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June 2021, Volume 29 Issue 2

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

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Cover Page Photograph - "Newly Appointed Nauru Utilities Corporation Chief Executive Officer, Mr. Carmine Piantedosi".

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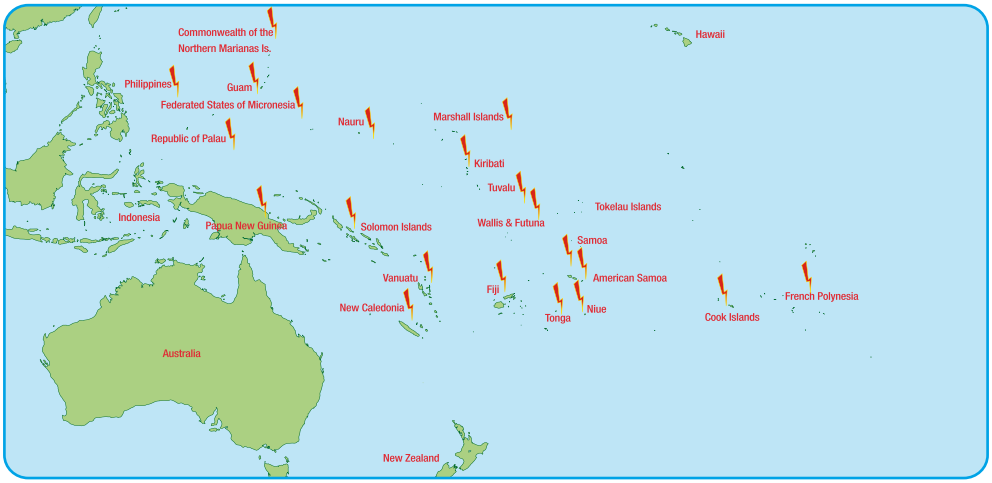

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Editor's Note

Gordon Chang
Acting Executive Director

Welcome to another issue of the PPA Magazine from the PPA Secretariat. We at the Secretariat have been under lockdown for almost three months due to the Covid-19 pandemic and most of the time we are working from home. We sincerely hope that you are all safe and healthy, in your own bubble, and in your home, and in your PIC/T and country.

This edition of the PPA Magazine profiles Mr. Carmine Piantedosi. He is an engineer, legal and regulatory professional with a proven track record of implementing and delivering regulatory reform and legislative objectives, engineering and development projects, and legal support within electricity, water and transport sectors. He is skilled at developing electricity and water utility regulation, implementing renewable energy and energy efficiency schemes, providing legal support to the resources and infrastructure sector and designing networks. His country experience includes Australia, Vanuatu, Fiji, and Nauru. He has held various senior management, supervisory and leadership roles in various sectors including: Chief Executive Officer, Nauru Utilities Corporation, Nauru; Chief Executive Officer, Land Transport Authority Fiji; Chief Executive Officer/part-time Commissioner, Vanuatu Utilities Regulatory Authority; Senior Regulatory Manager, Essential Services Commission, Victoria; Senior Project Manager and Ergon Energy Queensland to name a few.

It looks most unlikely that the PPA Secretariat will be not able to hold the PPA Conference for this year due to the Covid-19 pandemic. In place of the PPA Conference the Secretariat will hold the virtual conference presentation on Thursday 26 August 2021 and we would like to ask that both the active and allied members to take note of this date and participate to make this event a success as it is becoming the norm way to hold a meeting, workshop and conference.

The PPA Secretariat would like to welcome two new Allied Members, NiuPower Limited from Papua New Guinea and Sterling & Wilson Limited from Australia as the PPA's newest members. On the other hand, the Secretariat has two Allied Member withdrawals from Fiji Gas Limited and Oceangas Services Australia Pty Limited due to the pandemic and we hope that once this surpasses that they will be able to join the PPA membership again.

We want to finish with a thank you to our loyal members who continue to support the PPA with your financial membership fees, those who advertise and provided their articles in this magazine issue, and also supporting the PPA budget. We appreciate your support in these uncertain times.

Thank you.

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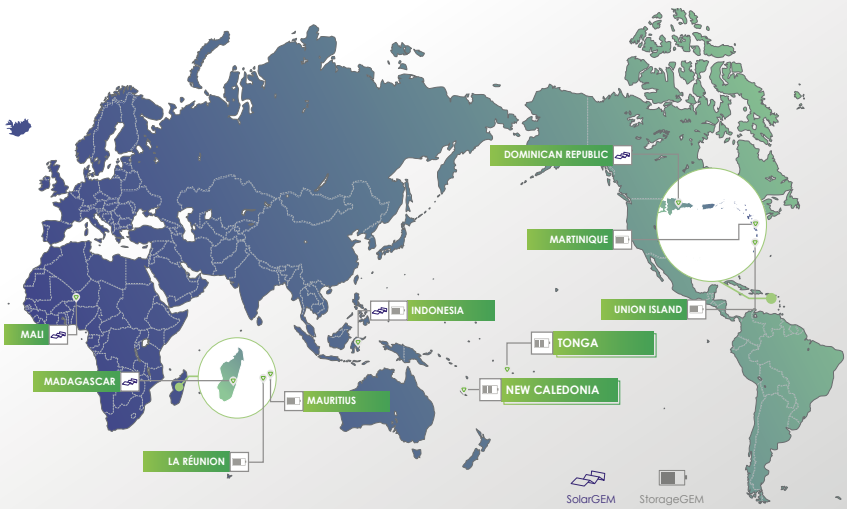

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Hatz is Where the Digitization of Compact Engines Begins
E1 Technology-Worlds First Single Cylinder Tier 4 Final Diesel Engine

Hatz Diesel

Hatz's latest generation of engines with E1 technology received their first emission certificates. This is an important milestone for the development and future of "light equipment". This is the first time that single-cylinder industrial diesel engines with electronic injection and control have been certified according to the currently valid US standard EPA Tier 4 final. The Hatz 1D90E engine is the peak performer of the range. At almost eleven kilowatts (14 horsepower), it is the most powerful single-cylinder diesel in the world. Hatz 1B50E, 1B30E and 1B30VE cover the output ranges up to around eight (11 horsepower) and five kilowatts (6 horsepower) respectively with extremely compact dimensions.

Compact light weight air cooled Tier 4 final
The E1 technology paves the way for a networked future, for example, for hand-guided machines, mobile light masts or power generators. This bridges the gap between previously mechanically controlled engines and the requirements of modern companies that work digitally. The Hatz E1 engines meet the emissions requirements according to EU Stage V and US EPA Tier 4 final. Thanks to Hatz designed engine control unit, ability to perform onsite and remote diagnoses can be achieved. Hatz offers new convenient functions such as starter motor and engine protection and automatic shut down when idling for long period, saving fuel, all achieved via dedicated engine control unit.

Hatz H series water cooled
High torque with low installation space requirements

The 3 & 4 cylinder H series has been specially constructed for low emissions at a very high torque. A ground breaking downsizing approach was adopted in the development of the Hatz H-series. The outcome is extremely compact, turbocharged engines, setting benchmarks in their performance classes. The 4H50TIC, a turbocharged 2 liter engine achieves a maximum power of 55 kW and sets the benchmark in its power class with a weight of only 173 kg. The engine complies with the strict limit values of EU 97/68 Stage IIIB and EPA Tier 4 final without particulate filter.

The H-family was developed from the very beginning with a focus on fulfilment of tighter regulations, such as EU_Stage V that will make a diesel particulate filter (DPF) inevitable. These TICD models are fitted with the customized Hatz diesel particulate filter system optiHEAT that can be optimally adapted to the machine and installation situation.

Hatz also offers the three-cylinder and four-cylinder TI models that work without EGR and DOC and achieve maximum outputs of 64 kilowatts for countries that do not place special requirements on emission values. Compliance with the EPA Tier 2 and EU Stage II emission levels is still achieved without any exhaust gas treatment.

