

# National Bulletin

Bulletin 11 | 2019

## Successfully Leading Change in the Electric Energy Area

**Author: Jeff Allen, National President of the Electric Energy Society of Australia**

**Date: November 2019**

Over the past few months I have held a number of seminars for EESA members with the title "Coping with Change in the Electric Energy Industry." The presentation describes my experiences gained from being involved in the investigations as to the reasons behind the occurrence of a number of major network events such as the 2009 Black Saturday Kilmore East - Kinglake Fires and the Auckland Power Failure – and the lessons learned from these as well as other events from my career in many different areas of the electric energy area.

The message I communicate via this presentation is "how relatively simple errors/oversights" can result in a significant "network" event with the result that there are major consequences for everyone associated with that event – the organisation, its staff, its customers and the community.

Given all the changes currently occurring across the electric energy industry, I suggest that there is a higher risk of such oversights occurring and thus companies need to ensure that they have the appropriate risk management controls in place.

Thus I am suggesting that it is essential for engineers to understand all the changes that are occurring (be they technical, market, management or customer) and adjust their knowledge, their attitude and their overall approach to their role in order to be successful in the "new business environment."

Therefore part of my presentation is about building capability within engineers to cope with these changing times and this "capability" is about what would have been a couple of years ago the "skills for the future." I suggest it is all about the "skills for now."

These "skills" are

- Personal attributes and non-technical skills (such as leadership, interpersonal skills, communication project management etc)
- Increased understanding of commercial and business fundamentals
- Improved technical skills & understanding of new technologies
- Work readiness – the ability to transition to the new roles that new technology (or other changes) are bringing

Thus for success in the new business environment engineers need to

- Stay up to date with technology and abreast of future technology
- Increase commercial/entrepreneurial skills
- Be agile, innovative & proactive

One of the key themes to come out of the discussions in the Q&A sessions following my presentations has been that at the same time as all these market, customer and technology changes are occurring that there are lots of organisational change also occurring - such as new organisational structures as well as new



**Jeff Allen**  
EESA National President

## Affiliations



---

managers.

Also the new technology often impacts on a number of branches/divisions of the company and this means that a number of different parties need to be involved with or were impacted by the changes. Thus often there was a team of people involved with the decision making associated with the changes or the implementation of the changes.

Another common theme to come out in the Q&A session is that of Leadership – and how engineers at all levels in their organisation need to “show leadership” to ensure successful change in their area of expertise or responsibility.

Thus the question emerges – what is leadership – and what do engineers need to do to successfully lead the changes associated with the new technology within an organisation?

In my view good leaders exhibit the following 10 characteristics

- Integrity - believing in, talking about and acting out the organizational values.
- Team building - encouraging strong, professional teamwork (**T**ogether **E**veryone **A**chieves **M**ore).
- Positivity - ensuring goal congruence between their group's activities and the organization's activities.
- Communication - developing and communicating a shared vision with their team.
- Listening – encouraging involvement from all team members in decision making.
- Emotional intelligence - providing supportive leadership – understanding your people and gaining their respect.
- Delegation - empowering and supporting staff - no micromanagement.
- Decision-making - displaying determination - making the tough decisions quickly and achieving the desired results.
- Collaboration - providing inspiration to individuals and the group as a whole – it's about the team.
- Flexibility - adapting your management style to the diverse needs within their team.

Another definition of good leadership is “doing the right things right” (easy to say but harder to do).

- the right things - knowing what they are - the “what's” - the business plan initiatives, project objectives etc
- doing them right - knowing how to lead and manage the best way for each circumstance or project - walking the talk of the leadership behaviours and values

Thus in today's changing electric energy world, engineers can find themselves in a leadership role even though their position description may not call them a manager.

You may find yourself in a leadership role given your technical expertise – and to understand how you should act to gain the best result from the collective members of the team (often allocated to the task from various groups across the company) and to achieve the best outcome for the organisation overall - is another personal challenge (and an opportunity) for engineers in the ever changing electric energy area.

# Contents

EECON 2019: A Great Outcome!	Page 4
Australian Power Institute Welcomes new CEO	Page 6
Hydro Tasmania promotes "Battery of the Nation" plan ...	Page 6
Aluminium industry pushes for more smelters to use ...	Page 8
World's biggest solar farm and longest undersea ...	Page 9
Managing the electrical power network to eliminate ...	Page 10
South Australia's Tesla Battery to grow by 50 per cent	Page 11
Ausgrid embraces "Digital Disruption" with ...	Page 12
International Articles	Page 15
History	Page 21
Humour Corner	Page 22
Cired Paper	Page 23
Awards	Page 23
What's on at EESA	Page 24
Thank You	Page 26

Disclaimer: The views and opinions expressed in the articles in this bulletin are those of the author and do not necessarily reflect the official policy or position of the Electric Energy Society of Australia (EESA).



## EECON 2019

### A Great Outcome!



The Electric Energy Society of Australia (EESA) hosted the 2-day National Electric Energy Conference – EECON 2019 - at the International Convention Centre in Sydney on **26th and 27th of November 2019**. The theme of EECON 2019 was **"Engineering leadership providing sustainable, customer-centric electric energy solutions through the interactive grid"**.

The conference had a diverse range of 34 very informative and interesting speakers. In addition, there was a great range of Exhibitors discussing their latest products as well as University students presenting "Poster Papers" to conference attendees in the exhibition/breakout area.

The 180 attendees gained a great understanding of the many and diverse issues impacting the ever changing electric energy businesses. There were presentations covering the methods and tools which have worked successfully to facilitate the changes, as well as presentations covering the opportunities and challenges still to be managed.

EECON 2019 also had some preconference events on Monday 25th November which included a Technical Workshop involving Systems Stability and a tour of the very important Desalination Plant supporting Sydney's water supply.

Our conference opened on Tuesday morning 26th November with two great keynote speakers who provided a great understanding of the key challenges we are facing in the electric energy area.

- Peter Brown - General Manager of PSC New Zealand – and a keynote speaker at the EEA Conference in Auckland NZ in June this year - discussed the changes occurring as a result of the growth of distributed energy resources - and he did this in a very novel way – which included playing a keyboard and singing at various times.
- The second keynote speaker was Violette Mouchaileh – Executive General Manager, Emerging Markets and Services from AEMO and she discussed the changing energy landscape in Australia and the integration of distributed energy resources and renewables, empowering consumers and the associated reliability and security issues.

After the Morning tea break in the exhibition area we then launched into 2 parallel sessions – each with 3 presentations – and we continued with this approach for the rest of the day. Thus the sessions were

- "Technology and Evolution 1", "Technology and Evolution 2" and then "Technology and Evolution 3"
- "Regulatory and Transmission 1", "Regulatory and Transmission 2" followed by "Security"

These technical paper sessions were followed by Networking Drinks in the Exhibition Area for 1 hour and then there was a very entertaining conference dinner at Dockside (a short walk from the ICC) – where there was lots of more great networking and well some hilarious moments created by the very entertaining MC - Michael Pope. A big thank you to a number of our conference attendees who became "stars" for the evening and undertook some major roles in the evening's entertainment.

Day 2 opened with another great keynote presentation - "Electricity Network Transformation" - by Dr Jill Caine, General Manager Networks at Energy Networks Australia who discussed the ENA's Electricity Network Transformation Roadmap and its subsequent projects which are aiming to achieve a sustainable, lower cost path to secure and reliable energy whilst coping with distributed energy resources.



---

We then launched straight into 2 parallel sessions – with 3 presentations in each session.

- People and Safety 1 – followed by People and Safety 2
- Asset Management 1 – followed by Asset Management 2

After the Lunch break in the exhibition area there was a “Brains Trust Panel” which provided a great summary of the key issues, new learnings and the technology described by all our presenters and this was followed by an open Q&A session.

We then awarded our 2 prizes for best papers

- Conway Prize - the best paper by a EESA Member and this was awarded for the paper “Early Fault Detection prevents powerlines faults and fires” presented by Tony Marxsen, Chairman of IND Technology
- Cresswell Prize - the best paper presented by a non EESA member and this was awarded for the paper “Earthing System Design for Supervision and Maintenance” presented by Chris Shaw, New Business Manager at Safeearth.

EECON 2019 was all about providing ongoing professional development for people in the electric energy industry. All those who were able to come along certainly participated in the event, questioned, networked and most of all – were well and truly informed on the latest thinking on many of the key issues impacting the electric energy area! The feedback from everyone was very positive.

Thank you very much to the EECON 2019 organising committee – led by Terry Lampard (the EESA NSW/ACT Chapter Chair) and also a big thank you to our event manager – Heidi Jephtha of 2em – for such a great event.

