solar, 3 MW / 12 MWh BESS and 20 km of distribution network.

The focus of this article is the larger network of Tongatapu, and discussion about lessons learnt targets the transition to renewable energy for similarly sized power systems.

The Tongatapu BESS solution

Entura was contracted by the ADB to review feasibility for TREP, procure contractors, and subsequently to provide ongoing support during construction.

The feasibility study findings for Tongatapu were aligned towards the Tonga Energy Roadmap by ramping up projects towards 2025. The proposed BESS were sized to manage system variability, support network reliability and distributed generation via the power station BESS at Popua (a half-hour, fastacting battery) and the load-shifting BESS (an approximately 4-hour slower acting BESS).



Above – an example of variability at Vaini Solar Facility, smoothed by an existing lithium-ion capacitor, still resulting in high system generation ramp rates

Variability in solar irradiance due to cloud cover was found to be very high. Over 95% of all days are typically categorised as 'partially cloudy' (this result is supported by 3 different irradiance sources considered), which is considered very high for most continental solar locations, but not unusual for island locations. As such, the power station BESS was also specified with the intention of reducing the ramping requirements from the supporting diesel generation.

As solar PV and wind network additions were intended to be staged over several years, the system was expected to likely continue running with diesel units online at all times until the network approached the target level of 50% renewable energy. In turn, the power station BESS was specified to have 'gridforming' capability but was not intended to run in this mode initially. The mode specification became one of the early challenges as it was one of the first grid-forming specifications prepared by Entura, and there was no formal definition of 'grid forming' at that time.

Additional scope included the progressive upgrade of the control system to provide automated curtailment control of distributed generation and generator scheduling in coordination with the BESS. The energy management capability was intended to be included with the first BESS (7.2 MW/ 4.1 MWh Popua Power Station); however, post-feasibility investigations showed that the existing SCADA required a more fundamental upgrade/replacement, along with existing diesel unit controllers. As a result, the BESS supplier's energy management system was limited by generation and network visibility. Tonga Power undertook further scoping work to define the SCADA upgrades and initially planned to fund it themselves. The overall SCADA system to be implemented is referred to locally as the 'Generation and Distribution Management System' (GDMS).

Implementation challenges

After BESS construction, it became apparent that delayed timing of the base-level SCADA upgrade and consecutive diesel unit controller installations meant that the Popua Power Station BESS could not be automatically scheduled in a real-time setpoint mode. Additionally, the battery supplier had not fully developed and tested its grid-forming mode. It was agreed that TREP savings realised during the BESS tender process would be allocated to expedite the SCADA upgrade, but the resulting timing meant that the power station BESS would be run in a manually scheduled mode (complemented by a grid-support function) until the SCADA improvements could be implemented.

The BESS grid-support mode implemented during this manual operation period was intended to function whenever the network frequency rose or fell outside a predefined band. Various contributing factors resulted in this mode being ineffective in some instances, although most were not fully recognised or understood until the SCADA system was finally implemented in the later project stage. The factors limiting the initial capability of the BESS grid-support mode included:

- Accuracy of power system simulation models. Power Factory & PSCAD models from the OEM did not reflect performance.
- TPL power system models had not been updated to account for some new network components (solar and capacitor banks), primarily due to a lack of familiarity with Power Factory software.
- A lack of reliable SCADA data limited the resolution of results for undertaking accurate BESS functional tests.
- The aim for higher reliability due to unplanned diesel generation outages prevented scheduled testing and, therefore, halted retest updates and delayed functionality improvements of the BESS.

As an interim control solution, the power station BESS was operated in a manual mode with operators determining real power setpoints, and the OEM's 'grid-support mode' set to active. During the period of manual operation, the BESS became critical at times to manage diesel generation shortfalls, which occurred due to unplanned unit outages. The operators rapidly learnt how to manage supply and demand by balancing renewable generation sources, minimising diesel schedules (the demand for the number of units online) by adjusting BESS output levels, and optimising renewable resources through BESS load shifting (storing excess energy during the day, then discharging during peak load times in the evening).

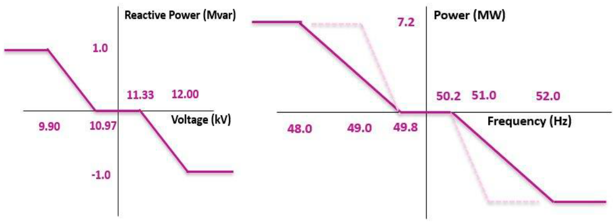
While the circumstances necessitated manual BESS control, it also highlighted the need to complete the SCADA upgrades, including an overall hybrid controller to provide dispatch of generation units and optimise available renewable energy. The following challenges were apparent during this period of manual BESS control:

- the need to have operators on hand 24/7 to enter setpoints
- variability and ramp rates too fast for operators to reasonably manage
- the BESS OEM's 'grid-support mode' acting disproportionately to events and requiring further tuning and development to act in a true grid-forming mode and manage frequency.

As implementation of the SCADA and overall hybrid controller progressed, challenges arose. The overly responsive BESS grid-support function settings assisted in many event cases. However, when combined with multiple diesel unit failures, this led to instability and delays in recovery from events.

It was determined that the grid-support mode was best deactivated until the alternative full gridforming function of the BESS was proven and tested. Timing of the testing of the grid-forming functions was constrained due to higher system reliability requirements following power outages, further delaying adjustments.

Changes to BESS settings were proposed, primarily to balance the proportional BESS response with the response of the diesel units and to coordinate how generation reacted to frequency excursions. These changes have since been implemented and have contributed to improved system security.



$$P = -\frac{7.2}{0.6}(f - 49.6)$$

$$f \rightarrow 49.0\ Hz; P \rightarrow 7.2\ MW$$

$$P = -\frac{7.2}{1.8}(f - 49.8)$$

$$f \rightarrow 49.0\ Hz; P \rightarrow 3.2\ MW$$

Above – an example of dampening the BESS response to frequency (one of multiple settings adjusted to tune the power system)

Additional works within the SCADA upgrade were anticipated within the first year of its operation, but these remain ongoing items to progress when circumstances allow. Various solar and wind generation indications from older remote sites were not incorporated into the new overall SCADA for various reasons:

- For some solar or wind generation sites, the unit SCADA had not been set up initially with the facility to enable remote control functionality.
- Contractual PPA/IPP agreements posed constraints.
- Some physical links or hardware were not in place.
- Gaps existed in the funding scope for changes required for remote generation sites.

The SCADA upgrade was intended to include system-wide network indications and control, providing a 'smart grid' to streamline network operations, fault response, and maintenance. However, this was limited during the contractual implementation period for reasons similar to the remote generation control issues discussed above.

Key lessons

Lessons that can be applied in future for similar networks where BESS and SCADA are being implemented and upgraded include the following:

- Modernised SCADA and control systems are critical when renewable energy contribution approaches or exceeds 30%. Hybrid control of generation units and BESS can greatly assist with system security when the instantaneous renewable power generation exceeds system loads. Increasingly there is a need to set up new (or updated) SCADA and control systems prior to any new generation or storage.
- It may become vital to ensure that solar independent power producers (IPPs) have contractual conditions for curtailment and control by utilities. This is typical in very large networks with competitive markets; however, on an island scale, agreements need to be targeted to the local circumstances. Developing, ratifying and maintaining an updated technical grid/network code can assist in managing these issues and avoiding contractual disputes.
- Technical specifications need to match the pace of technology development and be kept up to date. Clear specification of BESS functions and grid-forming capability will ensure that new equipment capabilities influencing power system control are suited for the task.
- It is crucial to prioritise equipment testing and validation, even when scheduled network outages

are required, to ensure all generating units with fast-acting voltage/frequency (V/f) control are coordinated.

Ongoing and future works

TREP has helped make substantial progress towards the Kingdom of Tonga's 70% renewable energy target, but ongoing work is needed to integrate distributed RE generation. The next phase of development includes an IPP of 24 MW of solar PV and 41 MWh of BESS. This dwarfs the current renewable generation. An additional 2 MW of wind is due to be connected concurrently. With total renewable generation (power) available representing around 600% of the minimum system load, smart controls and network indication will become critical to managing system stability and optimising the use of energy to minimise the demand for diesel. The system will shift from centralised generation at Popua Power Station in Nuku'alofa primarily towards a greater level of distributed generation around the island of Tongatapu, with BESS being the most significant component for managing system frequency, fault response and security. In a larger island system, having adequate SCADA with visibility of all generation components will become crucial. Work needs to continue to integrate all generation into the higher level SCADA and ensure key equipment settings are coordinated as the system evolves.

As more renewable energy generation comes online, various elements of the system will be enhanced by further development or adjustment of settings, specifically:

- Both the generation and distribution protection systems require coordination and assessment for each significant phase of renewable generation or storage addition.
- The Tongatapu network voltage levels are currently difficult to manage, particularly where conductors are heavily loaded, or remote generation sites are connected. As more distribution system indications become available to the SCADA and network upgrades occur, it may be possible to implement a greater level of dynamic voltage management via reactive power control of remote sites (in turn potentially minimising the need for circuit upgrades, improving power quality, and reducing distribution losses).
- Adding more network indications and generation control aspects into the SCADA will have operational advantages for managing network outages, black starts and disaster resilience, with advantages including better visibility of fault locations, reduced fault-finding times, and more efficient use of line workers.
- Tongatapu currently has very low uptake of household solar, so any curtailment functions would have minimal impact on managing system frequency. Regardless, standard inverter settings already include direct frequency response without the need for remote communications. However, 'smart grid' features incorporated into TPL's SCADA system could be utilised to enhance operational performance. These features could include enhanced fault detection, demand-side management, better monitoring through smart metering functions, or dynamic pricing.