Award winning technology
The E1 technology has also been honoured in the USA for the 2019 achievement with the Diesel Progress Award. The jury primarily based its decision on the ground breaking development of new technologies: "Hatz impresses with the electronic injection and control of compact, powerful engines, as well as the accompanying connectivity for the Internet of Things."

Diesel Progress Summit Awards 2020

- The winner of the New Power Technology of the Year Award is Hatz Diesel of North America.
- The award for the Engine of the Year under 175 horsepowers goes to the three-cylinder Hatz 3H50T.

E1 fire

E1

Evolution of Hatz Innovations

PERC Cell Technology & Half Cell Solar Modules: How Efficiency Gains and Cell Layout Yield Greater Charge Controller Output

Douglass Grubbs
Applications Engineer - Morningstar

Introduction

PV modules continuously improve through R&D efforts that contribute to incremental efficiency gains and reductions in cost. The industry then directly reaps these benefits each year. Occasionally a technology change takes a larger, more significant step that is worth taking note of. One such change was the introduction of Passivated Emitter and Rear Cell Technology (PERC) which significantly increased cell current and voltage (and in effect, maximum module voltage). In addition to this, there has been a large influx of half cell modules on the market. These half cell modules include an innovative cell layout that can provide even better performance than with traditional full cell modules. With a focused look at how solar power electronics can take advantage of these changes, we can make smarter system sizing decisions and leverage these new developments most effectively in off-grid solar systems where every watt matters.

How are New Solar PV PERC Modules different?

Half-cell modules have made a comeback

PERC PV cell technology has rapidly become the dominant cell technology in the market.

Many manufacturers are also offering these PERC modules in a half-cell configuration. Unlike small modules which use half-cells to achieve a smaller overall form factor and meet low wattage needs in the market, these new configurations are the same size as whole cell modules but contain twice as many half-cells to achieve the same ratings but with some unique benefits. Below are the relative new configurations:

36 full-cell ~ 72 half-cell
60 full-cell ~ 120 half-cell
72 full-cell ~ 144 half-cell

Half-cell modules have slightly higher efficiencies due to lower current in each cell and have higher voltage ratings than full-cell modules.

Besides these new cell configurations, Vmp and Voc voltages of PERC modules are ~5-15% higher than that of traditional modules. Table 1 below shows a comparison of voltage ratings between traditional modules and new PERC modules at standard test conditions.

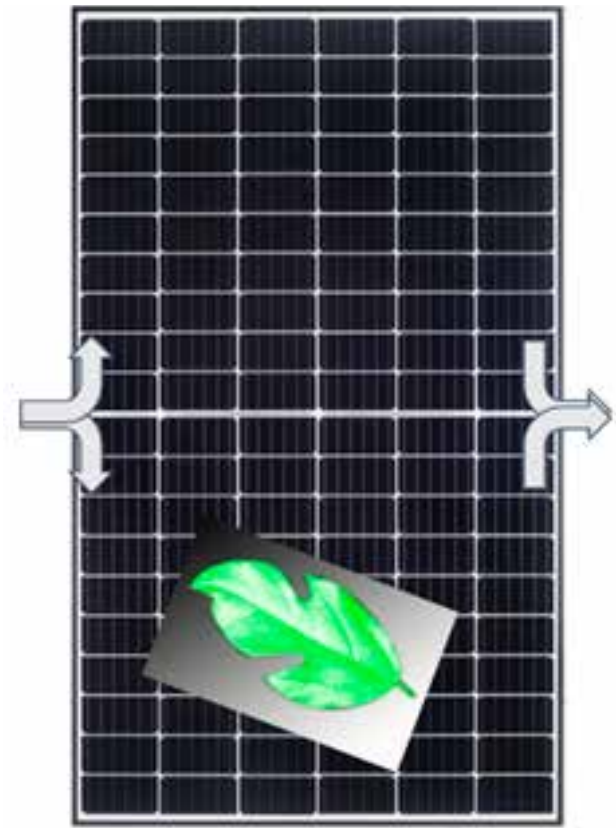
Table 1: New Perc Module Voltages

# of Cells	36 Cell / 12V Nominal		60 Cell		72 Cell / 24V Nominal	
Old/ New	Older	New PERC	Older	New PERC	Older	New PERC
Vmp	18V	19-21V	30V	31.5-34.5V	36	38-42V
Voc	22-23V	23-25V	36-37.5V	38-42V	44-46V	46-50V

Partial Shading Benefits of half-cell module layouts

Partial shading of solar modules has always been a major concern with solar PV systems. For off-grid systems it is especially important to get as much charging as possible in order to maintain loads and extend the lifetime of the battery. This is where using half-cell modules can really make a difference.

- Half-cells have the same voltage as full-cells but 50% of the current.
- Modules are made up of 2 parallel strings of half-cells which is similar to 2 modules wired in parallel
- Shading one side of the panel only affects 50% of the current of the module allowing the module to operate with full voltage with at least 50% current
- Partially shaded half-cell modules can provide enough voltage to support charge controllers in cases where full-cell modules do not.
- An MPPT controller can allow the full current with a lower voltage with some bypass diodes activated within limits.
- Better MPPT tracking can result with half-cell modules with higher array voltage levels



Partial shading with a whole cell module acts like a bottle neck limiting the current of the entire panel. With partial shading, the half-cell module can still operate with full voltage and at least 50% of the module current from the unshaded half of the panel. This can often be much better than having the partial shading affecting 100% of the current.

As these points show, the ability of half-cell modules to operate at full voltage and at least half of the current can make a significant difference allowing more charging when there is partial shading. This additional power can be critical for systems that may have partial shading that lasts for longer periods.

How does this affect array sizing with solar controllers?

Meeting the voltage requirements for a PV array is one of the most important considerations with string sizing calculations. The 5-15% higher voltage ratings of the new PERC modules can have a big effect on this.

- 36 cell and 72 cell PERC modules have higher voltage ratings than what was considered to be the standard with traditional nominal voltage modules in the past.
- 60 cell PERC module voltage ratings are now just a few volts lower than that of traditional 72 cell modules.

Table 2: Summary of System Sizing with PERC Modules

Type of Module	PWM Sizing	MPPT Sizing
36 Cell and 72 Cell Modules	Higher voltage than needed	Higher voltage works well
	Lower % of Pmp power utilized than before	Significantly higher MPPT Boost than before
60 Cell Modules	High risk of marginal performance	No risk with higher voltages
	Not recommended	Recommended

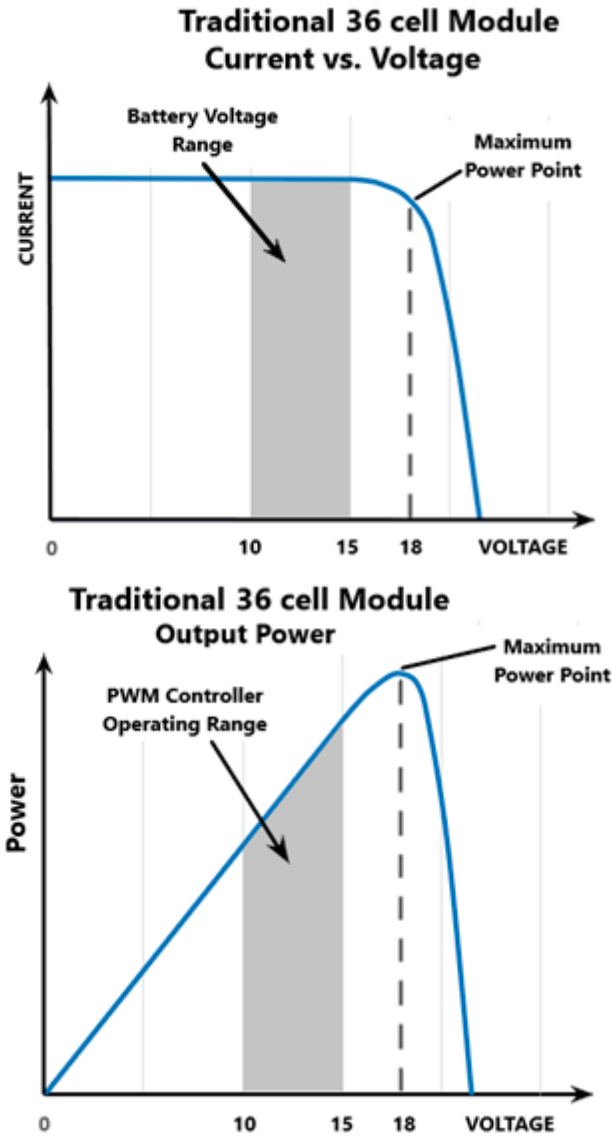
36 cell and 72 cell PERC "nominal voltage" modules

One of the advantages of using MPPT controllers instead of PWM controllers is "MPPT Boost"--the extra power achieved by operating at the maximum power voltage (Vmp) compared to a PWM controller which operates in the lower battery voltage operating range.