**Jeff Allen - EESA National President**

## AUSTRALIAN ARTICLES

### Australian Power Institute Welcomes new CEO

**Author:** Terry Miller

**Source:** [Australian Power Institute](#)

The Australian power engineering sector's national institute has announced the appointment of Dr David Ponting as its new CEO. David will commence in the role from December 2019, taking over from inaugural CEO Mike Griffin.

Chair of the API Board, Wayne Tucker said "After a very successful first fifteen years led by Mike Griffin, the API is entering a new phase. We are excited to have David joining the API as the new CEO. David brings a wealth of experience in working with employers, the Tertiary and broader education sector and the energy industry to build a pipeline of future professional engineering and technology talent so that we can continue to support communities, maintain competitiveness and to develop new opportunities".

David is a Chartered engineer and seasoned executive, leader and strategist, with more than 20 years experience in the engineering sector.

David's background includes a PhD on wind-hydrogen energy systems for Antarctic operations, working with the UN Environment Program on supporting Arctic communities to introduce sustainable energy systems, and almost 10 years with Engineers Australia in roles focused on building a capable and diverse engineering workforce.

Founder and inaugural CEO of the API, Mike Griffin, will formally step away from the API at the end of March 2020



---

### Hydro Tasmania promotes "Battery of the Nation" plan and production of clean hydrogen from renewable sources

**Author:** Terry Miller

**Date:** October 2019

**Source:** [Hydro Tasmania](#)

New analysis from Hydro Tasmania shows the Battery of the Nation initiative offers significant potential for Tasmania and Victoria to work together to achieve an affordable, reliable clean energy future.

The white paper, *How Battery of the Nation can contribute to Victoria's energy needs and objectives*, was developed with funding assistance from the Australian Renewable Energy Agency (ARENA) and outlines the challenges facing Victoria as it transitions away from fossil fuels to renewable energy.

The white paper shows Tasmania can help Victoria mitigate the risks of early or unexpected coal plant retirement, including high costs and unreliable supply, while supporting its renewable energy ambitions.

Hydro Tasmania's Chief Executive Officer Steve Davy, said Victoria's least-cost options are wind and solar – variable sources that require firming to be reliable.

"Victoria will need to access significant energy storage to ensure they can meet their renewable energy targets while keeping the power system reliable," Mr Davy said.

"Tasmania has idle capacity waiting to be unlocked by market signals and delivered through the additional interconnection required by Battery of the Nation.

"As well, Tasmania also has significant potential for development of new, low-cost, long-duration pumped hydro storage, offering the firming Victoria's future energy mix requires.

"However, with change already underway, we need proactive support for interconnection through TasNetwork's Marinus Link project to get the electricity to where it's needed, along with the timely development of investment incentives to ensure supply is available when it's needed.

"Further interconnection between Victoria and Tasmania will help manage the energy transition over coming decades, enabling practical solutions that are complementary to Victoria's renewable energy, as well as supporting the rest of the National Electricity Market. "By working together, Victoria and Tasmania can facilitate a smooth transition to the clean, reliable power system of the future."

ARENA has supported the Battery of the Nation initiative with up to \$5.0 million funding for project studies, being matched by Hydro Tasmania.

In another announcement the organisation has released analysis showing Tasmania is in a unique position to lead the nation in the production of green hydrogen from clean energy sources.

The analysis – contained in the white paper Tasmania's 'green hydrogen' opportunity – what makes Tasmania a unique, green hydrogen zone? shows the state has strong competitive advantages to meet domestic and global demand and become Australia's first green hydrogen production zone.

Mr Davy, said a large-scale, cost-competitive green hydrogen production industry could be developed in the state over the coming decade.

'Our analysis indicates that green hydrogen can be produced in Tasmania for approximately 10 to 15 per cent less than other Australian power grids needing to offset emissions and 20 to 30 per cent less than from dedicated off-grid renewables, due to the high plant utilisation that can be supported by Tasmania's hydropower,' Mr Davy said.

'Other advantages include reliability of supply due to the state's high level of energy security and stability, self-sufficiency in renewable energy by 2022, strong transport infrastructure options and more options for supply through development of further interconnection and the Battery of the Nation initiative.

'As countries like Japan and South Korea look to green hydrogen as a way to meet emissions reduction targets, hydrogen production has the potential to further support large-scale investment in new renewables, as well as direct employment.

'It also opens the door to the creation of industries around related technology and the development of local expertise, bringing substantial benefits for the Tasmanian economy.

'As Australia's largest generator of clean renewable energy, Hydro Tasmania stands ready to support the development of a green hydrogen industry in the state.

'This includes taking a lead role in establishing a program to explore the integration of green hydrogen production with renewable energy systems, such as the ability to use excess solar and wind generation to produce hydrogen by electrolysis.

'This could make use of existing facilities including the King Island and Flinders Island renewable energy integration hubs.

The program will also provide resources and expertise to assess the feasibility of redeveloping the Bell Bay Power Station site and facilities for hydrogen production and export, as well as supporting trials of the application of domestic hydrogen and related products to energy transport and storage and other industries,' Mr Davy said.



## Aluminium industry pushes for more smelters to use up surplus electricity

Author: Terry Miller

Source: Daily Telegraph

This recent article highlights the difficulties that the Australian aluminium industry is experiencing with rising electricity costs. With government subsidised electricity prices now ancient history, the Australian aluminium industry is exposed to market forces and sharply rising costs.

I am not sure that the concept of building more smelters is analogous to installing more "big batteries".

But with Australia's potential for international leadership in cheap renewable power, especially solar energy as predicted by Ross Garnaut and espoused by our Chief Scientist Alan Finkel, it is possible that our aluminium industry may regain its international competitiveness without future government subsidies.

Whether it can survive the wait is another question.

### Smelters are our best 'big batteries'

**T**HE now inevitable closure of Australia's remaining aluminium smelters is not only a disaster for the economy, but an even bigger disaster for our national power grid and any hope of delivering cheaper and reliable electricity to both businesses and consumers.

Indeed, the closing of the smelters is the biggest "own goal" that those pushing more and more renewable energy could ever conceivably "achieve".

As the CEO of the Tomago smelter in NSW, Matt Howell, pointed out last week, a smelter acted like a "big battery" to stabilise the network.

It is able to free up a lot of power, at reasonably short notice and for an extended period like no Snowy hydro or Tesla "battery" could do.

Indeed, I would go further: a smelter and far better, a string of smelters would be the smartest, cheapest and most effective way to stabilise the grid.

And that applies whether such a grid is based on the coal-fired power stations we mostly have now — the sensible most cost-effective grid that we are embarked on throwing away in an exercise of utter national insanity and stupidity the like of which we have never seen before.

Or a grid that forces more and more use of completely unreliable and functionally



**TERRY  
MCCRANN**

a huge double benefit.

More smelters mean adding significant value to our basic resource of either bauxite or the next stage which is alumina.

Broadly, 4-5 tonnes of bauxite gets turned into 2 tonnes of alumina, which gets turned into 1 tonne of aluminium.

Again, very broadly — prices obviously jump around — those 4-5 tonnes of bauxite would get you maybe \$US300 (\$450); the 2 tonnes of alumina would get you \$US1000; but the 1 tonne of aluminium \$US2200.

It makes a hell of a lot of — both business and national — sense to be selling the 1 tonne of aluminium. What makes for the difference? Essentially the electricity used to turn alumina into aluminium — indeed aluminium is often called "congealed electricity".

**T**HE way we are going — dramatically ratcheting up the price of power generally to everyone (doing

economic vandalism we will have "opted" to swap the \$US2200 we get for a tonne of aluminium for the \$US300 or so we would then get for the 4-5 tonnes of bauxite. If indeed we are then even allowed to dig that out of the ground.

We will send the smelters — and all those extra dollars to China, along with our coal to feed into their coal-fired power stations to in turn feed cheap power into their smelters!

Would any of those countless and supposedly even "very clever" idiots out there get even the slightest sense of how pointlessly insane this is? Even in the context of supposedly "doing something about climate change"?

And it would make dramatically better sense than spending, it now seems, \$10 billion on Snowy Two to pump water up the hill so it can come down again and generate electricity when the wind don't blow and the sun don't shine.

**T**HE — what should be obvious — problem with that is that if the wind is still not blowing and the sun is still not shining when all the water has flowed down you've got a \$10 billion "empty battery" and no power. It's even worse with the Tesla-style battery.

They can run out in 10 minutes.