Outcome

Both BESS in Tongatapu are operating, providing storage for excess solar, autonomously supporting system frequency, with unit scheduling to be automatically controlled by the new Generation and Distribution Management System (GDMS). The power station BESS has achieved the grid-forming response desired and the SCADA will work to optimise the renewable energy contribution with control of the load-shifting BESS. Overall, TREP has enabled greater access to modern, reliable energy services for around 94,000 people in Tonga. It is expected to deliver greater energy security by reducing the reliance on imported diesel while delivering a major step towards achieving Tonga's goal of 100% renewables by 2035.

Digitizing Islanded Grids: Lessons from the Energy Transition in French Polynesia

Agnieszka Rhychlicka, Business Development Manager, Energy Pool

I. Introduction:
The digital transformation of energy systems is often framed through the lens of real-time control and automation. Yet in islanded contexts—where infrastructure is isolated, resources are limited, and resilience is non-negotiable—digitization must be understood more holistically. It's not just about adding technology; it's about rethinking how people, tools, and infrastructure interact in a smart, integrated way.

French Polynesia, a French overseas territory in the South Pacific, provides a powerful case study. Historically served by a single centralized utility, the region is now undergoing a deep structural shift. Local operators are emerging, renewable energy targets are rising, and each island—often with its own microgrid and legacy thermal systems—is navigating the same fundamental question: how do we move from reactive, siloed control to intelligent, coordinated energy systems?

The objective of this paper is to demonstrate that smart grid success relies not only on digital tools but also on structuring a systemic transformation—technical, operational, and strategic. We present here our lessons from French Polynesia.

II. French Polynesia: A fragmented landscape with a shared challenge
French Polynesia consists of 118 islands and atolls scattered over a vast oceanic territory, with a population of around 280,000. As of 2023, there are 65 distinct electricity distribution networks across 58 islands, each operating in isolation. This fragmentation is not accidental: the islands are separated by vast distances and deep ocean waters, making submarine cable interconnections technically challenging and economically prohibitive. As a result, every island develops and manages its own grid, with its own specificities and constraints.

National law mandates a 75% renewable share in the energy mix by 2030, yet the country remains 93% dependent on imported diesel.

This reliance on fossil fuels is economically and environmentally unsustainable. Hybridization—combining renewables with thermal generation and storage—is the only viable path forward. But this transition is far from easy. The energy sector is shaped by a diverse mix of stakeholders: wellestablished operators (ENGIE), the public transmission system operator (TEP), and emerging local public entities such as SPL Te Uira Api No Te Mau Motu. All face the same fundamental constraint: enabling smart grid functionality in contexts where legacy infrastructure, operational silos, and lack of real-time visibility are the norm.

Why does fragmentation undermine smart grids in islanded systems?
One root cause lies in the historical structure of the electricity sector. The original centralized utility model is progressively being challenged by multiple local operators, creating a patchwork of systems. The result of this fragmentation is:

- Uncoordinated and unmanaged assets (thermal and renewable)
- Isolated microgrids with no control systems and manual operations
- New operational responsibilities that require hybrid management skills, such as reserve management, black-start procedures with BESS, hybrid plant protections, or grid-forming through BESS to optimize microgrid management.
- A slow shift from reactive operation modes to proactive, forward-looking strategies that improve grid stability

The consequence is that the energy transition requires transformation at every level—technical, organizational, and human. Digital tools alone cannot deliver results in structurally fragmented environments; real change requires addressing the power system, grid infrastructure, human capabilities, legal regulations, and digital solutions as an integrated whole.

At Energy Pool, we work with a variety of actors in the region. Some are embarking on their hybridization journey from scratch; others are already grappling with the challenges of managing variable renewable production. Over recent months, our projects have spanned a wide range of contexts:

- Off-grid microgrids with local operators and municipalities aiming to reduce diesel dependence by integrating renewables intelligently while increasing grid stability
- C&I prosumer sites—commercial facilities or industrial plants—seeking to reduce electricity bills through PV and battery storage (BESS), with some aiming to go completely off-grid, even when their existing supply is already from an isolated microgrid
- Hybrid power plants developed by renewable

producers/ IPPs, where the stakes lie in accurate weather forecasting to maximize revenues while meeting the fixed conditions of a PPA. Here, penalties for deviation and the risk of disconnection make the case for an advanced Energy Management System capable of optimizing output, complying with grid codes, and protecting the producer's bottom line

These examples illustrate the diversity of challenges in the region, as well as the issues they havein common. All need to consider digital transformation as a means of addressing these challenges. In the next section, we focus on two case studies that reflect these dynamics.

III. Case study 1 – Tahiti: Grid complexity and the new role of TEP

Tahiti, the largest and most populated island in French Polynesia, is the nerve center of the territory's power system. The grid supports a peak demand of approximately 100 MW and is supplied by a mix of hydroelectric generation (nearly 50 MW) and around 130 MW of thermal diesel capacity—both historically operated by ENGIE's subsidiary, EDT (Électricité de Tahiti).

Until recently, the system was relatively simple: EDT owned and operated all major generation assets, enabling fully centralized control. However, the entry of independent power producers (IPPs) with solar + battery hybrid plants disrupted this model. In line with local regulations, EDT could no longer combine the roles of producer and dispatcher, since responsibilities for generation and dispatch priorities must remain separate under the regulatory framework.

To address this, the government appointed TEP (Société de Transport d'Énergie électrique en Polynésie,) as an independent transmission system operator (TSO). Since 2022, TEP has been responsible for maintaining system balance, managing grid operations, and integrating variable renewable generation into dispatch. This shift has brought several challenges:

- Lack of centralized control over new generation assets
- Limited visibility: no direct control of energy injected by two IPPs in Tahiti
- Inadequate software tools—traditional SCADA systems rely only on real-time data and lack advanced functionalities
- Increasingly complex and time-consuming manual operations
- Urgent need for network reinforcement (lines, protections) and upgraded operational expertise to prepare for future evolution

TEP also anticipates future congestion, as most generation assets are concentrated on one side of the island, requiring grid adaptation. A further challenge lies in grid codes and regulations that are not yet fully adapted to this evolving context. To secure reserves and ensure system stability, TEP is planning to install a large battery energy storage system (BESS) before 2030.

Energy Pool's support to TEP:

To assist in this fast-evolving but fragile transition, Energy Pool is supporting TEP through a phased approach:

- **Phase 1 – Urgent monitoring combined with measurement and verification**
  TEP required a rapid solution for measurement and verification of two new IPP hybrid power plants (PV + BESS) connected to the Tahitian grid. These plants must deliver stable production in compliance with a detailed and complex grid code. TEP must verify that production matches the forecasted and declared schedules, on both an intra-day and daily basis. Deviations trigger alerts, and significant discrepancies can lead to the producer being disconnected.
- **Phase 2 – Progressive automation**
  The next step will focus on automating exchanges between the TSO and the two IPPs, potentially expanding the scope to integrate other generation assets for dynamic dispatch control. At this stage, grid stability will become the main operational priority.
- **Phase 3 – Centralized reserve management**

The final planned phase will integrate the future large BESS into operations, enabling centralized reserve management, potential black-start capability for the entire island, and fully dynamic control of all assets. At this point, Tahiti's system will reach a level of operational complexity comparable to that managed by **Tonga Power**, with multi-asset centralized management in place.

IV. Case study 2 – Te Uira Api No Te Mau Motu: Making the invisible visible

In parallel, other islands are facing their own unique hurdles. The SPL Te Uira Api No Te Mau Motu is a local public company that inherited concessions on several islands previously managed by ENGIE. These concessions include grids with:

- No SCADA system or control interface, and thus no visibility on diesel genset performance or grid conditions (remote switches, protections, etc.)

- Difficult fault identification and troubleshooting across the network
- An increasing need for renewable integration to reduce operational costs
- Limited expertise in hybrid operations, with no centralized dispatch or monitoring capabilities

Te Uira Api No Te Mau Motu is pioneering in the region as the first operator to tackle these issues head-on while committing to greater renewable integration. As it expands operations across multiple islands, the need grows for a centralized, standardized software platform (SCADA/EMS) enabling remote operation, unified monitoring, and consistent control strategies. This also requires a cultural and technical shift—from teams accustomed to diesel-only operations to skilled hybrid system management.

The Huahine hybridization project:
As a first step, Te Uira Api No Te Mau Motu launched a hybridization project on the island of Huahine, combining PV, batteries, and diesel gensets. The targets are ambitious:

- Integrate more than 50% renewable energy by combining a photovoltaic farm with battery storage. This will allow the complete temporary shutdown of the diesel power plant under certain conditions
- Reduce annual diesel consumption from 2.35 million liters to 1.2 million liters
- Cut CO_2 emissions by approximately 3,300 tons per year
- Ensure the cost per kWh from hybrid generation is lower than diesel-only generation

However, achieving these goals demands more than installing infrastructure. It requires an intelligent control and decision-making system to optimize costs and maximize renewable penetration.

Preparing the ground before hybridization:
Recognizing the risks of integrating intermittent generation into an unprepared system, Te Uira Api No Te Mau Motu first decided to conduct a gap analysis and technical assessment of its existing assets—both the thermal power plant and the distribution grid.

This is where Energy Pool became involved—before any renewable assets were installed. Our role included:

- Performing a detailed technical assessment of generation and network assets such as optical fiber
- Designing a control strategy adapted to local conditions and operational constraints
- Providing recommendations for equipment and network upgrades with a particular focus on the grid connection point, which tends to become a critical vulnerability when integrating renewable sources. The aim was to design a robust and resilient network architecture capable of reliably accommodating future photovoltaic (PV) plants and battery energy storage systems (BESS)
- Assisting with the installation of new third-party controllers (diesel genset controllers, instrumentation of electrical devices such as circuit breakers at the power station and on the grid)
- Enabling remote monitoring and control of the thermal power plant
- Deploying a local microgrid controller (PMS) and SCADA at this stage, to automatically and remotely coordinate generation assets in the initial diesel-dominated phase

By laying this foundation, Te Uira Api No Te Mau Motu ensures that when renewable and storage assets are deployed next year, they can be integrated into a robust, controllable hybrid system. Crucially, the battery will become a central component of this setup, playing a key role in stabilizing the electrical network. Grid stability functions will be shared between the diesel gensets and the battery, with a gradual transfer of responsibility for grid support—from the thermal power plant toward the storage system—as renewable penetration increases.