- 36 and 72 cell PERC modules can still be used at nominal voltage with an equivalent matching battery voltage of 12V or 24V respectively, with both PWM and MPPT controllers.
- MPPT Boost gains are now even more significant compared to a PWM controller.
  - MPPT Boost vs PWM is ~5-30% with traditional modules
  - MPPT Boost vs PWM is ~15-55% with PERC modules

While it is possible to use PWM controllers with new 36 cell and 72 cell PERC modules, the increase in MPPT boost associated with PERC modules position MPPT controllers to be even more economically attractive than before. The graphs that follow illustrate the additional MPPT boost attained from new modules compared to older modules.

Figure 1



This first pair of graphs in Figure 1 depict a traditional module operating at its rated Vmp voltage. You can see that the power shown at the Vmp voltage of 18V attained by an MPPT charge controller is greater than the power generated by a PWM controller with an operational voltage range of 10-15V.

Figure 2

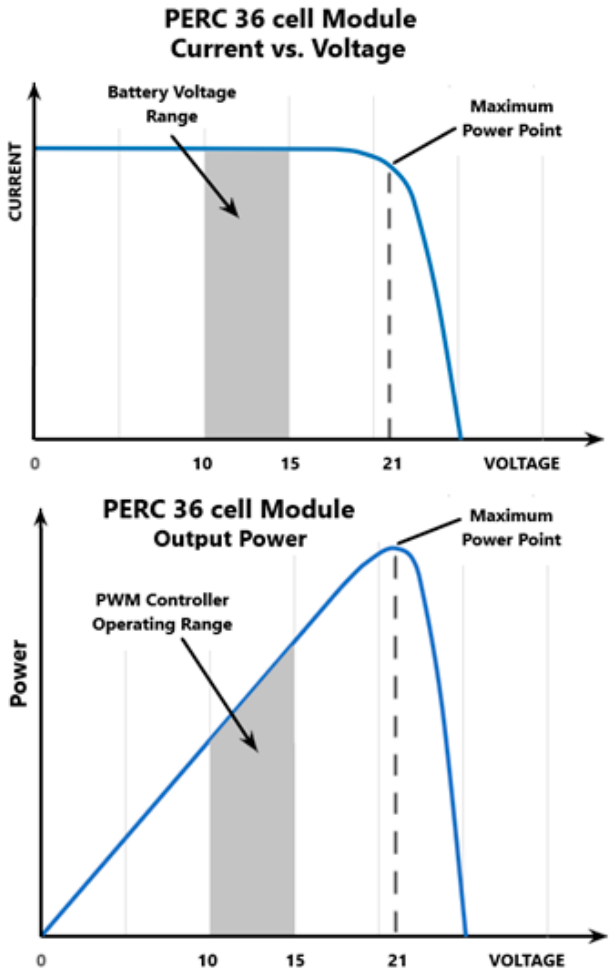


Figure 2 above illustrates the performance of a new PERC PV module operating at its rated Vmp voltage of 21 volts.

The MPPT boost with these new 36 and 72 cell PERC models is significantly higher than what we have seen before. The voltage vs. power graph shown here has a higher MPPT voltage of 21V compared to 18V in the previous graphs. With these higher voltages, the MPPT boost will be approximately 15 to 55% which is a significant gain over traditional modules. The higher the Vmp rating is, the higher the MPPT boost will be.

Sizing Example 1: New 72 PERC Cell Module with a 24V System

- Voltage ratings (STC) : Vmp = 41.3V; Voc = 49.3V
- Historic Temperatures: Record Low = -10°C/14°F, Average High = 35°C/95°F
- Module Voltage Calculations

- Min Vmp @ +35C = 36.7V,
- Max operating Vmp = 42.8V
- Max Voc @ -10C = 54V

- Comparative MPPT boost calculations during bulk charging with battery voltage = ~28V
  - MPPT Boost: PERC module = ~ +25% (warmest ave high) to +50% (coldest operational)
  - MPPT Boost: traditional module = ~ +5% (warmest ave. high) to 30% (coldest operational)

In Sizing Example 1, the minimum operational Vmp is as high as the standard (STC) ratings of most traditional modules. This is significant considering that this example has such a high annual average high temperature. The PERC cell based module's voltage ratings have all but eliminated the negative impact of this high temperature on module voltage. A significant advantage!

Array sizing with new 60 cell PERC modules

As indicated in Morningstar's 60 Cell PV Module Sizing Tech Tip, traditional 60 cell modules are not well adapted for meeting the nominal voltage array requirements for PWM controllers. This is because the Vmp voltage can drop too low with higher PV cell temperatures, causing marginal performance and preventing the battery from getting fully charged. Some customers may be tempted to now consider using 60 cell PERC modules in place of 72 cell modules in nominal-sized systems, especially with PWM controllers. One should exercise extreme caution and be aware of the possible consequences before deciding to use a 60 cell PERC module with a PWM controller.

Important! - Please be aware that it is the customer's responsibility to make array sizing choices and Morningstar does not guarantee the performance of the system when using our online String Sizing Tool. The tool uses data provided by other parties (such as PV module specs) and makes calculations based on reasonable assumptions which Morningstar cannot always verify.

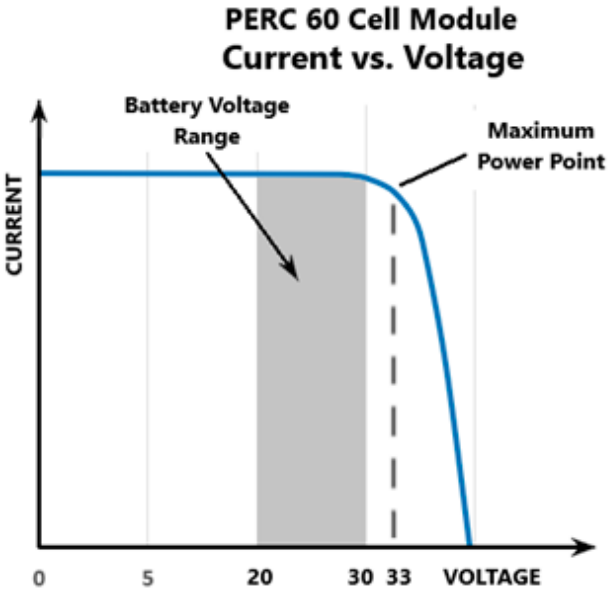
The following factors reduce the risk of marginal performance when sizing a 24V or 48V PWM system with 60 cell PERC modules.