Then think about a network of, say, a dozen smelters all drawing

## World's biggest solar farm and longest undersea cable - Australia to supply 20% of Singapore's electricity

Author: Terry Miller

Date: October 2019

Source: [Sun Cable](#)

According to media reports Sun Cable has been able to raise in excess of \$20 million to enable commencement of the development phase of this ambitious proposal, which entails building a 10GW solar farm and 22GWh of battery storage near Tennant Creek in the Northern Territory, and a 4500km long HVDC link to Singapore via Darwin.

3800km of the transmission link will be undersea cable – the longest in the world to date by far (existing or proposed), according to the 2015 Report "HVDC Submarine Cables in the World" published by the Joint Research Centre of the European Commission. (This Report is a comprehensive technical and economic study of HVDC submarine cables, and worth having on your reading list.)

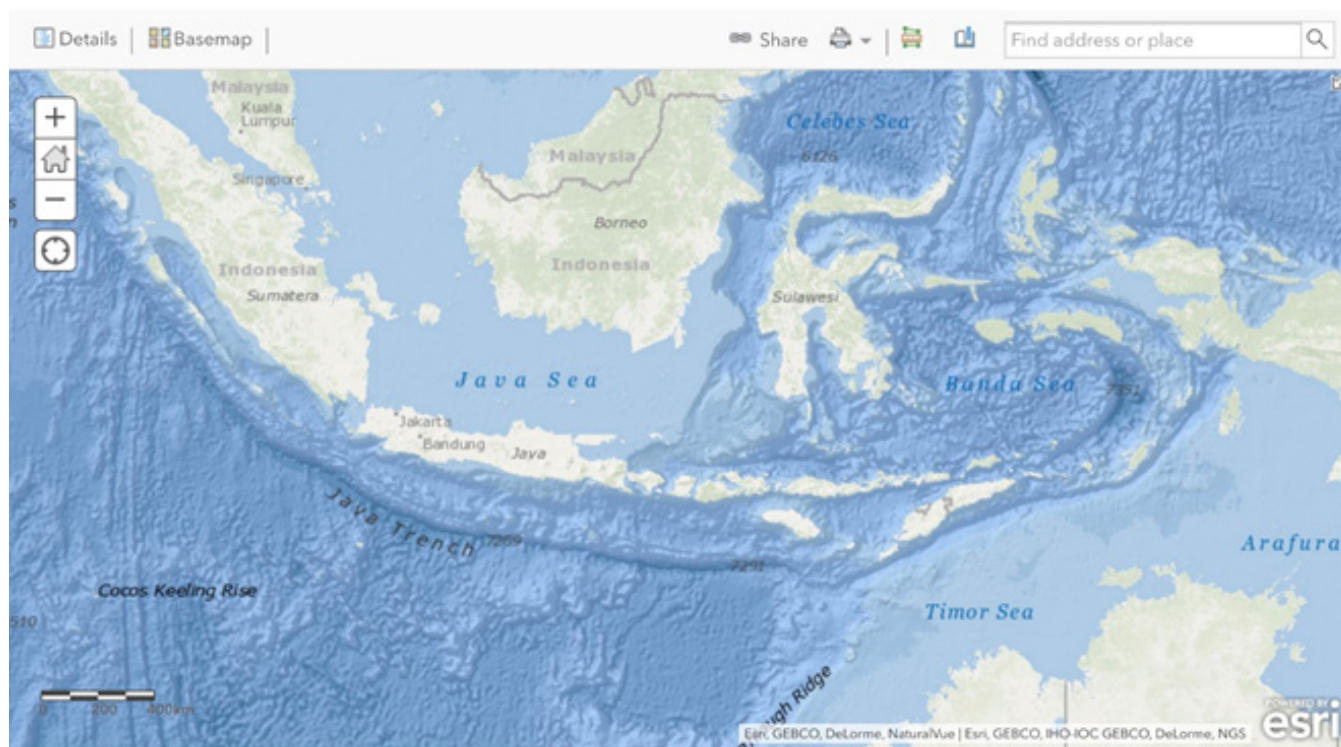
The challenges of the project are obvious. A quick perusal of ocean maps (see below) reveal that the ocean depths for most of the route between the north of Australia and Singapore are relatively shallow (under 50m), so that a practical installation certainly appears to be feasible.

Singapore faces the challenge of finding reliable and inexpensive electricity, currently relying largely on imported gas. The Tennant Creek solar farm will be able to supply 25% of Singapore's electricity.

We will watch the development of this project with interest.

ArcGIS ▾ Ocean Basemap

Modify Map  Sign In



## Managing the electrical power network to eliminate bushfire ignition risk

**Dr Bill Carman**

**BE (Elec)(Hons 1) PhD FIEAust CPEng NER APEC Engineer IntPE(Aus) SMIEEE**

**Director**

**Bill Carman Consulting (BC2)**

**Email: [billcarman2@gmail.com](mailto:billcarman2@gmail.com)**

**Phone: +61411140577**

Following the tragic bushfires in 2009 the Victorian Bushfire Royal Commission was entrusted with the task of investigating the cause of the disaster and producing guidelines to ensure the horror of Black Saturday would 'never be repeated'. The issues that were found to contribute to the fire starts included: the age of the assets (3 SWER related fires in 2009), the length of time between inspections (had been increased from 3yrs to 5yrs), the efficacy of inspections, hazardous trees outside normal vegetation clearances, the operation of reclosers, the absence of vibration dampers on long spans, and the absence of spreaders. The Commission called for the 'replacement of SWER and 22kV feeders with aerial bundled cable, underground cabling or other technology that delivers greatly reduced bushfire risk.'

The Powerline Bushfire Safety Committee (PBSC), set up to recommend and oversee the action plans arising from the Royal Commission, recommended the targeted replacement of SWER and 22kV powerlines with underground, insulated overhead or conversion of SWER to multi wire overhead, and the installation of new generation reclosers on SWER lines. A more controversial recommendation of the PBSC has been the programme to implement Rapid Earth Fault Current Limiter (REFCL) arc suppression coil (ASC) technology as introduced by one utility in New Zealand at over 40 substations feeding 22kV powerlines in high bushfire risk areas of Victoria.

The REFCL recommendation was made following extensive testing to determine the energy required to ignite a bushfire. The Victorian government was advised to enact a regulation to require distribution utilities to limit energy released during fault conditions to supposedly prevent bushfire ignition. Although power utilities and experts had voiced concerns regarding the inability of REFCL technology to adequately reduce the bushfire ignition risk and the significant operational and cost issues associated with the technology the regulation was enacted with significant penalties for not meeting implementation targets. The media release from the Victorian Minister for Industry, Energy and Resources on 23 November, 2015 clearly indicated to the wider public the intentions of the government and their belief that the cost associated with this technology was justified.

### **NEW POWERLINE BUSHFIRE SAFETY STANDARDS TO PROTECT VICTORIANS**

*The Andrews Labor Government has announced new regulations requiring power companies to introduce cutting edge technology across the state to better protect Victorians from bushfires started by powerline faults. Under the proposed Electricity Safety (Bushfire Mitigation) Regulations 2015 electricity distributors will have to install new, world-first technology across their networks that stops an electrical current within milliseconds of a powerline coming into contact with the ground or vegetation – stopping a fault before it can start a fire.*

*The Rapid Earth Fault Current Limiter (REFCL) technology was developed in Victoria in response to the recommendations of the 2009 Victorian Bushfires Royal Commission, intended to make powerlines safer in bushfire risk areas. Final testing in Kilmore in October found the REFCL technology reduces by ten-times the likelihood of a bushfire starting from a high voltage powerline fault. ...'*

While ASC's have been used in Europe since the 1920's to 'compensate' for and reduce fault current there is usually some residual current due to imbalances in line capacitance, resistive losses, grid impedance. The main advantages that resonant earthing claims to offer are in the areas of system reliability improvement as well as bushfire and earthing risk reduction.

Supply can be maintained while the compensation is active, and transient and high impedance faults can be seen by the sensitive earthfault detection scheme. Moreover, if the resonant earthing system is linked with some form of residual current cancellation scheme then the number of catastrophic bushfires ignited by power line infrastructure can be reduced.

However, like any engineering system resonant earthing doesn't come without some challenges, particularly when being retrofitted to an existing solid or impedance earthed system.