V. Energy Pool's approach: Enablement, Software, and Operations
Energy Pool's journey began in the early 2010s as a pioneer in demand response, becoming the first company to deliver large-scale flexibility services to the French Transmission System Operator (RTE). At the time, this was a breakthrough: for the first time, major industrial consumers actively adjusted or reduced their electricity consumption in response to grid needs. This marked a turning point—grid flexibility was no longer the exclusive role of producers; consumers have become active partners in system stability.

The model soon proved its value beyond France. In Tokyo, one of the world's most demanding urban power systems, Energy Pool supports TEPCO, the local TSO, in leveraging demand-side flexibility to maintain balance and prevent blackouts in a highly constrained network.

To make this possible, Energy Pool built its own Energy Management Platform from the ground up—capable of pooling diverse assets and dispatching curtailment instructions in real time. Over the years, this platform has evolved into a versatile, forward-looking system that supports contexts ranging from industrial load management to hybrid microgrids and large-scale storage coordination, enhanced by machine learning capabilities and advanced optimization models.

But behind technology lies a multidisciplinary team of experts. Among them are specialists in offgrid, island microgrids who understand the unique operational challenges faced by isolated systems. Their real-world deployment experience ensures that our digital solutions are not only technically robust but also tailored to local realities—with a strong focus on practical implementation, operator training, and long-term autonomy.

For us, digitization is not just software deployment—it's a holistic transformation that requires system thinking, operational support, and field-proven expertise.

Energy Pool's methodology for digitizing islanded grids combines:

- **A thorough audit and advisory process**
  - Upfront economic studies, including techno-economic assessments to optimize battery storage systems, and complete audits of existing installations to identify critical issues
  - A step-by-step process to enhance plant automation, supported by clear operating mode diagrams
  - Modernization of network architecture to optimize load distribution, integrate renewables, and model power flows with advanced tools
- **Operational support in the field**
  - Hands-on assistance during commissioning, including project management, testing, validation, and on-site training
  - SCADA and EMS analysis to ensure efficient dispatching and smooth renewable integration
  - Detailed incident and protection analysis to strengthen reliability
  - Organizational assessments of dispatch/control centers to improve decisionmaking and efficiency
- **Software and operations**
  - Scalable solutions designed for fragmented microgrids: a fully integrated SCADA combined with a real-time local power controller (PMS) and a cloud-based energy optimizer (EMS), each deployment customized to project needs
  - From manual to automated operations: microgrid management strategies adapted to operational constraints and aligned with local needs

Our experience shows that success depends less on technology itself and more on these quencing of transformation: start with a deep understanding of the context, provide visibility, then enable control, and finally optimize.

VI. From siloed assets to smart, evolving energy systems

The transition from siloed, diesel-dominated microgrids to smart, hybrid grids in islanded contexts is not a question of "adding digital tools" but of rethinking the entire operating model. The French Polynesia experience shows that success depends on sequencing the transformation: first creating visibility, then enabling coordinated control, and only then unlocking true optimization.

Digitization in such environments must serve as an enabler, not an end in itself. It is the bridge between fragmented assets, diverse stakeholders, and evolving regulatory frameworks. Its real impact emerges only when paired with operator empowerment, robust governance, and a willingness to adapt strategies as systems grow more complex.

The deployment of hybrid systems makes network digitalization indispensable. This transformation is not just about controlling renewables—it is an opportunity for operators to adopt a unified digital platform for asset and infrastructure management. Over time, such platforms can support advanced capabilities such as predictive maintenance, asset and performance monitoring, and even the tracking of supplier warranties and contractual obligations.

In this way, digitization becomes a lever for both operational excellence and long-term resilience.

French Polynesia offers critical lessons:

- Start with a holistic understanding of the technical, operational, and human landscape
- Deploy flexible, scalable platforms that can evolve with changing needs and market structures
- Build local capacity so operators can own and sustain their transformation journey

French Polynesia's journey is still unfolding, but its early steps offer a blueprint for other islanded and remote systems worldwide: digitization should be a living process, enabling grids—and the people who run them—to anticipate, adapt, and thrive in the face of change.

Ultimately, smart grids are not about technology, they're about building systems that can learn, adapt, and evolve together with the people who run them.

Where are the real benefit of a "digital twin"?

Nick Phillips M.Sc. ARCS, Head of Technical Sales (APAC), Itron

Abstract:
We all understand the term "Digital Transformation" to be synonymous with accurate record keeping, automating systems and enhanced recording and monitoring the state of a power system grid. But after the core control systems have been implemented, where does the best "bang-for-buck" come from, and more importantly, how easy is it to take the first "digital" steps?

The paper looks at some real-world events that impact the electricity grid and the aspects of "smart grid" that allowed each affected Utility to make dealing with each, more efficient. Real savings achieved here in operations equate directly to additional funds for longer-term investment. Ranking such savings provides an independent prioritization list of activities that can be conducted.

Importantly though, we also look at the factors that facilitate the digital journey. Cloud hosting, single sources of truth for data and the way updates are synchronised to systems (to name a few) all affect the usability and ultimately the ongoing running costs of the "digital twin". Recognising the important traits sets the firm grounding for a long-term success.

Introduction and Context

Back in 2017, Carl Zichella, the Director of the Natural Resource Defence Council described the Electricity Grid as "The most complicated machine ever built". We completely take it for granted that when we turn on our air conditioning the energy to power the unit is delivered instantaneously from distant generation sources, and all along the intervening network, the adjustment in energy flows are dealt with resiliently and without impacting other consumers. All conducted in real-time. And to get to this point, we have delivered sophisticated control systems that detect and monitor changes in the network's overall demand and ensure generation capacity is available for delivery and capacity exists to route the energy to the end usage points.

But as we advance into the renewable age, amongst many, three key factors mean that we need to revisit the way we control and monitor the network:

1. Generation sources exist at all levels of the network (individual homes, MV wind turbines and solar farms, HV power stations).
2. Renewable energy is intermittent and so system reliability depends on the ability to conduct "what if" scenarios and Montecarlo analyses to establish control strategies that are resilient to perturbation and unexpected events.
3. A significant generation source (solar) is only available for part of the day, and while it can be stored in batteries, there is an increased imperative to ensure that energy is delivered efficiently, and losses minimized.

Short term fluctuations in base load are becoming more prevalent, and this will only grow as the introduction of transport electrification requires short duration bursts of EV charging. Traditional gross modelling of network behaviour at the HV/MV level of the network is now insufficient and must be extended throughout an electricity grid. 40 – 60% of typical energy losses are sustained in the LV network, so maximizing efficiency through these assets (wires, transformers, switches etc) and understanding how they behave – and importantly recognising when they don't behave as expected is now a key focus to being able to deliver on the promises of renewable integration.

A "Digital Twin" in the context of an electricity distribution network is a comprehensive, real-time virtual representation of the physical electrical infrastructure of the as-operated state that combines multiple data sources, advanced modelling, and simulation capabilities to mirror the actual behaviour and performance of the grid. In this paper we'll look a little at what makes the Digital Twin different, some examples and the core enabling factors that allow for them to be used efficiently.

The key elements of the Digital twin revolve around the capacity to mimic what a system would do under either the prevailing conditions or under "what if" scenarios. In that later respect, they enable a Utility to plan for contingency analyses. A digital twin differs from traditional systems in that not only does it provide a holistic view of the system as opposed to the traditional compartmentalised elements, but a digital twin also goes beyond each of the big three currently used operational Utility systems:

- SCADA systems provide monitoring and control, digital twins add predictive capabilities, comprehensive modelling, and advanced analytics.
- Geographic Information Systems map network assets, but digital twins add real-time operational data and dynamic behaviour modelling.
- Traditional planning software works with static models, while digital twins incorporate live data and can model real-time scenarios.

For instance, a digital twin of an LV feeder, can compare the predicted behaviour of an LV transformer and underlying feeder loads with incoming data as it occurs, providing early warning when (for instance) transformer deterioration happens and could progress to an overload and outage.

It is perhaps this element that is of heightened importance to Island nations. Pacific nations are, by geography, isolated and thus unable to call upon generation reserves from neighbouring Utilities. Equally their grids are often built with minimal redundancy and within a Climatic zone of extreme weather where losing one generator or transmission line can cause widespread outages. When damage is caused, repair time can be elongated due to extended equipment shipping or offshore technical team availability. Being able to develop robust plans for incoming events as well as then provide monitoring in real-time provides an invaluable way to maximize network resilience and minimize disruption.

The Bottom Line

For island utilities, a digital twin isn't just a nice-to-have technology enhancement - it's a strategic necessity for survival and sustainability. The combination of isolation, resource constraints, environmental challenges, and ambitious renewable goals creates a perfect storm of operational complexity that digital twins are uniquely positioned to address.

Digital Twin Fundamentals for Power Systems

A true digital twin incorporates elements of real-time data integration, physics-based models, simulation engines and visualization platforms. Each of these elements aim to provide a simulation and working model of aspects of the physical plant that exists in the field. But the focus of that analytics can be very different depending upon the problem that the twin is aiming to mimic. For instance, a digital twin of the entire distribution grid focusing on the impact of renewable energy will be focusing on the power flows, overloading potential and times when supply will not balance demand. Whereas a twin of distribution transformers considers only the thermal behaviour of the units and the failure modes that may occur SHOULD overloading or backflow occur.