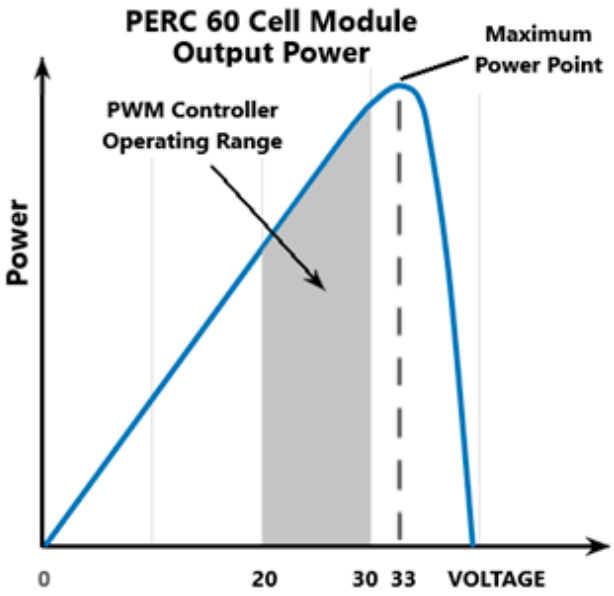
- Higher Vmp ratings
- Lower max regulation voltages; For sealed, AGM or GEL batteries; Not for Flooded batteries
- Climates with lower average max temperatures
- Systems deploying lithium batteries that can tolerate extended periods at a partial state of charge

Morningstar's string calculator can help evaluate the use of a 60 cell PERC module with a PWM controller and a 24V or 48V nominal voltage system. The string calculator results warn "marginal performance in high-temperature conditions" when the PV voltage might be insufficient for battery charging. To provide additional assurance, a higher max battery voltage, and a higher average high temperature can be entered into the string calculator to leave some headroom in the design.
The system should also be monitored during the warmest times of the year to verify that the battery is getting fully charged.

Figure 3 below shows graphs of the IV and power curves for a 60 cell PERC module operating at its rated Vmp voltage of 33 volts. The Vmp voltage is not that much higher than the PWM controller's highest operating voltage. When the module voltage reduces due to higher temperatures, the array Vmp may drop below the required voltage setpoints of the controller and charging may be temporarily paused during this period.

Figure 3





The insufficient voltage will be more of a problem with MPPT controllers. You can see from this graph that the lower Vmp voltage results in very little to no MPPT boost. Also, MPPT controllers are DC-DC Buck converters and require slightly higher input voltages than PWM controllers for charging to occur, increasing the risk of marginal performance in warmer conditions.

In accordance with past recommendations, Morningstar recommends using 60 cell PERC modules with MPPT controllers as long as there are enough modules in series to fully charge the battery bank.

- For 24V battery banks, this means at least two 60 cell modules in Series are required.
- For 48V battery banks, it means three or more modules in Series are required.

Table 3 below summarizes series string sizing options for 60 cell PV modules with Morningstar's MPPT controllers.

Table 3: Array Sizing Options with 60 Cell Modules

System Voltage	12V	24V	48V
SunSaver MPPT	1 in Series	N/A	N/A
ProStar MPPT	1 or 2 in Series	2 in Series	N/A
TriStar MPPT	1, 2 or 3 in Series	2 or 3 in Series	3 in Series

Sizing Example 2: 60 Cell Module for a 24V System

Here is an example of a string sizing configuration with a 24V system and a new 60 cell PERC module which is not advisable.

- Module voltage ratings (STC) : Vmp = 32V; Voc = 39V
- Battery Voltages:
  - Min = 23V,
  - Max = 29.2 + .5V = 29.7V
- Historic Temperatures:
  - Record Low = -10°C/14°F,
  - Average High = 30C + 5C = 35°C/95°F Module Voltage Calculations
- Min Vmp @ +35C = 27.7V, Max operating Vmp = ~ 32.1V
  Note: A 0.5V higher max Battery Voltage and 5C higher Average High Temperature was applied in these calculations for greater assurance.

The minimum Vmp is below the threshold minimum Vmp voltage requirement and will thus trigger our string calculator to display a "marginal performance in hot ambient temperature" warning for a PWM controller. The module in this example should not be used as a 24V nominal module as it would have marginal performance in hot conditions. This risk would be reduced if the max battery voltage and average high temperature were lower. Marginal performance from low voltage can be resolved by deploying a higher voltage string with an MPPT controller

Conclusion

In Summary, PERC cell technology, with its new cell configuration options, delivers more voltage to charge controllers to greatly increase power harvest. This provides more overall gains in Maximum Power Point Tracking systems and provides PWM controllers higher input voltage to improve their charging performance in hot temperatures. Additionally, higher cell-count modules, with their "two-in-one" design, mitigate impacts of partial shading, so modules can continue to provide most of their rated power during these conditions. We hope this technology overview, and the sizing examples we included, help you realize the benefits of PERC technology in your off-grid system designs.

Green microgrids for remote islands?

Naturally.

Remote communities often rely solely on fossil fuel for their energy needs, which usually comes at a high price. Thanks to ABB's pioneering microgrid solutions, remote locations like islands can maximize the use of renewable energy and get stable and cost effective access to high-quality power while minimizing environmental impact. Another example of how ABB's power and automation technologies are enabling a stronger, smarter and greener grid.

http://new.abb.com/microgrid-solutions

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ABB

Bringing Global Technology to South Pacific Networks

Transnet NZ Limited

The idea was to bring something new to the supply of electrical components for networks across New Zealand and the South Pacific

TransNet is a 100% privately owned, Carbon Neutral, Kiwi business, based in East Tamaki, Auckland, New Zealand. We've been servicing the electricity, OEM & rail industries here and in the South Pacific for more than twenty years. The industry needed a shake-up, a company that would scour the world for the very best and most trusted brands and bring them here. A company that would get those products to customers quickly with the technical support and training they require. A company that would hold enough stock to get New Zealand and the Pacific Islands through natural disasters or pandemics that could disrupt traditional supply chains. TransNet is that company.

The aim was to do things better, and in order to do that we had to focus on the needs of our customers and how we could meet them.

Our geographical location and size in the global market has long been a hurdle for sourcing the best products. With large MOQs and long lead times, coupled with the distance to travel and the relatively small size of the South Pacific market, targeted products for our conditions were often unavailable and customers were found making do with marginally suitable alternatives. That is, until TransNet came along and tipped the industry on its head.

Supplier Relationships

TransNet has forged strong relationships with suppliers from all over the world including right here in New Zealand. These relationships mean more than simply procuring the best products. They mean input into supply time lines as well as product innovation to suit the NZ market. These relationships are well established and with them comes exceptional technical support for all our customers.

Working with our suppliers, we have achieved many industry game changers, with one of the most notable being TUDS (Total Underground Distribution System). The result of being tasked with finding a way to reduce the number of damaged pillar boxes on distribution networks, TUDS have been in use for twenty years and are proving a huge success in not only reducing damage related outages, but also in reducing street furniture and improving general safety for field staff and the public alike.

Like many of our products, TUDS pits and lids are made in New Zealand helping other kiwi businesses to grow and innovate.

Service & Delivery

We have the ability to lean on suppliers in emergencies to source products our customers need quickly. Examples of this are evident in Cyclone recovery initiatives we are consistently involved with. Government agencies such as New Zealand Aid are quick to contact us for fast, simple and comprehensive supply of essential products to get the power restored in the immediate aftermath of a natural disaster. We work closely with our suppliers to procure any additional stock that is required, quickly. Suppliers globally make room in manufacturing facilities to produce what we need and expedite to New Zealand or in some cases direct to location to

keep the recovery operations moving. This effort is recognised by the agencies we work with and as a result we are consistently called to assist.

TransNet offers a 24/7 service to customers in New Zealand and the South Pacific and during storms or other emergency situations this has proven essential to getting the power on again. With delivery of goods being the key to all aspects of this business, we added delivery vehicles to the fleet so we can react even faster. We are also well known for having an extensive stock holding, and four stocking locations across the South Pacific ensures delivery even during times of global shipping delays and natural disasters. This is a key factor separating TransNet from our competitors.