Firstly, resonant earthing cannot compensate for phase to phase faults, such as those created by clashing conductors or branches dropping across powerlines. Nor can such systems compensate for cross country faults. These high current faults occur during compensation when the voltage rise on the two healthy phases causes insulation to breakdown at a second location. A high magnitude earthfault then flows between the first fault location and the second location. Often the second fault point happens to be a cable joint that is expensive and time consuming to repair. Although European networks were initially designed to withstand higher overvoltages, cross country faults are becoming increasingly prevalent as insulation deteriorates with repeated stressing. One utility recorded earthfaults evolving into cross country faults between 7% and 37% of the time over a 15 year period. During a demonstration of the REFCL system to politicians and reporters such a fault occurred igniting the grass in the test cell (see video of Test 217 [here](#))



withstand the increased voltage stresses. Full compensation is difficult to achieve with some embedded cogeneration sources as well as other harmonic sources, and the Victorian field trials have been plagued with repeated reliability issues. Much of the network is incompatible with REFCL technology including SWER systems, three phase equipment with an earthed neutral configuration (eg cap banks, open delta regulators), and many HV customer installations. One of the \$100M Federally funded Smartgrid Smartcity studies concluded in 2013 that resonant earthing could not be justified in Australia based upon a cost benefit analysis that weighed up the operational, reliability, bushfire and shock risk impacts of the technology. The Victorian experiment is confirming that REFCL technology does not integrate well with the Australian power network.

Less than 1.5% of all bushfires are caused by electrical assets during normal conditions when local fire fighting crews can contain the blaze. However, during extreme bushfire threat events this figure lifts to something like 50%. In high winds branches brushing against lines can cause concurrent high impedance faults leading to arcing, and also if the system configuration changes during the compensation period the arc may reignite. The most optimistic estimate claims that the REFCL technology will only reduce the likelihood of an earthfault created fire by some 70%. There is still a relatively high likelihood that a high societal cost fire might occur unless other mitigation measures in place. The 2009 Black Saturday fires highlight this fact. Of the 5 power asset related fires only the Beechworth fire where 2 people died could possibly have been prevented by the REFCL technology. It would not have prevented the other 4 cases, including the one event which contributed around 90% of fatalities.

Prevention is only possible by installing underground cables or insulated wire, or installing localised PV microgrids with storage and/or power line de-energisation. Unfortunately deenergising overhead lines increases the risk of fatality unless you can evacuate people or provide power to homes. Progressive power utilities working with emergency services and local communities are developing new resilience zones where electricity is supplied to central community resources during a public safety power shutoff event. The threat posed by LV and higher voltage lines in high fire threat areas can also be managed with a combination of natural hardening and deenergisation.

In demonstrating due diligence in managing risk to the public it is clear that the existing distribution system can and has caused fire ignition, particularly in extreme fire threat conditions.

The cost of the REFCL rollout has been far higher than expected and a technical minefield with many hurdles having to be overcome as the program progressed. Many are now questioning the value of the rapidly increasing expenditure, particularly as electricity bills are likely to increase to pay for technology that doesn't eliminate fire risk. At some point it must be questioned whether or not the Victorian utilities should have been forced by Government Regulation to install one particular technology when more effective alternative options are available.

## South Australia's Tesla Battery to grow by 50 per cent

By Terry Miller

Source: [Clean Energy Finance Corporation](#) and [ABC News](#)

South Australia's Tesla Battery will increase its maximum output from 100 to 150MW, with storage of 193.5 MWh.

The Clean Energy Finance Corporation will provide up to \$50m in project finance. The South Australian Government has committed \$15m in funding and the Australian Renewable Energy Agency is contributing \$8m.

The battery will also be used to test and demonstrate "digital inertia", replicating services traditionally supplied by rotating synchronous machines.



---

## Ausgrid embraces “Digital Disruption” with VPP trial and proposal for community batteries.

**By Terry Miller**

**Source: Ausgrid media releases**

### **Virtual Power Plant Trial**

Ausgrid has welcomed the release of an [Australian Energy Market Commission information paper](#) into how digital disruption can help deliver better outcomes for energy customers.

Chief Customer Officer Rob Amphlett Lewis said it is a space Ausgrid has been actively exploring.

“Customers have told us they want more affordable electricity and greater options about the way they make, store and share their energy. We know the grid is critical to achieving these goals.

In the age of disruption where sharing technology is changing how we operate – we see Ausgrid as being to energy what the internet is to global tech giants like Amazon and Google.

“We are the caretaker of a shared asset that, just like the internet, holds the key to unlocking greater competition in the energy sector”, Rob said.

Ausgrid and distributed energy leader Reposit Power, have just completed a successful trial of a 1 megawatt virtual power plant (VPP). Under the trial Ausgrid sent signals, known as dispatches, to customer batteries via Reposit software, to request the batteries export stored energy back into the grid.

The VPP allowed electricity from customer batteries to be directed back into the grid when needed, with customers receiving cash payments.

The project began in March and involved 237 customers across 170 suburbs in Sydney, the Central Coast and the Hunter.

“By collaborating with our customers and industry partners we were able to deliver financial savings and unlock previously unexplored options for sharing energy.

“In the long term this technology could provide a lower cost alternative to grid investment, which would result in lower bills for all our customers,” Rob said.

Reposit Power co-founder and CEO, Dean Spaccavento, said VPPs are the next step in Australia's energy revolution.

“We are delighted this trial has shown the enormous value of our clean, flexible and cost effective VPPs to individual households as well as the wider community.

“This technology is now empowering consumers and communities to make the best choice on how they share their energy,” Dean said. The value of the technology can be seen on days where demand on the network rises, such as very hot days when energy consumption spikes.

On 12th March temperatures reached 34.6 degrees at Sydney Observatory Hill. That afternoon between 3:15pm and 6:15pm Ausgrid sent a dispatch to 207 customers in the VPP and on average each customer battery fed back 1.8kW into the grid. During the 4-month trial each customer received an average total payment of \$30.

### **Community Battery Trial**

Ausgrid today (9th October) confirmed its long-term commitment to renewable energy announcing it intends to progress plans to trial shared community batteries, in what could be a first for NSW.

Speaking at the AFR Summit today, Chief Customer Officer Rob Amphlett Lewis confirmed Ausgrid had been assessing the feasibility of ‘community batteries’ – a shared neighbourhood battery solution where solar energy could be stored and shared. Offering an alternative to individual households purchasing their own battery storage system, saving them thousands of dollars and improving the state's clean energy supply.

We know one of the biggest barriers to home battery systems is the cost. If you own a solar panel system without storage, you are only able to get real benefits from your system when the sun is out.

Imagine if we could change that, if instead of investing what could be an additional \$10,000 in a battery system at your home, you saved

that money and shared a storage system with your neighbours at the end of the street. Your energy is stored in the community battery for you to draw on when you need it, plus you could sell back to the grid the energy you don't use.

Ausgrid is conducting a feasibility study in collaboration with customer groups to determine the best approach to a future with community batteries and is now asking customers and the community to engage with the project in the next phase to establish customers appetite for this service.

"There is no doubt, there are regulatory challenges and technical complexities to making these community batteries a reality, but we think it's worth investigating," Mr Amphlett Lewis said.

Customers subscribing to a community battery could enjoy benefits that don't apply to customers who have installed a home battery system. These benefits could include:

- No upfront and installation costs
- No maintenance costs
- The potential to offer a range of different storage size options
- Flexibility to change storage sizes if photovoltaic (PV) system size increases, or consumption patterns change.

## NSW Electricity strategy released

By Terry Miller

Source: [NSW Govt](#)

In late November the NSW Minister for Energy, The Hon. Matt Kean, released "our plan for a reliable, affordable and sustainable electricity system".

The foundation for the Strategy is based on the following observations:

- Four of the State's five remaining coal fired generators are due to closed by 2025
- The network needs to adapt to the growing impact of roof top solar exports
- Firmed renewables are the cheapest type of new reliable generation. As at October 2019, NSW has more than 100 private sector proposals to build large renewable generators with a capacity of 17700MW and capital investment of \$24 billion.
- Grid congestion is growing, with today only one in 20 of the State's new generation proposals able to connect.
- Electricity prices have risen. The wholesale annual average price was \$36/MWh in 2014-15 and rose to \$92 in 2018-19.