Each informs and benefits the running of the overall electrical grid, but the insights the two give are completely different in scale and the type of actions that they provide the operators with to mitigate and react to the situations that arise. In the former, dispatch and constraint levels for generation and demand on a real-time basis, while in the later predictive maintenance for days and months ahead to avoid catastrophic failure.

It's also important to understand and consider the existing systems already in use and the overlap or potential conflicts that may arise. A grid control system of some kind will already be in use, and so adding a digital twin may mean duplication of aspects of the monitoring. Alternatively, this may require extensive integration that can expand the scope and cost of the solution.

The results of a digital twin must be actionable. For instance, it may be impractical to control domestic solar PV rooftop generation so insights on an impending problem may not lead to tangible mitigating actions; but advice about a transformer's persistent out-of-range operation can result in the development of an achievable and timely intervention strategy for replacement or load reduction.

Realtime Data Integration

One aspect that any digital twin / digitisation strategy depends on, irrespective of scope, is accurately measured and real-time data inputs. In the context of a power system, that equates to the need for accurate and extensive data points collecting PQ data across the network. SCADA may well do this for the high voltage areas of the network, but if monitoring is limited to that, then only half of the problem is being watched (the generation). Even this statement is from the past, given the growing prevalence of Consumer Energy resources and plant such as Community Batteries.

So being able to collect and curate large quantities of accurately measured data is a de-facto precursor to any analytics suite or digitisation strategy. Depending upon the target of the "twin" this may be a Meter Data Management System (MDMS) or maybe a dedicated Time Series historian that collects data from a wider range of sensors. One thing for sure is that the traditional home of power usage data – the billing system – is an ill-equipped repository since it not only handles vastly abstracted data but is often a "sink" of data with limited ability to present the data to upstream systems to work on.

Alongside the measured data comes the other aspect of "real-time data" – real-time. This requires a communications network that can reliably deliver the data from the sensors to the repository and digital infrastructure to work on. Luckily, in this regard there are many different standards and mechanisms (Cellular, RF Mesh, Satellite, PLC, IoT) that can be used for delivery and so even incorporating more than one technology into the solution is no longer a costly impediment to solution architects. The focus can then move to ensuring that the communication conduits are reliable and resistant to disruption.

Finally, it is important to feed the model with the right type of data. Time synchronised, instantaneous Voltage and Current data is much more valuable than 30-minute averaged power data where volatility is hidden and the detail that can show abnormalities has been obscured by natural smoothing.

These are the basis of any digitisation strategy – collection, transmission and storage of the key digital assets - the data. Or more precisely in the context of Energy management, consumption and power flow data, which can be most omni-presently delivered through smart meters.

The Value of Smart Metering to a Digitization Strategy

Smart metering represents a foundational element in the digital transformation of Pacific Island electricity utilities, offering unprecedented visibility into energy consumption patterns across geographically dispersed communities. For island nations where traditional meter reading can be logistically challenging and expensive due to remote locations and difficult terrain, smart meters enable automatic data collection and real-time monitoring without the need for physical site visits. This digital infrastructure creates a comprehensive data foundation that supports the evidence-based decision making that can then follow, from demand forecasting to grid optimization. The granular consumption data collected enables utilities to identify energy efficiency opportunities, detect non-technical losses, and implement dynamic pricing strategies that can help manage peak demand during critical periods when generation capacity is constrained. Assembled data is applicable to a wide range of different twin modelling scenarios - "Collected once – used many times" represents an unrivaled foundational step to many end use cases.

Beyond operational efficiency, smart metering accelerates broader digitization initiatives by establishing the communication networks and data management capabilities essential for modern utility operations. The digital infrastructure required for smart meter deployment—including advanced metering infrastructure (AMI) networks and data analytics platforms—creates a scalable foundation for additional digital services such as distributed energy resource management, predictive maintenance systems, and customer engagement portals. For Pacific island utilities often operating with limited technical resources, this integrated approach to digitization maximizes the return on infrastructure investments while equally importantly building local technical capacity. Smart meters also enable two-way communication that supports the integration of renewable energy sources and battery storage systems, which are increasingly vital for island energy independence and resilience against climate-related disruptions.

The Value Streams for a Digital Twin

Digital twins offer several compelling real-world benefits for electricity distribution utilities. They move the current operations from a mode of reactionary work to a point at which the operators can intervene or forewarn of incidents. For instance,

- In Predictive Maintenance and Asset Management Utilities can model the condition of transformers, cables, and switchgear to predict failures before they occur. This reduces unplanned outages by 20-30% and extends equipment lifespan by optimizing maintenance schedules based on actual usage patterns rather than fixed intervals.
- Grid Optimization and Load Forecasting Digital twins enable utilities to simulate different demand scenarios and optimize power flow in real-time. This helps reduce energy losses during transmission and distribution, typically saving 2-5% of total electricity consumption while improving voltage stability across the network.
- Outage Management and Response When outages occur, digital twins can instantly model the impact and identify the optimal restoration sequence. This reduces average outage duration and helps dispatchers prioritize repairs that will restore power to the most customers fastest.
- Integration of Renewable Energy As solar panels

and wind farms create more variable power generation, digital twins help utilities model how distributed energy resources affect grid stability. This enables better integration of renewables while maintaining reliable service.

- Capital Investment Planning Utilities can evaluate infrastructure upgrades before spending millions on new equipment. Digital twins help identify which grid improvements will provide the best return on investment and where capacity constraints are likely to develop.
- Regulatory Compliance and Reporting Digital twins automatically track grid performance metrics required by regulatory bodies, reducing manual reporting costs and ensuring utilities meet reliability standards.

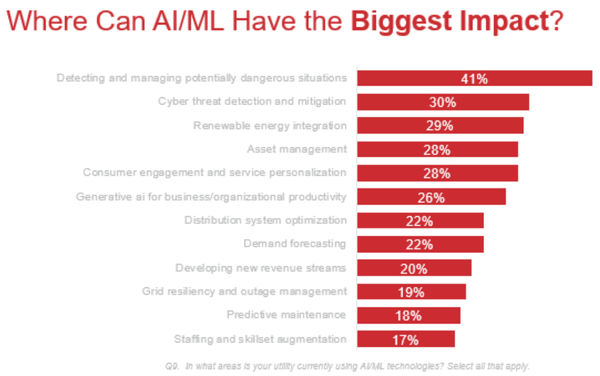
Implementors of digital twins have reported that utilities using digital twins see 15-25% improvements in operational efficiency and significant reductions in both planned and unplanned maintenance costs.

The Link between Digital Twins and Artificial Intelligence (AI)

A core tenet of the digital twin is to mimic the as-operated network for running simulations and detecting abnormal conditions. Such a model is founded on the measured historical data collected by a utility. It is a natural extension to employ artificial intelligence / machine learning to be able to use an Artificial Intelligence algorithm to detect abnormalities / failure conditions. Artificial Intelligence excels in correlating multiple data sets together to derive connections and previously un-appreciated cause-and-effect.

So, while formal algorithm can be applied upon model data to explicitly derive a specific insight, AI can be equally valuable. The true differentiator is whether there is enough data to reliably train an AI system. For instance, if failure modes are only rarely encountered and each is different, it is likely that an AI algorithm will be slow to learn and likely to miss considerable events before it can derive a common connection in the data models. This situation is most likely to be encountered in extreme conditions and so maybe inappropriate for disaster weather scenarios.

Each year, Itron conducts a global survey that looks at trends in the industry and in 2024 the survey of Utility managers asked about the impact of AI. The questions probed the current use of AI, the perceived capacity to deliver, and implementation concerns.



Overall, there is correlation between the impact of digital twins and that of AI. But interestingly, whereas safety, grid resilience, outage and asset management rate highly, preventative was an outlier, rating to the bottom of the list of expectations. This could be due to it being an early target and so "low-hanging-fruit" use cases have already been implemented. Equally it may be a response that this area has under-delivered for some reason.

Either way though, the multiple sets of coordinated and time-synchronised data needed to build a digital twin form an essential precursor to using AI. So, the value streams that come from both will be potentially facilitated from starting either. In fact, AI learning may well be facilitated by a digital twin since the predict – compare – analyse the differences model of the digital twin is akin to the supervised learning of AI models which can converge learning often faster than the un-supervised models.

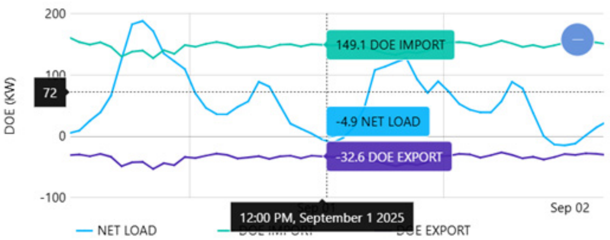
Digital Twins in Practice

What does a digital twin look like - and how difficult is it to embrace in this technology? The best way to understand this is to review a few digital twin use cases and look at how they can benefit the MV-LV distribution networks.

Renewable Energy Integration

Recent Australian Electricity mandated programmes of work have focused on the management and control of rooftop solar. With over 30% of homes possessing and exporting PV generation to the grid, Spring days consistently drive demand to record low minimums threatening grid stability. A digital twin of the LV distribution model enables the prediction of the impact of rooftop solar generation and for mediation strategies to be developed ahead of time.

This digital twin needs to understand the local network topology, connectivity of the Consumers and assets, measured consumption patterns of the Consumers, the potential generation capacity of the embedded devices (PV, battery, wind etc) and then calculate the maximum allowable limits of generation and load. It then needs to ensure that grid equipment capacity constraints (transformer throughput and transformer line and voltage constraints) are not violated. This calculation can be conducted either by a robust mathematical power flow or Distribution System State Estimation model (DSSE) or more heuristically by forecasting the network response based on previously observed similar days – through, for instance AI. Such a digital twin can then constantly monitor the actual measured consumption data from the last 5 minutes alongside the forecasted solar to predict the next 5 minutes. Lastly, with both prediction and actual data, the twin can evaluate and learn from any discrepancies detected from past iterations.