Product Range

With more than 14,000 SKU, the range of products we offer is second-to-none. Our purpose-built facility has enabled us to add value in new ways too. We are proud to have the only TE Connectivity certified independent Raychem Cable Accessory kitting room outside Europe. This means customers can have special kits designed and manufactured locally for even faster dispatch. We also have the only G&W certified service workshop in Oceania, offering unparalleled service for the setup, pre-installation testing, and maintenance of G&W switchgear. Our new HV test lab, opened in 2020, has proven not only an asset to customers requiring tested PPE quickly, but also to TransNet's R&D division to do prototype testing. The R&D division works closely with customers who need a solution to a problem and task TransNet with the job of finding it.

We work closely with our suppliers to secure the best warranty terms available, some examples are a 20 year warranty on all Raychem heatshrink products and a 25 year warranty on all TE porcelain insulators. This sort of support is what gives our customers the confidence to move forward with us.

One unexpected benefit we found early on in this journey was that many of these changes weren't only good for the environment and our impact on it, but also for the efficiencies of our own business.

When TransNet embarked on this sustainability journey we were acutely aware that any initiatives employed had the potential to impact service delivery for our customers. With this in mind, we set out to identify proposals that intersected with our business goals and implement them in a way that generated positive flow-on effects wherever available.

Supply Chain

With our supply chain spanning New Zealand and the globe it was a laborious yet satisfying task to audit and adjust supply chain practices. We have consolidated shipping, spread order dates, and further increased stock holding to reduce air freight reliance and better align with freight forwarders' schedules. By doing all this, we have introduced a highly managed stream of deliveries from suppliers to replenish our stocks – in some instances we have orders in the system six months out from actual production. These efficiencies not only decrease emissions but also result in a more effective supply chain, tailor-made to suit the requirements of our industry. Strengthening our already impressive stock holding means our customers can rest assured that when a natural disaster or other global event impacts production we have enough stock in the pipeline to carry you safely over the period of interruption.

Facility

Our purpose-built facility, completed in late 2016 was engineered to maximise the use of available natural resources and minimise our reliance on external utilities. This includes sensor operated energy efficient LED lighting, utilisation of natural sunlight and heat, rainwater collection, and our micro grid consisting of a 544-panel on-site solar farm with smart battery management system that consistently produces more than 100% of the energy required to power the entire facility. These features not only have a nil impact on our everyday operation, they place us in a uniquely beneficial position during emergency situations. Our micro grid means when the power is out around us, our facility can still operate. We can run completely free of the grid ensuring security of supply for our customers even during natural disasters.

Less Waste

Reducing waste seems like an obvious initiative and packaging was the area we determined was the most beneficial. There is a fine balance between reducing packaging and keeping product protected, but any excess identified is a waste of both production and disposal resources. We have worked with our suppliers to remove any unnecessary packaging and where we can't remove it, we have begun changing to greener and more sustainable alternatives. This not only reduces our waste but also that of our

customers. In the first year we managed to reduce our own landfill waste by 66% on the previous year.

Recycling

Recycling was already a vital part of our business, so we ramped up our internal programme and found ways to recycle materials previously deemed non-recyclable, such as polystyrene, batteries, and even wood pallets. This has also enabled our customers to recycle materials they had been previously sending to landfill. In some instances we have been able to assist in the transportation of these recyclable materials coordinating this with deliveries of goods using our in-house delivery fleet. We've done the work and we want everyone to reap the gains.

Sustainable Alternatives

You'll notice our products are being packed with paper padding instead of bubble wrap. When void filling to secure items in a box during transit we're using this clever single ply folded and creased paper to do the job. We're still looking for a viable compostable alternative pallet wrap, but in the meantime we have introduced a new pallet wrapping machine that stretches the wrap more and in turn reduces by 30% the amount of wrap required to secure the load. All our pallet wrap is recyclable and we send this to a local plastic manufacturer, where it is recycled and made into TransNet cable cover that we sell to networks around the country. In addition, we have added electric vehicles to our fleet, we power them from our solar farm and we also offer smart charging infrastructure in our range. Our unique position in the market enables us to understand the demands of EV charging on supply as well as the desired charging of end users. We have partnered with Wallbox - the leader in EV charging. Wallbox units monitor and manage usage to reduce the demand on supply. Our team work closely with commercial customers to instil knowledge around EV charging and how best to set up their charging infrastructure for a mutually beneficial result.

Year on Year Improvements

To maintain our ISO and Carbon Neutral certifications we must keep improving with year on year reductions in our carbon footprint. This process becomes increasingly more difficult as changes are made and inefficiencies eliminated, but even subtle improvements have an impact. One of our recent projects is to account for the carbon footprint of every product that leaves us on its way to you, with the result that all deliveries from TransNet reach our customers completely carbon neutral. It is important to us that we continue our journey to a more sustainable future alongside our commitment to providing exceptional service. We are working hard to expect more from ourselves every year and we want you to expect even more from us.

When TransNet began developing a purpose- built facility in East Tamaki back in 2015 the ability for it to meet industry, customer, and safety requirements was paramount.

As the largest supplier to the electricity industry in the South Pacific TransNet is required to deliver wherever and whenever you need it – regardless of a natural disaster or other emergency.

Our main distribution warehouse was designed with four main objectives in mind: Safety, Smart Energy System, Mana Whenua considerations, and Sustainable functionality.

Safety

The architect-designed building was to be fully compliant with the Building Code, but in addition to this TransNet needed to ensure it would remain functional and safe in the event of an earthquake or other natural disaster. Our East Tamaki facility has a 100% NBS rating (% New Building Standard), the national seismic building rating system introduced after the experience of the Canterbury earthquake sequence.

It was essential for the safety of our team that the 11m high racking in the warehouse was also rated to retain its integrity during and after seismic activity. This racking has been designed and built to AS 4084-2012 and AS / NZS 1170:2002 Structural Design Actions. Part 5: Earthquake actions. This ensures our staff remain safe and that we can still operate during a natural disaster recovery. The sprinkler system in this building is top tier, designed to NZS4541:2013 with fire hazard classification of "Extra High Hazard", and the fire alarm system is connected directly to the fire service for even faster dispatch of crews in the event of fire.

In addition to all this built-in safety the general well-being of the team is crucial, so to ensure everyone breathes safe air all our forklifts and wave pickers are electric and are charged using solar energy generated on-site.

Smart Energy System

TransNet built a fully functioning micro grid on-site with a 544 panel solar farm generating 150kW which consistently generates more than 100% of the energy required to power the facility. This energy is managed, stored, and used efficiently by the smart energy system connected to the 30kW/130kWh vanadium redox flow battery storage unit, with any excess energy fed back to the grid. This building is fully self-sufficient and can continue functioning on solar and stored energy if there is a power cut. As an additional backup there is a 100kVa generator also connected to the micro grid. Having the capacity to operate independent of the grid offers our customers a more reliable service offering even during an emergency situation.

Mana Whenua

The community and Mana Whenua is important to the holistic approach TransNet has to the environment. Consulting with the local Iwi about requirements they had around the impact of the new facility was a big part of the planning process. The facility borders a significant Mana Whenua site, and we have undertaken native plantings to ensure these areas are protected in accordance with requirements.

Sustainable Functionality

TransNet set out to introduce sustainable processes without impacting the service offered to customers. These processes have been seamlessly introduced and in some cases efficiencies have been improved because of them. TransNet is continuously working to reduce the carbon footprint of the business and this also assists our customers to do the same. Some of these sustainability initiatives include a rainwater collection and storage system for watering gardens, washing vehicles, and flushing toilets, LED lighting with motion and light sensors throughout, Electric forklifts, and an extensive recycling programme.