Key new initiatives announced in the Strategy include:

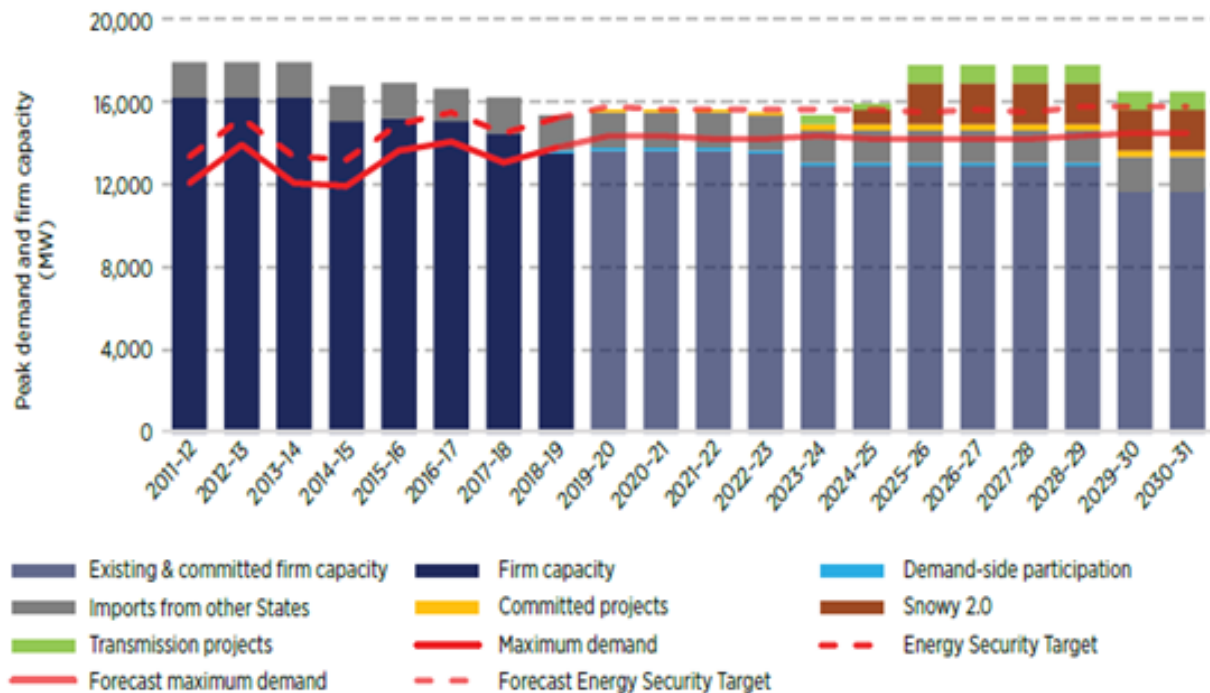
- **Rolling out Renewable Energy Zones:**  
The Government will ask the market for Expressions of Interest to invest in NSW Renewable Energy Zones, starting with a 3,000 MW pilot Renewable Energy Zone in the State's Central-West. The NSW Government will set up a dedicated Renewable Energy Zone body that will bring together investors and undertake early planning so benefits for local communities are maximised. Where appropriate, the Government will change the regulatory settings to incentivise generators to cover part of the cost of building new transmission for Renewable Energy Zones. This initiative will reduce the uncertainty, risk and costs for generators wanting a connection agreement.
- **A new Energy Security Safeguard** building on the existing Energy Savings Scheme based largely around energy efficiency, and a new demand reduction scheme to support technologies that can shift demand away from peak periods.
- **Supporting new generation** by developing a regulatory framework to promote new generation, with particular focus on projects that can be implemented before the existing stations close.
- **An Energy Security Target** to give the market certainty about how much new electricity is needed to deliver a reliable energy system over the medium to long term. (See more on this below)
- **Avoiding electricity supply emergencies** (ie insufficient capacity to meet demand) by accelerating and incentivising key generation projects, increasing scheme targets under the Energy Security Safeguard, offering more grants under the Emerging Energy program, and fast tracking additional priority transmission projects.
- **Increase powers to gather information** from market participants to help keep track of critical infrastructure and its impact on the system's reliability.
- Ensure the the existing **emergency response powers and processes** remain fit for purpose and are regularly reviewed and supported.

The Energy Security Target 2020-2030



NSW is projected to experience its tightest reserve conditions in 2023-4 after the closure of Liddell. This will be partially mitigated by the QNI and VNI upgrades and private sector projects committed over the next few years.

### Outlook for the NSW Energy Security Target



While there remains a risk of breaching the Energy Security Target in the summer of 2023-24 without further investment, there are more than enough proposed firm generation projects to meet and exceed the Target. However, without final investment decisions on these projects, there is a risk that they will not proceed. These projects include:

- a 250MW gas peaking plant at Newcastle (AGL)
- a 320MW gas peaking plant at Tallawarra (Energy Australia)
- four large-scale 50MW batteries (AGL with Maoneng Group)
- the 50MW Darlington Point Battery
- projects funded under the Emerging Energy program.

The NSW Government has five options to enhance firm supply or reduce peak demand, if required, to meet the Energy Security Target:

1. Fast track the development of the HumeLink interconnector to unlock up to 1200MW of existing capacity, of which 500MW would be available during periods of peak demand, and 2000MW of new reliable capacity following the completion of Snowy 2.0
2. Accelerate a further upgrade of the Queensland-NSW Transmission Interconnector Upgrade (378MW)
3. Use the NSW Government's electricity contracts to stimulate private sector investment in firm generation
4. Expand the Emerging Energy program
5. Increasing scheme targets under the Energy Security Safeguard.

## INTERNATIONAL ARTICLES

### The World of CIGRE

**Author:** Michael Heyeck

**Date:** 22 October 2019

**Source:** CIGRE and The Grid Group

"The World of CIGRE" article was published in T&D World's Straight Talk column in their September 2019 edition. Michael Heyeck, our Marketing & Communications Task Force convener for the Steering Committee, authored this article with support from CIGRE officers, the Central Office, and our marketing consultant, Colin Knox from Aspire. Mike has authored a total of five Straight Talk columns for T&D World, one a few years ago for support of the next generation for our profession, now NGN.

Debating about how the next 100+ years of electric power systems may be much more transformational than the last 100+ years is fascinating. Thomas Edison, Nikola Tesla, and others were extraordinarily transformative in their technological development of DC and AC electricity. Thomas Edison started with a DC "micro-grid" emanating from the Pearl Street Station in New York City. Power systems then evolved to local AC grids with Tesla, et al. Today, we have very large grids with AC and DC, but that is only part of the story. Interconnections were developed that drove economies of scale and long-distance needs, yielding large grid operational structures and extra-to-ultra high-voltage transmission. Centralization and standardization developed. The atom was split, supercritical boilers advanced, pumped-storage flourished, and central station power became a mainstay. Prices dropped significantly, then prices starting rising, seeding markets and open transmission access to mitigate.

For years, the complexities of the centralized top-down grid structure called upon higher voltages for greater distances with equipment being pushed to greater sizes, reliability, and lower costs. Extraordinary protection and controls developed as forerunners of self-healing. Then large markets developed via an extensive transmission grid, and complexity ensued.

Today Generation, Transmission and Distribution are blurred, with distribution changing significantly with network attributes and distributed energy resources. Consumers are active and transactional with the grid. Aggregators transcend the grid in varied ways. The grid has more just-in-time resources, is decentralized, and includes big data, blockchain, cyber-security, and more. And we have returned to the microgrid once again. Today's complexities are growing exponentially. Climate change and decarbonization add another complex dimension and a call for greater resilience and sustainability.

#### Evolution Meets Purpose

This evolution fits well with CIGRE's purpose "to foster engagement and knowledge sharing among power system professionals globally to enable the sustainable provision of electricity for all."

CIGRE was founded in Paris in 1921 when the electric industry envisioned the need for a global organization to complement the International Electrotechnical Commission (IEC - founded in 1906). Today, CIGRE approaches its second century, evolving with the extraordinary evolution of global power systems.

CIGRE is uniquely positioned as a community of thought leaders, decision-makers, and technology leaders across the world. Power system expertise across the globe offers technology and professional development for those young in their career and for those seasoned. CIGRE knows it is not enough to stay in the rear view mirror. Rather, CIGRE creates a forward-looking thought leadership to better electricity for society.

CIGRE is for power system expertise and is no longer an abbreviation. For many years, since its founding in Paris in 1921, CIGRE was a French abbreviation for International Council on Large Electric Systems with some slight variations. Today, CIGRE approaches its second century with a new strategy and brand inaugurated in Paris 2018 with end-to-end (E2E) power system expertise. E2E is CIGRE's scope for the grid, the globe, and all that seek sustainable and affordable electricity. Thousands of volunteers across the globe in 16 Study Committees and over 200 Working Groups are developing technical material on every conceivable subject for power system expertise.

CIGRE also has humanitarian desires to enable sustainable and affordable electricity for all that do not enjoy electricity today. Renewables, microgrids, and battery energy storage systems can create the progress we enjoy in developed countries to assist developing countries and regions. We have partnered with the World Bank in Africa to assist.