While the twin predicts the required generation limits to ensure equipment constraints are not violated, the base benefit is in automatically issuing curtailment commands to inverters to enact the control predicted by the model.

But this is not the only benefit.

- Power flows and Voltages measured from reality that differ significantly from those predicted can be a symptom of an inaccurate network topology (loads, PV on the wrong phase or incorrect switch open points). The digital twin can act in cleansing inaccurate GIS data.
- Upcoming planned maintenance information can be fed into the model to develop contingency plans where PV or consumption load will be unavailable. The same applies to when transformers or lines are temporarily derated, allowing the impact on the local network to be simulated.
- By comparing the actual behaviour against that simulated, incorrect PV configuration can be detected in un-telemetered installations. For instance, where solar output has tripped out due to incorrectly set voltage limits – this can be identified and fixed.

While the core benefits of this digital twin may appear restricted to schedule generation, the feedback loop from comparing actual to measured data unlocks additional benefits from data cleansing through outage management and more.

Preventative Maintenance

The boundary constraint in curtailing PV generation is ensuring that the capacity constraints of the network are adhered to. But what about the cases where constraint violations do occur – what would be the impact, and importantly what impact will that have on then network equipment?

Transformer management is a good example of a digital twin in this domain, and it also shows the difference between the "twin" concept and the traditional monitoring role.

The construction of a digital twin for a transformer is not that difficult. A well-accepted IEEE thermal model for distribution transformers exists and accounting for factors such as the internal structure of the transformer, winding types, oil etc. a relationship between external temperature, 3 phase current, voltage, oil temperature and age can be established. This is a pure digital twin – a mathematical model that can ingests real-time input data and exports actionable intelligence – in this case in one of two forms:

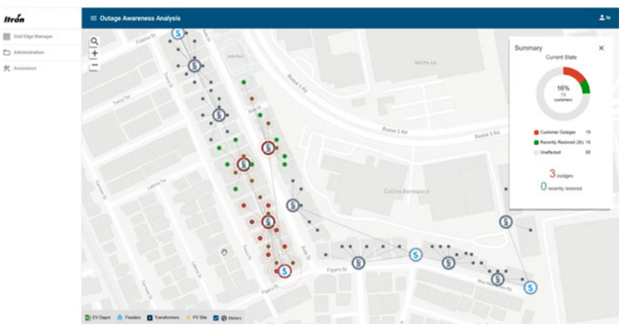
- Input power data and specifically overload events can be played through the model to determine the amount of "aging" the transformer has suffered and thus shortened its overall life.
- By also monitoring the actual oil temperature within the transformer, a comparison between the measured internal temperature (caused by heating) can be compared to that expected by the IEEE thermal model.

In the former case, a transformer that has suffered multiple aging events can then be scheduled for more frequent oil changes or other maintenance or in extreme cases early replacement. The "aging" data does not predict the imminent failure date, simply that lifespan will be shortened. The later scenario holds the prospect to deliver more focused information. Any sudden departure or step changes in correlation between measured and expected temperatures can be a symptom of internal structural change and damage (such as insulation breakdown). Monitoring such changes and trends in real-time, can then provide early indication of more imminent failure.

So, while traditional transformer monitoring retrieves power throughput data and alerts when a capacity limit is exceeded, a digital twin can be more qualitative about any impact and drive a medium-term preventative maintenance schedule. However, by adding one more dataset to the model, it then starts to become a tool aimed at the Operations time-frame to detect behavioural changes. The important element is that (except for the additional sensor) it is largely the same data set that a utility already can retrieve.

Outage Management

Traditional outage management systems primarily react to outages after they occur, using static network models and historical data. They can identify affected customers and dispatch crews. An entry level digital twin not only accepts the outage information, but also then correlates that information with other data streams to attempt to verify the completeness of the information as well as determining root cause. Such a system can then more efficiently guide response crews and assist in the improved restoration of the event.



Moving to more sophisticated modelling, the goal is to be able to be able to predict how an initial fault might cascade through the network in real-time.

This is where the full digital twin benefit comes to play. A digital twin continuously maintains a live, physics-based model of the distribution network that can:

- Simulate fault propagation in real-time. When sensors detect an initial fault (like equipment overheating or abnormal voltage), the digital twin can immediately model how this might cascade - which protective devices will trip, how load will redistribute, and where secondary failures might occur.
- Predict outage boundaries dynamically, so rather than waiting for customer calls or additional alarms, it can predict which areas will lose power and in what sequence, allowing proactive customer notifications and crew pre-positioning.
- Optimize restoration sequencing. By modelling different restoration scenarios, it can determine the optimal sequence for re-energizing circuits to minimize restoration time and prevent equipment damage from inrush currents or voltage issues.

For example, if a transformer shows signs of impending failure, the digital twin might predict that its failure will cause protective relays to isolate three downstream feeders, affecting 2,400 customers, and that attempting to restore service via an alternate path could overload a nearby circuit. This allows operators to proactively reconfigure the network before the failure occurs, potentially preventing the outage entirely.

This predictive capability transforms outage management from reactive to proactive, which conventional OMS systems cannot achieve with current approaches.

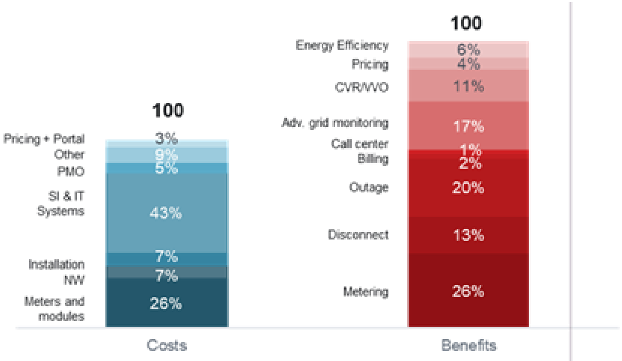
Choosing a Starting Point

Digital twins can be implemented across the Utility landscape, evaluating "what" to digitally transform is the harder question. Any programme of work wants to lean-in and be forward thinking in the challenges to address, but equally it needs to be approached with pragmatism to ensure that it results in meaningful and actionable insights that drive difference.

Implementing a digital twin is not so much about necessarily choosing a different solution space to address, but rather about bringing to bear smarter analytics to address the same problems that have traditionally been encountered. Revisiting where most clear benefits have been achieved in the past can provide guidance into where initial stepping stones into the digital world will result in early successes.

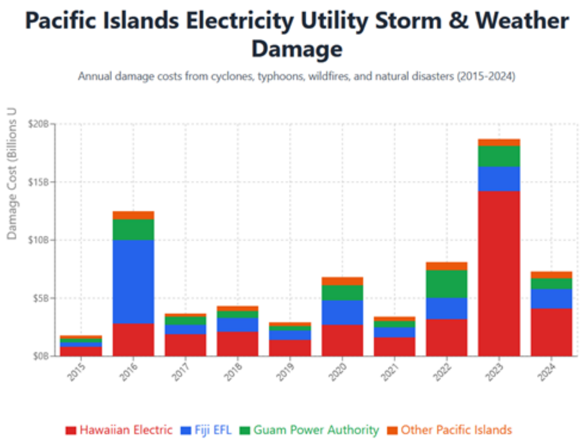
Programmes of work can be ranked against return on Investment and those consistently featured within the top three come out as:

- Improved Outage Management
- Advanced Grid Monitoring
- CVR/VVO & Energy Efficiency programs



Approximately 40% of the overall benefits from a digital transformation program have been consolidated into these three elements and here there is large alignment to the cases where digital twins have been used. Technology is enabling a migration from a traditional approach here as opposed to a step change in problem solving ability. Approaching digital transformation under an evolutionary model also provides a means to ensure that identified benefits can be realised in short sprints.

Of relevance to the Pacific islands is the effect of severe weather and the environment. Looking back over the last 10 years we can see a distinct upwards trend in the damage inflicted. A key target of any digital transformation strategy must be to alleviate the effect of extreme weather.



So, where to start? Perhaps with the acronym K.I.S.S. – "keep it simple, stupid. Concentrate on improving the core elements of delivery and restoration, like outage management, to provide measurable benefits to both Consumers and the Utility. This is what other utilities like Xcel Energy in the United States.

At Xcel they focused on a comprehensive digital twin strategy that transforms its vast data streams into actionable intelligence for grid reliability. Their Grid Visibility Tool (GVT) uses advanced metering infrastructure (AMI) data to enable distribution operators to:

- Identify overloaded transformers proactively.
- Reduce blackouts through predictive monitoring.
- Monitor voltage irregularities to advance grid reliability.
- Save significant dollars compared to the cost of rolling trucks to manage incidents.

Their digital twin enables real-time consumption monitoring and helps with efficient capital deployment for asset upgrades, particularly addressing grid reliability challenges from increased electric vehicle adoption.

Conclusion

A digital twin is not just an improved version of a traditional isolated system. It has distinct characteristics that allow it to make comparisons between a predicted outcome and reality, and from which a priori actions can be taken with confidence. In this respect it is fundamentally different to traditional monitoring.

But approaching digital transformation does not need to require a "big bang" approach. Rather it is quite possible to identify individual modelling scenarios and develop them in isolation to produce specific outcomes. Over time a repository of these models develops with the potential to ultimately use the outcomes from one as the inputs to another. For example, transformer failure warnings from that model can be issued into wider models:

- To predict the downstream outage impact in predictive outage management
- Or to identify the impact on PV generation flows and alter a predetermined capacity schedule.