Not only does TransNet have this purpose-built facility at our disposal, we have three additional facilities around New Zealand and the South Pacific that can supply product should the necessity arise. With extensive stock holdings in all facilities across the TransNet network we are well placed to service the electricity industry in any conditions.

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Energy Reliability and Sustainability: The New Drivers of Economic Prosperity

Sarang Modi
Head of Sales and Marketing - Sterling & Wilson Limited

Energy has always been regarded as the lifeblood of the world economy and a potential driver of economic growth. It promotes investments, innovations, and industrialization, which in turn catalyzes job creation, inclusive growth, and shared prosperity for nations. It has been closely related to almost every conceivable aspect of development, such as health, education, economic prosperity, infrastructure, water, and nutrition.

The period of industrial boom has been characterized by a strong correlation between economic growth and electricity consumption. However, growth in energy intensity – the measure of how an economy uses energy efficiently to add every dollar to its GDP, is gradually declining. This is not to say that the energy demand is going to fall once economies recover from their present crises. The downward trend is on account of improvements in energy efficiency, and other developments in the economy that result in lower energy use per unit of economic output.

This implies that a country's economic prosperity is nowadays not only linked to energy exploration, generation, and consumption but also its energy conservation, efficiency, and sustainability initiatives.

Factors promoting energy efficiency and sustainability

The rapid addition of renewable power will add certain stress on the grid and pose new challenges to energy reliability. The biggest challenge also of new generation assets is the Right of Way, environment clearance, and local habitat displacement and rehabilitation. Energy generation players will need to focus on the easement while doing a tight rope walk -- balancing their economic and environmental agenda.

Economies saddled with inefficiencies and high cost of energy production, T&D, emissions, and energy losses in transmission, are focusing on newer ways to transform themselves. Goals related to climate mitigation, cleaner, efficient and cost-effective production of energy, and T&D of electricity are making way for technological advancement for increasing the KWH production and distribution per unit space. Implementation of Flexible AC Transmission Systems (FACTS) controls is being pursued to manage the voltage and frequency fluctuations and is helping improve the reliability of AC grids, power quality, and transmission efficiency. Research has brought the spotlight under 800KV HVDC and 1200KV AC, double-circuit lines, and conductor alloys that can withstand high temperatures. These solutions are being adopted to increase the ampacity and reduce sag values. The target is the reduce T&D losses from the present 20% to 13% by 2025 globally.

Energy transition and efficiency measures redefining the energy mix of the future

The share of electricity in the final energy mix is expected to double by mid-century, with solar PV and wind contributing 31% each. Initiatives to reduce carbon emissions and improve efficiency include the replacement of old and aging coal plants by supercritical and ultra-supercritical plants, which promise to yield the highest efficiency among all power plants. Larger conventional power plants are being used more as spinning reserves to renewable power sources.

With gas all set to become the largest energy source in 2026, smaller-scale gas power plants is being added at localized centers, serving as demand response or peak power reserves. The transition to renewables is witnessing aggressive targets and wider adoption of rooftop solar, offshore wind power installations.

Developing a story on the Hydrogen gas-fuelled economy is expected to be a game-changer. It brings advantages of both the work, being a 24x7 reliable and flexible power solution with 100% renewable.

On the consumer side, Electric Vehicles are expected to cause a reduction of 56% in oil demand in the road transport sector between 2018 and 2050, globally. Additionally, the increased use of energy-efficient appliances and equipment, and the utilization of waste heat will further diminish the per capita electricity consumption per unit of GDP addition.

Looking ahead

Energy reliability and sustainability will emerge as a strong theme, dominated by hybrid solutions comprising conventional and renewable power sources. T&D developments will be influenced by smart grids running on automation that can take care of transients.

One thing is clear – energy capacity additions over the next decade will not be proportional to economic growth or prosperity. These will be compensated by the reduction in energy consumption owing to energy efficiency measures, T&D losses reduction, etc. This calls for economies to listen to the clarion call for decarbonizing, decentralizing, and digitalizing for a cleaner, sustainable future.

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CCU Media Release - 10th Consolidated Commission on Utilities

Guam Power Authority

Shown above (L-R) are Guam Consolidated Commission on Utilities (CCU) commissioners Francis E. Santos, Joseph (Joey) T. Duenas, Pedro Roy Martinez, Simon A. Sanchez II and Michael T. Limtiaco.

On Tuesday, March 23, 2021, the 10th Consolidated Commission on Utilities (CCU) welcomed elected commissioner Pedro Roy Martinez.

Commissioner Martinez now serves in place of former commissioner Judith (Judi) P. Guthertz, who resigned from the CCU on March 18, 2021.

The Guam Election Commission confirmed and then issued a certification of election to Commissioner Martinez on March 18, 2021. He was administered the oath of office by the Honorable F. Philip Carbullido, Chief Justice of the Supreme Court of Guam at his Chambers on March 22, 2021.

Both GPA and GWA ratepayers, as well as the general public can learn more about their elected CCU at www.guamccu.org.

‘De-insularising’ our Pacific utilities

Marc Perraud
Managing Director - UNELCO

The members of the PPA community are all too aware of the significant challenges and constraints involved in financing and operating electric systems in small, remote, fractioned, and dispersed insular environments.

These constraints translate into very tangible challenges for the design, procurement, human resources, operations and maintenance of our electric systems … which ultimately trickle down to the customers in the form of higher prices and sub-optimal quality and continuity of service.

While geography is a concrete constraint to be reconned with, some of the outcomes are not a fatality if they are properly managed. This article does address tweaking of the practices for incremental improvement but rather makes the case for real step-change by rethinking the fundamental organization of the sector and the models under which we operate.

The ultimate objective should be to de-insularise our utilities so the question is how do we achieve this? The first solution involves economies of scale.

(1) Achieving economies of scale

The absence of economies of scale affects every facet of running a small insular utility; which are often further plagued by ‘secondary insularity’ brought about by each island composing the archipelago.

While some aspects cannot be addressed and are inherently constrained by geography and the size of demand (eg. the size of generators, the generation technologies available at that scale, the section of distribution lines, etc.), many others can be addressed by mutualization.

Efficiency of procurement is one important aspect since it underpins the entire economics of the utility: the costs of utility assets, the costs of consumables and fuels, the costs of materials and equipment, to name only a few.

As a small single entity, even abiding by good procurement practices (tenders and consultations in particular), the opportunity for gains remain marginal because of the balance of bargaining power between utility suppliers (most often global) and the small utility is severely skewed.

Attempting to mutualize, by *ad hoc* agreements amongst the utilities or through the coordination of an Association such as PPA, is possible but in practice a bit cumbersome and of limited reach.

Seeking the backing of a large multi-national utility however offers the local utility access to prices only available at scale, the possibility to tap into pre-negotiated supply contracts (ie. outsources procurement process time and cost to a wider entity), widens and diversifies the potential supplier base, ensures more diligence and care from the supplier because of the overall importance of the global client, and assists the local utility in choosing and harmonizing assets based on the collective experience other utilities within the same multi-national company.

Efficiency in support functions

Personnel expenses represent a substantial part of utility expenses; part of these expenses are inherently local (mechanics, line's men, …) and are the unavoidable cost of providing the service.

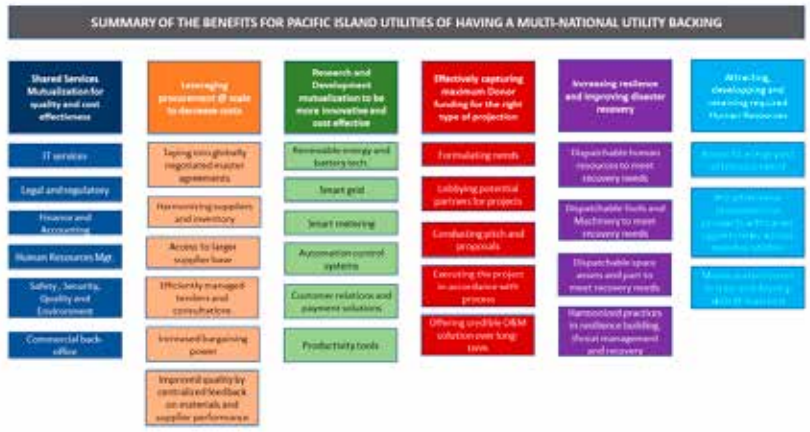
However, a large subset of overhead personnel costs are support services such as Human Resources, Legal and Regulation, Information Technology, Finance and Accounting, Procurement, Marketing and Communication, Research and Development, etc.