Biennially in even years, CIGRE holds its signature global power system event in Paris for thousands of delegates, hundreds of exhibitors, a next-generation network (NGN) showcase, and a women in engineering (WiE) event. Where can you go and benchmark more than 90 countries in one venue with 16 technical threads from which to choose? Many country and international events are also held by CIGRE.

We think sometimes we are best in power system expertise, but then we see what others are doing in the world. What better community provides information on Ireland's renewables connected at the distribution level, or China's perfection of ultra-high voltage AC and DC, or South Korea's best-practice distribution automation, or the complexities of Australia's energy market, or Brazil's evolving market, or...? And the list goes on.

[CIGRE.org](#) is the international website with a vast array of resources for members via [e-CIGRE](#). The signature magazine, *Electra*, is in digital form today but will advance in June 2020 to a modern digital platform with some freely accessible articles, technical information, and interviews. National Committees also have websites for events and registration. For those in the United States, visit [CIGRE-USNC](#)

CIGRE's E2E global community is a complement to any power system expertise need.

*Michael Heyeck was president of CIGRE's US National Committee (USNC) from 2011 to 2016, and currently serves as member of CIGRE's Administrative Council and Steering Committee with roles as chair of the Marketing & Communications Task Force and the Electra Editorial Board. Heyeck is founder, The Grid Group LLC, and formerly senior vice president of Transmission, American Electric Power.*

## Lithium-Sulfur Battery Project Aims to Double the Range of Electric Airplanes

Author: [Philip E. Ross](#)

Date: 11 November 2019

Source: IEEE Spectrum

Bye Aerospace is working with batteries from Oxis Energy to hit the magic mark of 500 watt-hours/kilogram.

When General Motors briefly first wowed the world with its EV-1 electric car, back in 1990, it relied on lead-acid batteries that packed a piddling 30 to 40 watt-hours per kilogram. The project eventually died, in part because that metric was so low (and the cost was so high). It was the advent of new battery designs, above all the lithium-ion variant, that launched today's electric-car wave. Today's Tesla Model 3's lithium-ion battery pack has an estimated 168 Wh/kg. And important as this energy-per-weight ratio is for electric cars, it's more important still for electric aircraft.

Now comes Oxis Energy, of Abingdon, UK, with a battery based on lithium-sulfur chemistry that it says can greatly increase the ratio, and do so in a product that's safe enough for use even in an electric airplane. Specifically, a plane built by Bye Aerospace, in Englewood, Colo., whose founder, George Bye, described the project in an 2017 article for IEEE Spectrum.

The two companies said in a statement that they were beginning a one-year joint project to demonstrate feasibility. They said the Oxis battery would provide "in excess" of 500 Wh/kg, a number which appears to apply to the individual cells, rather than the battery pack, with all its packaging, power electronics, and other paraphernalia. That per-cell figure may be compared directly to the "record-breaking energy density of 260 watt-hours per kilogram" that Bye cited for the batteries his planes were using in 2017.

This per-cell reduction will cut the total system weight in half, enough to extend flying range by 50 to 100 percent, at least in the small planes Bye Aerospace has specialized in so far. If lithium-sulfur wins the day, bigger planes may well follow.

"We believe this to be the first phase in the electrification of commercial aircraft and will ultimately form the basis for the electrification of air taxis, with the additional requirement for regional aircraft," said Huw Hampson-Jones, the chief executive of Oxis, in a statement. One reason why lithium-sulfur batteries have been on the sidelines for so long is their short life, due to degradation of the cathode during the charge-discharge cycle. Oxis expects its batteries will be able to last for 500 such cycles within the next two years. That's about par for the course for today's lithium-ion batteries.

Another reason is safety: Lithium-sulfur batteries have been prone to overheating. Oxis says its design incorporates a ceramic lithium sulfide as a "passivation layer," which blocks the flow of electricity—both to prevent sudden discharge and the more insidious leakage that can cause a lithium-ion battery to slowly lose capacity even while just sitting on a shelf. Oxis also uses a non-flammable electrolyte.

Presumably there is more to Oxis's secret sauce than these two elements: The company says it has 186 patents, with 87 more pending. *This story was updated on 14 November 2019.*



## Renewables continue to get cheap, just not as fast as before, Lazard analysis finds.

**Author:** Robert Walton

**Date:** 8 November 2019

**Source:** Utility Dive

### Dive Brief:

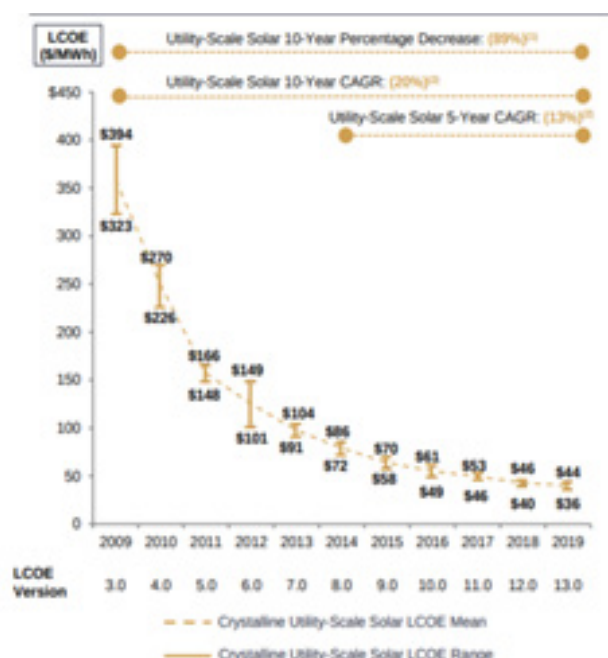
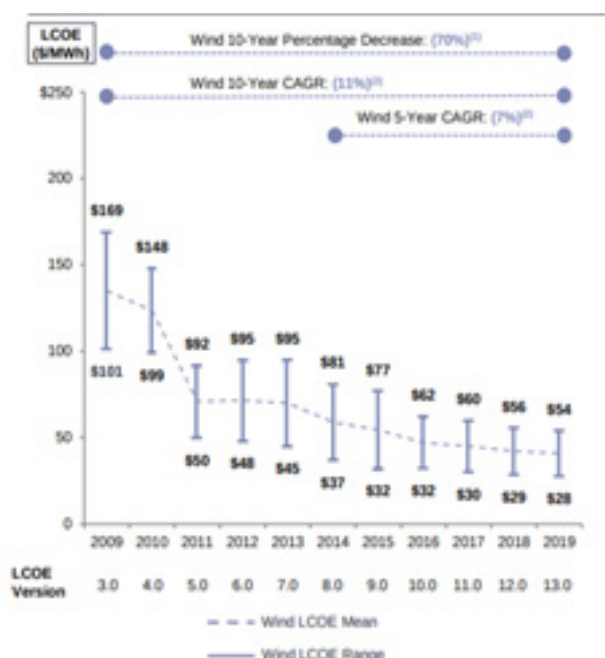
- New analysis from Lazard concludes the cost of renewable energy continues to fall, though the firm's most recent levelized cost of energy (LCOE) analysis, released Thursday, also warns the rate of decline is slowing.
- Solar and onshore wind remain cost competitive with the marginal cost of existing conventional generation technologies, according to the new analysis. Costs for utility-scale solar have been falling about 13% annually for the last five years while onshore wind costs have declined a more modest 7% annually.
- Lazard has also released its levelized cost of storage (LCOS) analysis, concluding lithium-ion batteries, in particular for short-duration applications, are cheapest compared to other technologies and chemistries thanks to improving efficiencies and a maturing supply chain.<sup>55</sup>

### Dive Insight:

Lazard's annual analysis shows continued declines in the cost of renewable technologies are pressuring conventional resources, but also makes clear that regional variations and dispatch challenges for intermittent resources remain a factor in determining the most economical mix.