The key here to enablement is to ensure that all the twins are built from a single source of data that is received and processed in the same timeframes. That way, even if each model is procured from different vendors, each can be assured that each is "seeing" the same data set with the same time-synchronised data. If this is not the case, one model may arrive at conclusions that are invisible to another with resultant confusion between the two. But managed correctly, an evolutionary approach allows for addressing relevant problems in shorter timeframes and ensuring staff and processes have time to adjust to the more predictive mode of operation afforded by a "digital twin".


KARADENIZ POWERSHIP ERIN SULTAN
KARADENIZ POWERSHIP MURAT BEY

Pacific Power Association and Palau Public Utilities Corporation Hosts the PPA 32nd Annual Conference and Trade Exhibition Koror, Palau

Pacific Power Association

The Pacific Power Association (PPA), in collaboration with the Palau Public Utilities Corporation (PPUC), successfully hosted its 32nd Annual Conference and Trade Exhibition from 22 to 25 September 2025 in Koror, Palau. The event welcomed over 258 participants, including representatives from power utilities, allied members, affiliate members, government officials, and development partners from across the Pacific region.

Held under the theme **"Smart Grids and Digital Transformation in Energy,"** the conference provided a vibrant platform for regional collaboration, technical exchange, and showcasing innovative energy solutions. A key highlight was the trade exhibition, which featured **38 exhibitors** presenting cutting-edge technologies, products, and services tailored to the Pacific energy sector.

Delegates engaged in workshops, panel discussions, and networking sessions focused on advancing energy resilience, sustainability, and digital innovation. The strong turnout and active engagement reflected the Pacific region's shared commitment to transforming its energy landscape through smart technologies and strategic partnerships.

Sunday 21 September 2025

The conference activities opened on Sunday, 21 September, with registration and bilateral meetings with development partners, the World Bank and Asian Development Bank, with the power utilities. These sessions provided valuable opportunities for strategic dialogue and partnership building.

Figure 1: Sunday Registrations with PPA & PPUC Committee team

Monday 22 September 2025

CEO's Retreat

The CEO's Retreat was held at the Ngarachamayong Cultural Centre and attended by CEOs and senior representatives from 20 power utilities across the Pacific. The retreat was coordinated by Ms. Jane Romero from the Pacific Regional Infrastructure Facility (PRIF) and featured active participation from key development partners. These included representatives from the World Bank (WB), Asian Development Bank (ADB), Australia High Commission/Australia Investment Financing Facility for the Pacific (AIFFP/DCCEEW), the British High Commission, the Republic of China (Taiwan), the FSM Department of Resources and Development, the Hawaii Natural Energy Institute, and the Pacific Community (SPC). The CEO's Retreat session also featured two key activities: the official signing and launch of the PPA Business Strategy Plan 2025–2029, and a consultation led by the Asian Development Bank (ADB) on the proposed Regional Project Management Unit (PMU) concept.

Figure 2: CEOs Retreat in session.

The following presentations at the CEOs retreat were as follows.

1. *World Bank, Ms. Slavena Georgieva – Energy Transition Roadmap*
2. *World Bank, Mr. Ximing Peng – Signing and Launching of PPA Business Strategy Plan 2025-2029*
3. *Hawaii Natural Energy Institute, Mr. Leon Roose – Modernized Resource Planning in PICs for Orderly Transition*
4. *Australia High Commission/Australia Investment Financing Facility for the Pacific, His Excellency Mr. Toby Sharpe – The Pacific Climate Infrastructure Partnership – Australia's Regional Investment in Pacific Renewable Energy*
5. *World Bank (PWIP), Ms. Helle Buchhave – Pacific Women in Power Trailblazers in Action*
6. *Energy Fiji Limited, Mr. Bobby Naimawi – Pacific Regional Energy Training Centre*
7. *Asian Development Bank, Mr. Keiju Mitsuhashi – Consultation on Regional PMU Concept*

Engineers Workshop

Running concurrently with the CEO's Retreat was the Engineers Workshop, held on Monday, Tuesday, and Thursday. The sessions on Monday and Tuesday were facilitated by Mr. Sandip Kumar and focused on inspection and compliance checks for Solar PV Systems, referencing standards such as AS/NZS and NEC. To conclude the first two days, participants were taken on site visits in Palau, including the International Airport's 225 kW solar panel installation and the 100 x 4 Sanyo Denki system.

Figure 3: Engineers Workshop in session

Figure 4: Utility Board of Directors Workshop

Utility Board Directors Workshop

The Utility Board of Directors Workshop was a two-day event held at the Ngarachamayong Cultural Centre. It was facilitated by Dr. Iain McGill and Mr. Janendra Prasad, both representing the University of New South Wales. The workshop provided board members with valuable insights and guidance on governance and strategic leadership within the energy sector.

Allied Members Formal Meeting

The formal meeting of the Allied members took place following their informal gathering and afternoon tea. As both the designated chairman and alternate were unable to attend the conference, one of the Allied members from Hadron Energy, Mr. Ross Ridenoure, volunteered to lead the meeting.

Figure 5: Allied Members Formal Meeting in progress

PPA extends its appreciation to Nauru Utilities Corporation for the morning and afternoon teas and Chuuk Public Utilities Corporation for the lunch on Monday.

All Delegates were treated to dinner and entertainment at the welcome dinner held at the Palau Royal Resort, kindly hosted and sponsored by the host utility Palau Public Utilities Corporation.

Figure 6: Delegates at the welcome dinner

The host utility complemented the welcome dinner with traditional entertainment.

Figure 7: Entertainment at the welcome dinner.

Tuesday 23 September 2025

Official Opening

The conference was officially opened by the Minister of Public Infrastructure, Industries and Commerce, Hon. Charles I. Obichang and the keynote address was delivered by Mr. Keiju Mitsuhashi, Director, Southeast Asia and the Pacific Team, Energy Sector Office, Asian Development Bank.

The Hon. Charles I. Obichang warmly welcomed delegates to Palau for the 32nd Annual Pacific Power Association Conference and Trade Exhibition, expressing pride in hosting the event for the fourth time. Emphasizing Palau's deep connection to nature and its vulnerability as a small island developing state reliant on imported fuel, the speech highlighted the nation's commitment to achieving 100% renewable energy by 2032 under its Nationally Determined Contributions (NDC).

The speech concluded with gratitude to the Pacific Power Association Secretariat and Palau Public Utilities Corporation for organizing the event, and a call for continued collaboration among Pacific nations to achieve a sustainable energy future.

The Keynote address by Mr. Mitsuhashi emphasized the critical importance of developing and implementing smart grids and digital transformation across the Pacific region. He expressed appreciation for the collaboration among Pacific Power Association (PPA) members, contractors, and consultants, highlighting the shared commitment to improving energy systems.

Figure 8: The Chief Guest Hon. Charles I. Obichang

Figure 9: The Keynote Speaker Mr. Keiju Mitsuhashi

Figure 10: Delegates attending the official opening.

Following the guest speeches, gifts were presented to all sponsors as a token of appreciation for their support of the event. The official opening was followed by a group photo session and morning tea.

Session 1: Panel Discussions

The session began with a presentation by the Government of the Federated States of Micronesia, followed by contributions from the World Bank and the University of New South Wales, focusing on 'Early Market Engagement for the Procurement of Solar PV/BESS and Mini Grids in FSM and RMI.

Figure 11: Presenters for Session 1

Session 2: Presentations

Chair: Mr. Mafalu Lotolua, GM, Tuvalu Electricity Corporation (TEC), Tuvalu.

Figure 12: Presenters for Session 2

1300-1330 – *"Where are the Real Benefit of Digital Twin?" – Mr. Nicholas Phillips, Itron*

Figure 13: Mr. Nicholas Phillips of Itron

1330-1400 – *"Paradigm shift in Diversity and Supply of Energy" – Mr. John Benavente, Guam Power Authority*

Figure 14: Mr. John Benavente of Guam Power Authority

1400-1430 – *"Digitizing Islanded Grids: Lessons from French Polynesia" – Ms. Agnieszka Rychlicka, Energy Pool*

Figure 15: Ms. Agnieszka Rychlicka of Energy Pool & Mr. Anthony Maurin of SPL Te Uira Api

1430-1500 – *"Modernizing Island Grids with Smart Hybrid Systems" – Mr. Kari Punnonen, Wartsila*

Figure 16: Mr. Kari Punnonen of Wartsila

Session 3: PPA Board Meeting

The PPA Board meeting, which was open to all members, commenced at 4:05 p.m. and concluded at 5:55pm.

Figure 17: Board Meeting in session

PPA extends its appreciation to Marshalls Energy Company for sponsoring the morning and afternoon tea, and to S&C Electric Company for providing lunch on Tuesday.

Opening of the Trade Exhibition

On Tuesday evening the opening of the trade exhibition was officially opened by one of the PPUC Board of Directors, Mr. Richard Misech where he warmly welcomed all delegates, utilities, and allied members to Palau. He highlighted the region's commitment to clean, reliable, and affordable power through renewable sources. The trade exhibition was emphasized as a key platform for showcasing cutting-edge innovations and fostering networking among participants. Gratitude was expressed to allied members for supporting the exhibition and to the PPA Secretariat for organizing the event. The speech concluded with the official declaration of the exhibition as open.

PPA sincerely thanks Hawthorne CAT for generously sponsoring the opening trade exhibition cocktail.

Figure 18: Chief Guest, Mr Richard Misech of the PPUC Board of Directors

Figure 19: Delegates participating at the opening of the trade exhibition cocktail.

The exhibition featured 38 tables, exclusively from PPA Allied members.