A substantial portion of these functions can be mutualized across local utilities operating in similar contexts. Virtually all multi-national companies have adopted a ‘shared support services’ model as it has proven to be most efficient, both financially and because it creates centers of excellence in each area where skills and performance can be properly driven.

One such instance is for IT services. The benefits

stem not only from mutualization and efficient use of personnel but also from the fact that the small-scale of utilities make custom software solutions too costly to justify. The development and maintenance of IT systems for a multi-utility base, allows mutualization of the fixed costs and opens a new realm of IT systems that would otherwise be unavailable to a small utility.

By piggy-backing small local utilities to a global one, many support functions can be shared and provided with better quality and lower cost.



(2) Building effective resilience at least cost

UNDP has rated the Pacific islands amongst the most vulnerable to natural disasters. As utilities, we are unfortunately at the forefront of the consequences of most of these disasters – cyclones, tsunamis, floods, volcanic eruptions, earthquakes, etc. - and the mitigation and recovery from such events has all too real consequences on the design, the management, and the downstream impacts for customers in terms of service and cost of service.

Dispersed assets and unaligned practices - inventories, machinery, human resources, standards – are inherently inefficient and mutualization is key for both resilience building and recovery.

Resilience could be pursued by ad hoc means, such as by mutual assistance agreements between the utilities, or reliance of Development Partner emergency support for example, but these falls short of truly building resilience into the operating model.

For most large countries the solution comes in the form of a large Government, which due to its sheer size, is capable to lend assistance of the limited pocket of its territory that has been affected by a natural disaster.

Unfortunately, none of our Pacific countries are blessed with such resources, nor are the Governments dealing with an isolated issue; in general, when disasters strikes at our scale, it is many areas of the local economy, the population, and the entire country that are plunged into crisis. The Government tends to be overwhelmed both logistically and financially.

The solution must therefore come from elsewhere and this is where the power of multi-national companies, which often have financial means equaling several times the GDP of our Pacific nations, can offer the required support.

Choosing to be backed by a multi-national company enjoys a classic portfolio effect in which the risk is mutualized across geographies; the multi-national offers the financial breadth and the logistical means to substitute for the Government in coming to the assistance of the utility in times of trouble.

(3) Attracting, developing and retaining talent

The market for talent has become global, the requirements of our profession are becoming increasingly technical (automation, digitalization etc.), and the competition in the pools of our traditional labor force, is increasing.

The times when a few good 'mechanics' with island pragmatism could fix cars and gen-sets alike are fading. The time when our local resources stayed put are also revolute. The attractivity of prospects abroad, higher paying service company jobs, seasonal worker programs etc. have all contributed to the workforce challenge. Managing the concurrent changes in the nature of the utility jobs and of the workforce dynamics is a pressing issue in our small island states.

Island utilities face chronic shortages in certain areas so being able to attract, develop and retain them has become paramount.

Again it is necessary to look beyond what can be done alone to explore the possibilities opened by being affiliate to a multi-national utility: standardized

training support, attractive career opportunities for prospective employees that reach far beyond the local utility, wider recruitment pool that extends beyond the local market, and, while it may seem trivial but not to the prospective employee, an attractive and recognized international brand-name to put on their resumes.

(4) Research and development of island specific solutions

The utilities sector was once considered a somewhat sleepy industry of mature technologies and slow incremental improvements.

The revolution in digital and communication technologies, the exponential growth of renewable energy and battery solutions, the opportunity to shift transportation to electricity, the influx of aid to support energy transition are just some of the forces that are deeply transforming our industry.

Keeping up with the pace of change and with the momentum of larger countries has become a challenge for small insular utilities. Most often, the small utilities cannot just sit by and simply 'copy-paste' large scale solutions to their environment. At the same time, utilities want to implement the innovations and face government and customer expectations to keep up with the rest of the world.

The expertise, collective experience, financial means and diverse portfolio of multi-national utilities offers the opportunity to mutualize and customize the required R&D for island utilities. By seeking out the backing of a large company, the island utility can bridge the technology gap and transition from 'trying to keep up' towards becoming laboratories at the forefront of some of these innovations.

(5) Leveraging Development Partners to the fullest

The awareness of the global community and the commitments made towards combatting climate change - in particular in the context of the CoP21 (Paris Climate Agreement) – combined with the renewed interest of the largest countries in the world to secure strategic spheres of influence in our region, has made Development Partner (sovereign or organizations) quite bountiful … at least in theory.

The electric system operators of the region currently have a historic opportunity to solve many long-standing issues – energy sovereignty, electrification and access, affordability – by taping into these funds.

The issues between Pacific nations and Development Partners has always been at least threefold:

- Allocations of projects and resources that are frequently misaligned with actual strategic priorities of the nation (but a 'we'll take it anyway because it's free' attitude)
- Incapacity of the countries (or utilities) to actually capture all the funds theoretically available to them and to navigate the involved processes imposed by Development Partners
- Incapacity to carry-out the project or to ensure that it is operated and maintained over the long-run

The solution to many of these issues is to manage Development Partners as a resource, to the same extent as we all manage our other utility assets, rather than as one-off deals.

Managing the Development Partners is a time and resource commitment and to be done effectively and consistently, mutualization is again a key tool:

- If masterplan requirements are managed by a single shared entity this ensures that the actual needs and requirements of the utility are communicated effectively to the Development partners, both at the individual utility level and regional synergies are sought to create a palatable Development Agency 'program'.
- If a single shared Donor relations unit manages the relationships and networking, the pitches, the application process and conducts the project shaping steps of the donor funded project, this would go a long way to increasing the conversion rate and decreasing the 'time to commissioning'.
- Overall, having a global utility company with a track record (and a reputation to uphold) as the backer of the Donor project increases credibility and Donor confidence that the projects will be implemented to standard but also be duly cared for over their lifetime (to avoid the all to present risk of the project 'rusting in the sun' after the Development Partner has gone).

How to tap into these benefits?

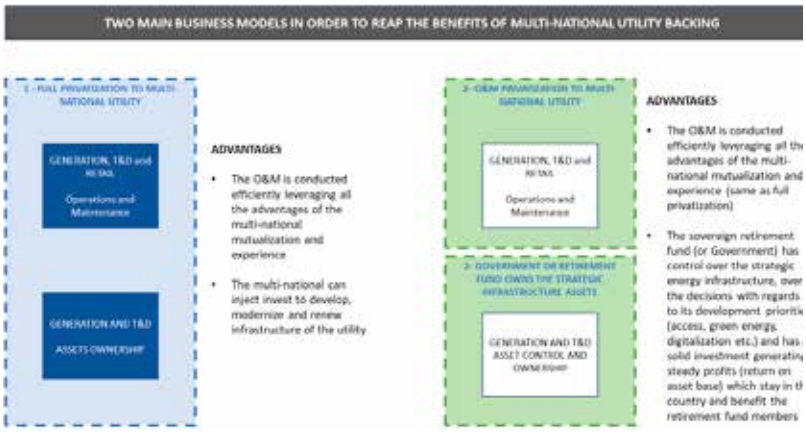
The conclusion of this article is not outright 'privatization' to a multi-national utility. That is

naturally one strategic option and the choice that has been made by many other countries, the Caribbean in particular to speak only of SIDS.