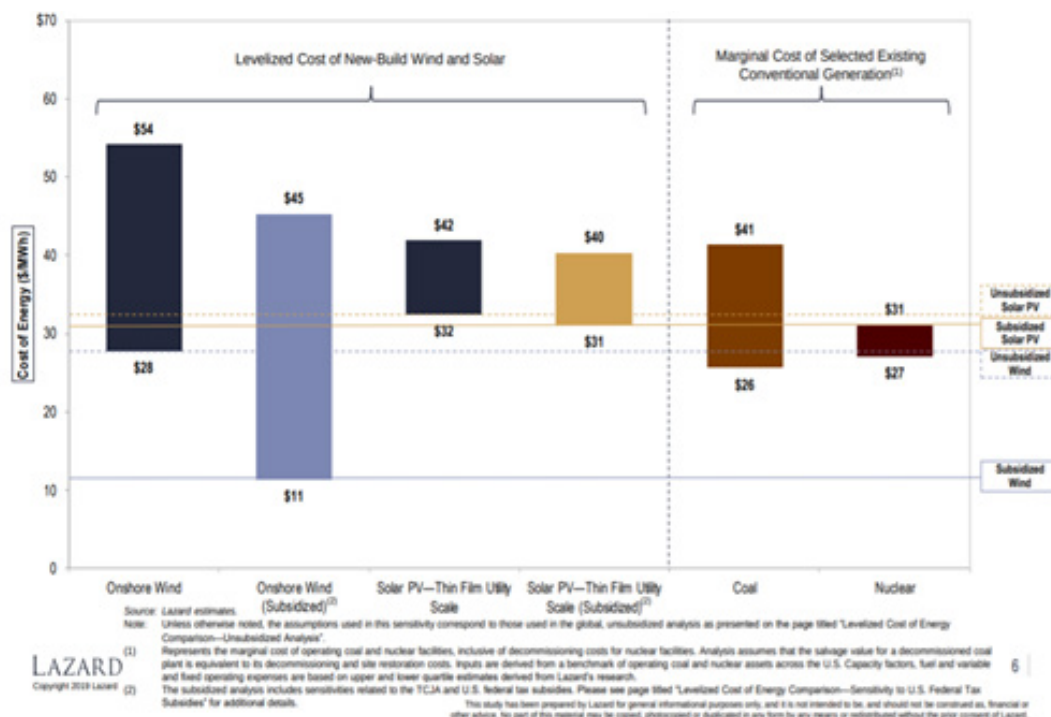
When federal subsidies are included, Lazard found the cost of building new onshore wind (\$28/MWh, on average) and utility-scale solar (\$36/MWh) were competitive with the marginal cost of coal (\$34/MWh) and nuclear generation (\$29/MWh).

On an unsubsidized basis some resources, particularly wind, remain cost-competitive with conventional generation technologies "under certain circumstances," according to Lazard. Onshore wind resources on an unsubsidized basis range from \$28/MWh to \$54/MWh. Wind and solar cost declines have been driven by the falling price of system components and improvements in efficiency, among other factors, Lazard said. But the industries are maturing, the firm warned, and "the rates of decline have diminished."



Regional differences in resource availability and fuel costs can drive "meaningful variance" in the LCOE of certain technologies, Lazard cautioned. And without associated energy storage, "these resources lack the dispatch characteristics, and associated benefits, of such conventional technologies."

However, the firm's LCOS report has good news on that front.



"Solar PV + storage systems are economically attractive for short-duration wholesale and commercial use cases, though they remain challenged for residential and longer-duration wholesale use cases," the firm said.

Comparing the unsubsidized LCOS in terms of energy, Lazard found 100 MW/200 MWh systems ranged from \$173/MWh to \$315/MWh. Residential systems sized 0.006 MW/0.025 MWh had costs from \$457/MWh to \$663/MWh.

The storage report shows "significant cost declines across most use cases, despite industry concern about rising costs for future deliveries of Lithium-ion systems due to higher commodity pricing and challenges related to storage module availability."

Lazard noted that cost declines for storage modules were more pronounced than for system components or operations and maintenance. And year-over-year cost declines were less pronounced than what the firm observed a year ago.

"The previously observed trend of growing cost disparity within use cases continued, as the gap between the lowest- and highest-cost systems increased, on a relative basis," versus the previous LCOS analysis, the firm said.

## PG&E's Wild Fire Fiasco

**Date: November 2019**

**Source: EEnergy Informer**

California utility's decision to shut off power to avoid wild fires backfires

Perry Sioshansi in the November issue of EEnergy Informer writes that following the devastating wildfires in 2017 and 2018, for which the **Pacific Gas & Electric Company (PG&E)** was found to be partially at fault, the utility's finances have taken a dive. Its liabilities from scores of lawsuits exceeds its assets by a wide margin, the standard accounting definition for being bankrupt. Of course, a company this big and this vital – it serves roughly half of California's population – cannot really be allowed to go bankrupt, can it? It is merely under "bankruptcy protection". But it certainly has no appetite for more lawsuits from more wildfires. Under new management and overseen by a court appointed bankruptcy judge, PG&E has assumed a low-risk, back to basics posture, no surprise.

Its mission, to the extent that it has one, is to re-emerge from bankruptcy protection unscathed and with some resemblance of normalcy restored. Anticipating hot, dry and windy conditions in October – a perennial feature of California weather made worse in recent years by climate change – the utility had earlier warned that it would **shut off power** to customers in advance to avoid sparking new wildfires or

---

be blamed for them. The idea was to do this as a last resort, and selectively to minimize the loss of life and property. If the choice was between service or safety – read more lawsuits – PG&E would go for the latter.

As it turned out, hot, dry and windy conditions were forecast for large portions of the state for 9-10 Oct and PG&E decided to shut power off to about 738,000 customers in Northern and Central California – affecting roughly 1 million residents and businesses. Fortunately, no major fires were reported in PG&E's service area and the company started restoring power to some 426,000 customers on the following day. In some cases, restoration took a day or longer since the company had to inspect the condition of the wires before it could re-energize them.

No matter how noble or justified the motivations, the service disruption, poorly planned and hastily communicated, did not go well with the public, those who were disrupted as well as those who might have been disrupted including this editor.

The backlash was immediate and unanimous. PG&E screwed up badly managing to turn more customers, regulators and politicians into skeptics on its ability to run a business. To be fair, **Southern California Edison Company** (SCE), the other big utility that essentially serves the rest of the state – setting aside a few smallish areas – also shut off power to some 13,000 customers while putting another 200,000 on alert. But these were isolated and did not cause the massive disruptions caused by PG&E.

The new president of **California Public Utilities Commission** (CPUC), **Marybel Batjer**, was typical in stating that PG&E's response "has been absolutely unacceptable" to communities, "to individual people, to the commerce of our state and the safety of our people." Others, especially customers literally stranded in the dark and not knowing when the power will be stored, had even harsher words.

California Gov. **Gavin Newsom** was blunt in blaming PG&E for the blackouts. He said, "This is not a climate change story as much as a story about greed and mismanagement over the course of decades. Neglect, a desire to advance not public safety but profits." Understandably, the newly elected governor wants to deflect any criticism of the incident on himself. He must have known that this was coming, did he not? And if not, why not?

The central question is if PG&E cannot operate its network safely and reliably, then why has it not done something about it already? Climate change is partly to blame for making the fire danger more prevalent and more deadly, but surely utilities in warmer and hashier climates manage to keep the lights on, don't they?

**Mindy Spatt**, speaking for **The Utility Reform Network** (TURN), a customer advocacy group, said, "Every time you think PG&E can't do worse, they do." Making matters worse, PG&E's website went down and the phone lines were flooded making it difficult for customers to get information on when the power may be restored.

Restoring power is not as simple as tuning on a switch. On average it takes about 48 hours but can take longer, especially in the case of a major shut off like this. The only silver lining, if there is one, is that more customers may decide that they cannot rely on the local utility for reliable service, prompting them to invest in self-generation, battery storage and/or back-up emergency generation. That would drive more customers away from the incumbent utilities.

While the debate about the wisdom of PG&E's decision to shut off power drags on, a large wildfire erupted Northwest of Los Angeles in SCE's service area forcing mass evacuations. The dry vegetation and gusty winds spread the fire despite efforts to contain it.

Clearly, the fiasco is far from over as everyone in the chain of command – from Governor to PG&E's CEO **Bill Johnson** to commissioners at the CPUC are scrambling to decide how best to move forward. California is getting warmer and drier and the fire hazard is imminent and serious as was experienced during the recent events with major fatalities and massive loss of property. A better way must be found to balance the safety vs. service option.

Gov. Newsom declared a state of emergency in affected areas just as PG&E was restoring service in Northern California.

---

## Utility-scale Storage on The Rise

Date: November 2019

Source: EEnergy Informer

IRENA identifies 6 critical technologies for energy transition.

Perry Sioshansi in the November issue of EEnergy Informer writes that while a few skeptics stick to the business as usual scenario, the great majority of experts looking at the future of the global energy picture are convinced that it is undergoing dramatic change at an unprecedented speed. **Enabling Technologies: Innovation Landscape**, a report released by the **International Renewable Energy Agency (IRENA)**, examines 6 technologies, which it says, are likely to play a critical role in the transition. They include:

- Utility-scale batteries, also known as front-of-the-meter batteries;
- Behind-the-meter (BTM) batteries;
- Electric vehicle (EV) smart charging;
- Internet of Things (IoT);
- Artificial intelligence (AI) and big data; and
- Blockchain.