Exhibition Table #	Allied Members
1.	Sicuro USA
2.	Sustainable Energy Industry Association of the Pacific Islands
3.	Aggreko NZ Ltd
4.	Koppers
5.	HNAC Technology
6.	CBS Power Solutions
7.	Cummins
8.	Hadron Energy
9.	AR Industrial
10.	Arthur D Riley
11.	Sulzer
12.	HDF Energy
13.	Boroko Power Generation Motors
14.	Canadian Solar
15.	S&C Electric
16.	Delstar
17.	Supreme Group
18.	Entura
19.	Yachiyo Engineering
20.	Utilligence Ltd
21.	Power & Marine Engineering
22.	Energy Pool Development
23.	Karpowership
24.	ComAp
25.	Selectronic
26.	Solar Pacific Pristine Inc
27.	Pacific Engineering Projects
28.	Itron
29.	Pernix Fiji
30.	Accelleron
31.	Hawthorne
32.	Nan Electrical Cables
33.	NOJA Power
34.	ITP Renewables
35.	Marinsa International Inc.
36.	Wartsila
37.	Radian Research
38.	OHM International

The Exhibitors

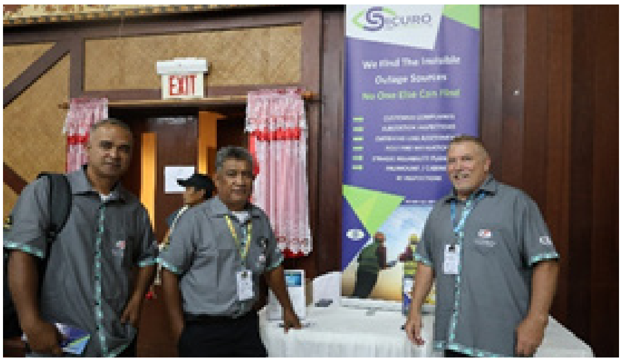


Figure 20: Bill McConaha of Sicuro with Kosrae Utilities Authority delegates

Figure 21: Sandip Kumar of Sustainable Energy Industry Association in the Pacific Islands

Figure 22: David Chute of Aggreko NZ Ltd & Wallace Smith of Pernix Fiji Ltd

Figure 23: Damian McCue of Koppers

Figure 24: Mark Candy of Arthur D Riley

Figure 25: Boris Krull of Sulzer and PPUC CEO Frank Kyota

Figure 26: Gordon Petersen & Bryan Dumail of HDF Energy

Figure 27: James Edwards & Darren Hoffman of Canadian Solar

Figure 28: Eduardo Soares of S&C Electric & Melissa Malsol of PPUC

Figure 29: Gaurav Khire of Delstar & PPUC delegate

Figure 30: Shekhar Prince, Dean Haley & Lachlan MacKenna of Entura with Prof. Ian MacGill of UNSW

Figure 31: Neil & Sarang Bhat of Power & Marine Engineers with Anthony Maurin of SPL Te Uira Api No Te Mau Motu

Figure 32: Jeremy Szopa & Asli Surek of Karpowership

Figure 33: Rod Scott & Christine Scott of Selectronic

Figure 34: Craig Armstrong & Iain Hannaway of ComAp with PUB CEO David Drake

Figure 35: Villa Ngirailild of Palau Solar/Utilligence with one of the delegates

Figure 36: Nicholas Philipps & Sagar Shevade of Itron

Figure 37: David Boekee of Nan Electrical Cables

Figure 38: Donald Bisaya of Pacific Engineering Projects & Mohammed Edward of Petro Oceania Energy

Figure 39: Anthony Abela & Bong Camu of Accelleron

Figure 40: Matthew O'Regan of ITP Renewables, Leopold Balogh of NOJA Power & Clarence Kitalong of PPUC

Figure 41: Leopold Balogh of NOJA Power

Figure 42: Marcus Zickefoose & Geromy Cunnigham of Radian Research & Alexandra Lutuni of MEC

Figure 43: Jayaraman Padmanabhan & Faisal Mahmood of Wartsila & Quazi Hassan of Accelleron

Figure 44: Kyoji Fujii, Sato Masataka & Diego Mejia of Yachiyo Engineering

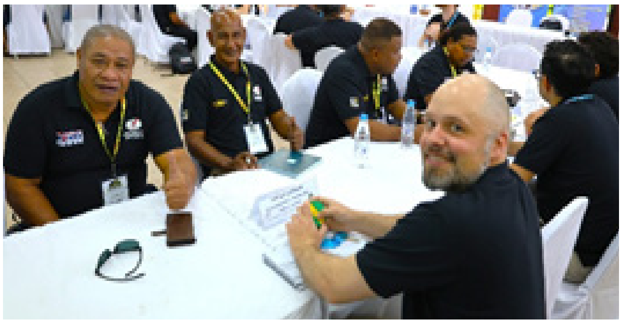
Figure 45: Lane Petersen of OHM International

Figure 46: Umesh Geakwad of Boroko Motors

Wednesday 24 September 2025

Speed Networking & Field Trip

Day 3 of the conference started off with the speed networking at the Ngarachamayong Cultural Centre. The speed networking was facilitated by the newly appointed PPA Alternate Allied Members Chairman, Ross Ridenoure of Hadron Energy. Each Allied member was given 5 minutes each with the 20 Active member utilities. Due to bad weather conditions, there was a slight change in the afternoon program where only a limited number of delegates was able to go on the field trip to the traditional village in Palau and the Malakal power station.



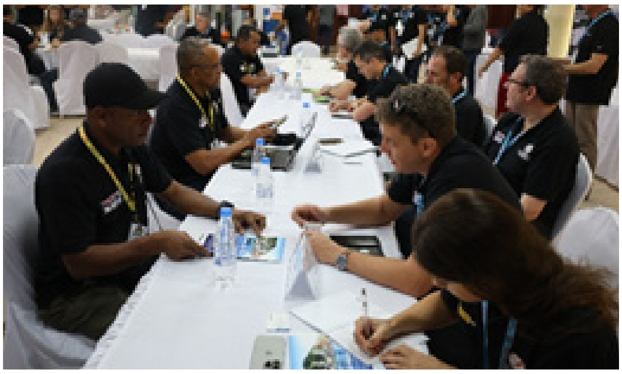


Figure 47: Speed Networking in progress

The PPA acknowledges the kind sponsorship from Wartsila for morning tea and the World Bank for lunch.

Conference Closing Dinner

In the evening, delegates enjoyed a closing dinner and entertainment at the Palau Pacific Resort, generously sponsored by the Pernix (Fiji) Ltd and Palau Public Utilities Corporation.

Figure 48: Delegates enjoying the dinner & entertainment.

Thursday 25 September 2025

Session 7: Presentations
Chair: Ms. Delilah Homelo, CEO, Solomon Power, Solomon Islands

0830-0900 – *Field-Based Meter Site Analysis for Revenue Integrity and Loss Prevention, Mr. Marcus Zickefoose, Radian Research*

Figure 49: Marcus Zickefoose of Radian Research

0900-0930 – *Hadron Energy's 10 Mwe Micro Modular Reactor (MMR)", Mr. Ross Ridenoure, Hadron Energy*

Figure 50: Ross Ridenoure of Hadron Energy

0930-1000 – *Energy Transition in the Pacific Island Countries, Challenges and Solutions, Mr. Kyoji Fujii, Yachiyo Engineering Co.*

Figure 51: Kyoji Fujii of Yachiyo Engineering

Session 8: Presentations
Chair: Mrs. Lesley Katoa, CEO, Te Aponga Uira, Cook Islands

1030-1100 – *Smart Grids for the Pacific: Unlocking revenue, resilience and renewables, Mr. Ross Waddington, Utilligence*

Figure 52: Ross Waddington of Utilligence

1100-1130 – *The Tonga Renewable Energy Project (TREP): Lessons from BESS and SCADA implementation with low network visibility", Mr. Lachlan McKenna, Entura*

Figure 53: Lachlan MacKenna of Entura

Session 9: Presentations

Chair: Mr. Apenisa Manuduitagi, Acting General Manager - Power, Nauru Utilities Corporation

1300-1330 – *Electric Power Operations 10-year Plan, Mr. Ramon Adelbai, Palau Public Utilities Corporation*

Figure 54: Ramon Adelbai of Palau Public Utilities Corporation

1330-1400 – *Women Energizing the Pacific", Ms. Helle Buchhave, World Bank PWIP*

Figure 55:Helle Buchhave of World Bank - Pacific Women in Power

1400-1430 – *Market-facing pipeline of energy projects in the Pacific" Mr. Robert Guild, PRIF*

Figure 56: Robert Guild from Pacific Regional Infrastructure Facility

1430-1500 – *Economically Optimized and Autonomous EV Smart Charging, Mr. Leon Roose, Hawaii Natural Energy Institute*

Figure 57: Leon Roose of Hawaii Natural Energy Institute

Annual General Meeting

The AGM was held at the Ngarachamayong Cultural Centre in Palau.

Figure 58: Annual General Meeting in progress.

At the meeting the PPA Board Chairman provided a summary of the resolutions from the Board meeting held on Tuesday. During the meeting a conference theme committee was formed. The committee consists of Mrs. Lesley Katoa of Te Aponga Uira, Cook Islands, Mr. Frank Kyota of Palau Public Utilities Corporation, Mr. Mafalu Lotolua of Tuvalu Electricity Corporation and Mr. Clinton Chapman of Niue Power Corporation. The committee then elected Mrs. Lesley Katoa to be the Chair.

Closing Trade Exhibition

The Closing of the Trade Exhibition was closed by the Palau Public Utilities of Corporation CEO, Mr. Frank Kyota. The closing exhibition cocktail was kindly sponsored by Sino Soar Hybrid.

Figure 59: Delegates at the Closing Trade Exhibition Cocktail

The PPA acknowledges the kind sponsorship from Guam Power Authority for the morning and afternoon teas, and lunch from NiuPower on Thursday.

Acknowledgements

The funding and sponsorships from members below have ensured a successful 2025 conference and trade exhibition.