There is however an alternative business model, which may provide the best of both worlds and that would be particularly relevant for our small pacific islands – a privatization of only the operations and maintenance but the preservation by the country of ownership of the strategic infrastructure and of control over its future developments.

If the island nation or territory is seeking a partner with capital, then the full privatization model would not only bring about the operational benefits but also provide a partner with the capacity to shoulder the investment required to meet access, energy transition and digitalization challenges.

If however the island nation has either a well endowed Retirement Fund (Provident Fund or similar, as many of the Pacific nations do), a Government with a healthy budget balance, or a solid backing from Development Partners, it could choose the second option of privatizing O&M only.



In this model, the Retirement Fund (for example) could purchase the utility's infrastructure assets from their current owner (the utility or Government), thereby providing a solid strategic investment in a pilar of the local economy and creating a steady Return on Assets to retirement fund members while concurrently outsourcing all the operations and maintenance to a reputable multi-national utility specialist to bank on all the benefits provided by 'de-insularization'.

The advantage of this model is that the Retirement Fund finds a solid investment, reaps steady returns for its members on its capital, the control of the existing and future strategic infrastructure remains in the country, and the O&M company brings all the 'de-insuralizing' benefits at a limited cost because it has virtually no assets invested.

This approach also broadens the number of potential multinational companies willing to provide the service, as considerations of country risk premium (economic and political), potential black or grey listing (as many of our countries are currently facing), global allocation of investments to only core markets (which, more often than not, excludes our small markets), will become significantly less relevant to the extent that they are not investing but providing an O&M service.

While in the past it would possibly have been a more dichotomous choice for decision makers between keeping a utility public (or assimilated) or taking it private, and a matter of weighing retaining control on one hand and finding a source of needed investment capital on the other, the choice has now become less binary because national Retirement Funds have appeared and become rather well-endowed with capital, Development Partners have also become increasingly generous with capital (grants or concessional loans), so it may just be the perfect time for our nations to try to seize the best of both worlds, keeping the strategic assets and control (using the alternative capital sources they now have at their disposal), and privatizing the O&M to a multinational utility to reap the benefits of 'de-insularizing'.

Marc Perraud has 15-years of strategy consulting experience working for a leading global firm in Paris and California, he specializes in designing strategies for markets facing disruptive legal, technological and business model changes; he has worked for electric and water utilities across the South Pacific and is currently the Managing Director of UNELCO Engie in Vanuatu.

CCU and GPA Complete Ribbon Cutting to Commemorate Hagatna Battery Energy Storage System Project

Guam Power Authority

Photo: Guam Power Authority

Shown (L-R): *, LG CNS Project Manager Jincheol (JC) Kim; GPA General Manager John M. Benavente, P.E.; Consolidated Commission on Utilities Commissioner Pedro Roy Martinez; Lt. Governor Joshua Tenorio, Governor Lou Leon Guerrero, Consolidated Commission on Utilities Chairman Joey T. Duenas; Senator Clynt Ridgell, 36th Guam Legislature Chairman-Committee on Economic Development, Agriculture, Power and Energy Utilities, and the Arts; Guam Public Utilities Commission Chairman Jeffrey Johnson, GPA ESS Project Manager Lorraine O. Shinohara, P.E.; GPA Assistant General Manager Engineering & Technical Services John J. Cruz, Jr., P.E.; and Guam Public Utilities Commission Chief Administrative Law Judge Frederick Horecky.*

On Friday, May 14, 2021, the Consolidated Commission on Utilities (CCU) and Guam Power Authority (GPA) cut a ceremonial ribbon to mark GPAâ€™s milestone achievement in the addition of its utility-scale Battery Energy Storage System(s) onto Guamâ€™s islandwide power grid. Fully operational on March 1, 2021, the project was designed and constructed by LG CNS. GPA is on-track to achieve a 50% renewable energy mix by 2030; and the mandated 100% renewable energy mix by 2045.

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Megger's automatic portable oil test sets perform accurate breakdown voltage tests on mineral, ester and silicon insulating liquids. Moulded test vessels give repeatable results in the field and laboratory with lock in precision electrode gap setting adjustment wheels. The transparent, shielded lid is a key feature enabling users to see what is happening within the test chamber.

Megger portable 60 kV and 80 kV oil test sets are the lightest on the market ranging from 16 kg to 23.5 kg depending on model and configuration. They come complete with optional carry bag and transport case.

Newly Appointed Nauru Utilities Corporation Chief Executive Officer, Mr. Carmine Piantedosi

Nauru Utilities Corporation

Experienced engineering, legal and regulatory professional with a proven track record of implementing and delivering regulatory reform and legislative objectives, engineering and development projects, and legal support within electricity, water and transport sectors. He is skilled at developing electricity and water utility regulation, implementing renewable energy and energy efficiency schemes, providing legal support to the resources and infrastructure sector and designing networks. His country experience includes Australia, Vanuatu, Fiji, and Nauru.

Held various senior management, supervisory and leadership roles in various sectors including: Chief Executive Officer, Nauru Utilities Corporation, Nauru; Chief Executive Officer, Land Transport Authority Fiji; Chief Executive Officer/part-time Commissioner, Vanuatu Utilities Regulatory Authority; Senior Regulatory Manager, Essential Services Commission Victoria; Senior Project Manager, Ergon Energy Queensland, to name a few.

Key achievements include:

- More recently, developing and setting the strategic direction and leadership of the Nauru Utilities Corporation;
- Setting the strategic direction and leadership of the LTA, including transport sector reform, organisational change, stakeholder management, financial management and long-term sustainability of the public transport sector of Fiji, this included the review of public transport fares;
- Identified, developed and directed the implementation of long-term tariff and pricing strategies during his 5 years of managing the regulation and pricing division in Goulburn Murray Water Corporation, including leading the revenue reset of $500M for the organisation;
- Implemented reform and advised the Vanuatu Utility Regulatory Authority on utility regulation; regulatory and operational issues to ensure its proper functioning; delivered electricity tariff reviews; developed policy and procedures to ensure transparency, independence and good governance;
- Delivering various network distribution and transmission infrastructure projects in Australia, including managing budgets, finances, workplace health and safety, environmental risk and human resources. Delivered construction contracts and projects valued in excess of $40M.
- Established and implemented renewable energy and energy efficiency programs in Australia including the development of ICT registry for the scheme's transactions and trade of certificates.

Holds a Degree in Electrical Engineering from University of South Australia, a Degree in Law from University of Adelaide, and Graduate Diploma in Legal Practice, The Law Society of South Australia; Advanced Certificate Public Utility and Research Centre Energy Pricing and Benchmarking Infrastructure Operations University of Florida; Certificate Public Utility and Research Centre Utility Regulation and Strategy Practicing Leadership in a Political Environment, University of Florida.

Welcome!

New Allied Member

Two new Companies has joined PPA as Allied Members since our last PPA Magazine. The new members are:

NIUPOWER LIMITED: NiuPower Limited is based in Port Moresby, Papua New Guinea. Their primary activity is independent power producer.

STERLING & WILSON LIMITED: Sterling & Wilson Limited is based in Perth, Australia. Their primary activity is design, engineer, build and maintain distributed power plants.

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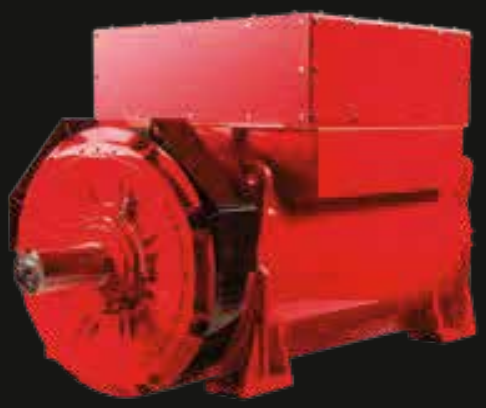

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