Events	Sponsor
Monday Morning Tea & Afternoon Tea	Nauru Utilities Corporation
Monday Lunch	Chuuk Public Utilities Corporation
Monday Welcome Dinner	Palau Public Utilities Corporation
Tuesday Morning Tea & Afternoon Tea	Marshalls Energy Company
Tuesday Lunch	S&C Electric Company
Tuesday Opening of Trade Exhibition	Hawthorne CAT
Wednesday Morning Tea	Wartsila
Wednesday Lunch	World Bank
Wednesday Conference Dinner	Pernix (Fiji) Ltd & Palau Public Utilities Corporation
Thursday Morning Tea & Afternoon Tea	Guam Power Authority
Thursday Lunch	NiuPower
Thursday Closing of Trade Exhibition	Sino Soar Hybrid
Monday Conference shirt/blouse	Pacific Engineering Projects

Events	Sponsor
Tuesday Conference shirt/blouse	CBS Power
Conference Polo shirts	Boroko Motors Power Generation & Carptrac
Conference caps	Nan Electrical Cables
Conference Satchels	Sulzer
Conference Program	World Bank – Pacific Women in Power

Other Major Sponsors:	
1.	Asian Development Bank (ADB)
2.	Department of Climate Change, Energy, the Environment and Water – Australia (DCCEEW)
3.	The World Bank
4.	Republic of China, Taiwan

The PPA Secretariat extends its sincere appreciation to all sponsors, Allied and Active members, Donor Partners, and Affiliate members for contributing to a successful conference. We also thank the delegates for their commitment in attending, as well as the presenters and workshop facilitators for their time and preparation. A special acknowledgment goes to the Palau Public Utilities Corporation for their warm hospitality and for hosting our delegates throughout the week. Your support, hard work, and dedication made this event truly remarkable. We look forward to welcoming you to the 33rd Annual Conference and Trade Exhibition in Fiji in 2026.

Figure 60: PPUC Conference Committee

Momentum Builds for Women in Energy Across Pacific Utilities

Fiona Bingham, Consultant – Pacific Island Countries
Organisation: World Bank

At the Pacific Power Association (PPA) Annual Meeting in Palau in October 2025, member utilities endorsed the PPA 2025–29 Strategy, a roadmap that places people and skills at the heart of the region's energy transition. A key strategic objective in the new plan is to increase women's employment in technical and managerial roles.

The World Bank–supported Pacific Women in Power (PWIP) program is helping members turn this commitment into action. Established to support utilities in building stronger, more inclusive talent pipelines, PWIP focuses on six core areas: gender-inclusive recruitment, school-to-work transitions, family-friendly retention measures, respectful workplaces, leadership diversity, and outreach to ensure women know they are welcome in the energy sector.

One year after the PWIP Baseline Report (2024) revealed that women held only 5% of technical roles, the program returned to the PPA CEO retreat to report concrete progress from eight PWIP Trailblazer Utilities: Chuuk PUC, Marshalls Energy Company, PNG Power, Pohnpei PUC, Samoa EPC, Solomon Power, Tonga Power, and Yap PUC.

90+ Actions Launched Across the Region

More than 90 actions have been implemented across PWIP-supported utilities—evidence that utilities are moving beyond aspiration into structured, practical steps. These actions include updated hiring processes, outreach programs, new HR policies, targeted training, and investments in safer and more supportive workplaces for women.

While women's participation in technical roles has increased only modestly from 5% to 6%, Helle Buchhave, World Bank Global Gender Lead and Task Team Leader for PWIP, emphasized that systemic change begins with policy shifts, leadership buy-in, and early recruitment efforts. "The foundation has now been laid," she said when presenting the progress made by PWIP trailblazers, adding that "These coordinated efforts are the critical first steps toward long-term workforce transformation."

Apprenticeships and Internships for Women Double

One of the clearest signs of progress comes from school-to-work pathways. The number of women participating in apprenticeships and internships across the trailblazer utilities has doubled thanks to targeted recruitment and outreach. For example, Chuuk PUC launched a scholarship program and showcased female engineers during school visits; its first scholarship recipient is a woman. Samoa EPC and Solomon Power now prioritize women during internship selection. Tonga Power and PNG Power have also recorded significant increases in female apprentice numbers.

Utilities were encouraged to set internal targets and deepen collaboration with training institutions to sustain this trend.

Policy Reform Gains Speed

Together, Samoa and Chuuk are introducing 16 new policies and practices designed to better support women's employment. Samoa EPC is leading the region with 11 policy initiatives completed or underway, including measures on family-friendly work arrangements, gender-inclusive recruitment, and workplace safety. Chuuk PUC is developing five new policies, among them anti-harassment guidelines and gender-mainstreaming procedures.

Marshalls Energy Company (MEC) is strengthening safety protocols for female staff, engaging directly with schools, and promoting female role models within the company.

Tonga Power demonstrated leadership at the highest level with the appointment of 'Ofa Guttenbeil-Likiliki, a prominent advocate for women's rights, to its board—signaling a commitment to gender-inclusive governance.

Building Capability Across Utilities

So far, PWIP has trained 375 staff across PPA members, including through a six-month program on unconscious bias followed by a Training-of-Trainers in Suva. Each trailblazer utility now has at least one certified trainer able to deliver unconscious bias training in-house—crucial for embedding cultural and behavioral change.

Utilities have also run 25 outreach and awareness events, with 24 newly trained outreach champions engaging schools and communities. PNG Power, for example, hosted hydro-station tours for more than 200 students and participated in four major career fairs.

Looking Ahead: Mentorship and New Tools
The World Bank PWIP program announced a new year-long mentorship program for women engineers and senior STEM students, delivered in partnership with the Global Women Network for Energy Transition. An updated PPA gender website was also launched, housing baseline data and soon the latest progress results—supporting accountability, transparency, and shared learning across the region.

A Turning Point for Pacific Energy Utilities
Across all updates, a clear message emerged: Pacific utilities are taking tangible, measurable steps to build more diverse and resilient workforces. The progress demonstrated by the eight trailblazers shows that members are moving from broad commitments to concrete action—increasing opportunities for women and strengthening the sector's talent base for the future.

"This is what change looks like—local leadership, steady progress, and the foundations for long-term impact," Ms. Buchhave said. "It's a privilege to be part of this transformation, and we're just getting started."

Geoffrey Stapleton's Order of Australia Investiture Ceremony

Sustainable Energy Industry Association of the Pacific Islands

Geoff Stapleton's award was announced earlier in June during the King's Birthday honours list for 2025. However, the investiture ceremony for the Order of Australia took place on Thursday 25 September at Government House in Canberra. Mr Stapleton was named an Officer of the Order of Australia (AO) in the General Division and the award was presented by the Governor-General of Australia, Her Excellency the Honourable Ms Sam Mostyn.

The award was for Mr Stapleton's "distinguished service to engineering in the renewable and sustainable energy sector, and to ,and to training and development.

Mr Stapleton's list of achievements and groups he was associated with is long and impressive. He has worked in Africa, Asia and the Pacific.

His current roles include: Director, International Training for Global Sustainable Energy Solutions; and Executive Officer of the Sustainable Energy Industry Association of the Pacific Islands since 2022. He has also been: Member and Chair of the Australian Industry Associations', Standards, Training and Accreditation Committee, 2000- 2012; Conference Chair, Solar World Congress, 2020; Initiator and Project Lead, ISES Online Solar Energy Museum; Industry representative on the Sustainable Energy Development Authority Advisory Board, 1996-1999; Member of Australian standards committees since 1993, Australian representative on International Electrotechnical Commission standard committee since 2014 and was Chair, Solar Energy Industry Association of Australia, NSW Chapter, 1992-2002.

The SEIAPI Executive Committee is proud of Geoff's award and would like to thank him for his many contribution to the solar industry as a whole and in particular the Pacific solar industry.

Welcome!

TO THE NEW ALLIED MEMBERS

There have been four (4) new Companies who have joined the PPA as Allied Members since our last PPA Magazine.

TOTAL ENGINEERING SOLUTIONS (AUST) PTY LTD: Total Engineering Solutions (Aust) Pty Ltd is based in Wetherhill Park, Australia. Their primary activity is power generation/mech, auxiliary systems. Their secondary activity is maintenance system and installation services.

SUPREME GROUP GUAM LLC: Supreme Group Guam LLC is based in Tamuning, Guam. Their primary activity is contract management fuel terminal. Their secondary activity is asset management and inspection.

E RAIL TRANS PTY LTD: E Rail Trans Pty Ltd is based in Georges Hall, Australia. Their primary activity is authorised distributors for SKF bearings and maintenance products and FUCS lubricants. Their secondary activity is prime sourcing of vast range of products apart from SKF & FUCHS.

AINSBURY HOLDINGS PTY LTD T/A BARCLAY ENGINEERING: Ainsbury Holdings Pty Ltd T/A Barclay Engineering is based in Canning Vale, Australia. Their primary activity is full turnkey solutions in power generation and power station EPC, Hybrid, remote and black-start power generation EPC and manufacturer of exhaust and steam vent silencers, delivering worldwide. Their secondary activity is balance of plant supplier, pipework, fuel and lube oil tanks, and electrical switch rooms (modular and Containerised) ventilation systems and transformers enclosures.


A//
Accelerating sustainability in marine and energy
We develop, produce and service turbochargers and digital solutions: these make engines more powerful and efficient, while also reducing emissions. Our advanced products are used in a wide-range of sectors including marine, energy and rail. These industries make our world turn and we power them, reliably and sustainably, while also helping them decarbonize.
Accelleron Australia Pty Ltd
87 East Derrimut Crescent
Derrimut, Victoria
3026 Melbourne, Australia
24hrs: +61 400 064 278
turbo.au@accelleron-industries.com
accelleron.com
Acce//eron