It is hard to come up with a better list. Prior IRENA reports in the series included **Innovation Landscape for a Renewable-powered Future: Solutions to Integrate Variable Renewables**, published in February 2019. As IRENA sees it, the rapid expected rise of renewable generation has to be complemented with other enabling technologies and innovations, leading to new business models, encouraged by changes in market design rules and new developments in how future electricity networks are managed and operated.

IRENA reckons stationary **energy storage systems (ESS)** will grow at a fast clip from a small scale to reach 100-400 GWhs by 2030 depending on the particular scenario considered. The two dominant applications in the stationary category – that is not including EV batteries – is behind-the meter ESS coupled with rooftop solar PVs and utility-scale batteries, of the type increasingly paired with utility-scale solar and wind plants.

The obvious benefit of utility-scale batteries is that they can save some of the surplus generation from variable renewable resources and move it to hours where there may be a deficit in the supply and demand balance.

This is schematically illustrated for the famous **California Duck Curve** where a 14% peak load reduction is accompanied with a 59% peak ramp reduction simply by storing some of the excess solar generation from the “belly” of the curve to the evening hours after the sun has set.

Similar feats, of course, can be achieved with wind, especially where there are daily variations in generation patterns.

IRENA recognizes that there are many obstacles to rapid implementation of large-scale ESS but points out that the benefits are simply overwhelming. Helpful regulatory policies and policy clarity on the role of ESS in the traditional networks is identified among the main drivers.

In many parts of the world, energy storage resides in a regulatory no man's land. Because it behaves as a generation – when discharging – and as a load – when it is charging – regulators have had difficulties deciding how to treat it as an investment asset. Moreover, its role in providing services to the network and the wholesale market are currently under-valued and under-estimated.

But this is beginning to change as regulators increasingly realize that without large scale ESS, large amounts of renewable generation added to the network will simply flood the market, exacerbating the surplus when the value is low and adding to the challenge of making up the deficits when renewables are not available.

[https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA\\_Enabling\\_Technologies\\_Collection\\_2019.pdf](https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA_Enabling_Technologies_Collection_2019.pdf)



## HISTORY

### Single Wire Earth Return System for Rural Distribution

**Author:** Tony Patterson

**Date:** November 2019

I have included two papers in this history section for this bulletin. These papers deal with the common theme of rural distribution, but have a significant time difference which permits a different technological approach to the problem.

In the early days of our Association many of our engineers were focused on providing electricity to potential customers. The State Government of NSW had a plan to electrify the whole of the state and provide grid-based electricity to every potential customer. Everyone had the right to receive electricity whether they lived in a metro city, a remote rural town or even a very remote rural property. The Government had a Rural Electrification Scheme which established this objective and decreed that the capital cost would be split with a payment of one third from the Government, one third from the County Council and the final third from the customer.

Many of these potential customers were "very remote" and the capital cost to provide conventional distribution was prohibitive, despite the subsidy. A new approach to the line design was required, which was less capital intensive.

Innovative engineering produced the Single Wire Earth Return Scheme, commonly called SWER. This scheme reduced costs significantly and the reduction was achieved through:

- use of a single conductor, usually steel and earth as the return conductor
- long spans on flat country
- minimum pole top hardware
- simple substations
- lightning protection using displaced twin arc gaps and single phase reclosers
- drop off fuses
- no phase to phase faults
- etc

The problem with SWER was that it was never going to be economic. I built SWER lines in South West Queensland that comprised 50 km's of line for 11 customers and 52 km's for 14 customers. Because of the remoteness, the cost of operation, maintenance and access was prohibitive.

However, let us go back to 1947 when the only problem was construction capital and the urgent need to connect every NSW resident to the electricity grid. Please read the attached paper to get a full understanding of the development and application of the SWER process.

#### **Paper: Single Wire Earth Return System for Rural Distribution**

**Author:** M M McDonald

**Date:** This paper was presented to our conference in 1947

[Download Paper](#)

The second paper that I have provided again relates to rural electrification. Many of our customers live in "very, very remote" locations, where even SWER did not provide an economic solution to their electrical needs. The paper by Matt Darveniza proposes the use of solar power for these remote regions and in 1974 with solar in its very early days of development, it was very optimistic. While the paper is more about the development of coordinated research into this option, it has to be one of the first papers to propose such a solution. For all our members, and particularly our renewable energy buffs, this paper is essential reading.

#### **Paper: Solar Electricity for Remote Rural Customers**

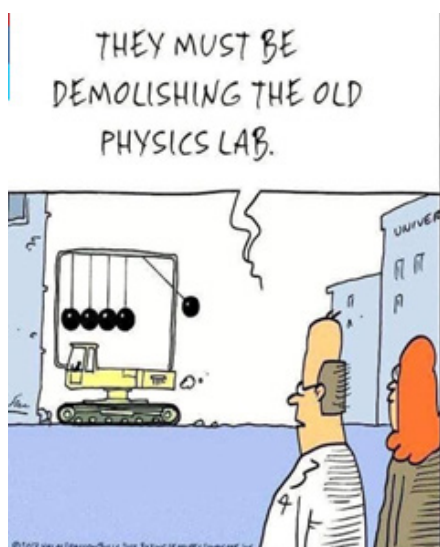
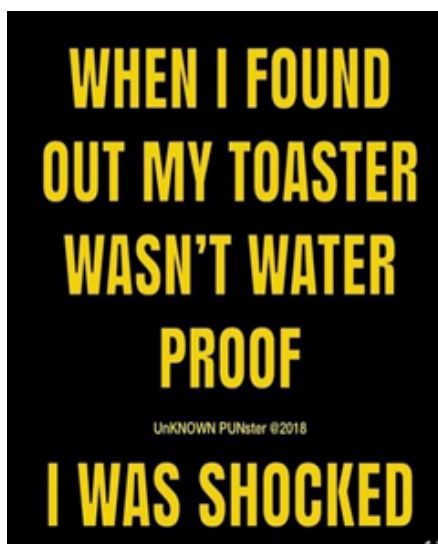
**Author:** M Darveniza

**Date:** This paper was presented to our conference in 1974

[Download Paper](#)

While we have been looking at history, perhaps it is now time to look into the future and to the possible demise of SWER lines. Where lines are primarily domestic/farm loads and not irrigation, renewable and battery technology have developed to the point of SWER replacement. The SWER lines are very old, have been subject to bushfire enquiries and are expensive to service. Just a concluding thought from the author.

## HUMOUR CORNER



## CIREP PAPER

### How to Build Smarter Electrical Substations by Mimicking Biology

Paper 84 from the Madrid CIREP Workshop held on 3-6 June 2019.

#### Abstract

What do human biology and electrical power distribution systems have in common? Perhaps surprisingly, quite a lot. These similarities can inspire electrical distribution networks' design and management and risk minimization efforts. To understand why biomimicry helps utilities build smarter electrical substations, consider the functions of the human body.

[Download Paper](#)

## AWARDS

### The Institution of Engineering and Technology (IET) has celebrated ground breaking innovations in a glittering awards ceremony in London.

**Date: 15 November 2019**

**Source: E&T Magazine**

The IET Innovation Awards, held annually in the heart of London, attract a wide range of entries from across the fields of engineering and technology, from biomedical technologies to cybersecurity.

Heriot-Watt University and SP Energy Networks were handed the top prize by a panel of E&T journalists - the E&T Innovation of the Year - for their "Network Constraints Early Warning System" (NCEWS), which generates algorithms to extract information about missing cable assets and voltage excursions. The platform uses huge quantities of data from smart meters to train deep learning algorithms (which extract useful information as data is processed through multiple layers) to predict missing cable assets and voltage excursions across a network.

Even when some data is missing, NCEWS is capable of generating extremely accurate predictions.

Heriot-Watt and SP Energy Networks were also awarded the prize for Information Technology: one of 16 awards given for innovations in specific areas. The winners commented: "We are delighted to have won both the Information Systems Award and IET's [...] E&T Innovation of the Year prize at this year's Innovation Awards. The award highlights a very successful collaboration between the Smart Systems Group at Heriot-Watt University. The methods we've developed are at the forefront of research efforts in this area and have resulted in publications in top international journals and conferences."

# How to Implement Flexibility in the Distribution System?

4 – 5 JUNE 2020 | ESTREL CONGRESS CENTRE | BERLIN | GERMANY

## Submit your work to the CIRED 2020 Workshop

Present, discuss and share new ideas and new developments in the realm of flexibility. The CIRED 2020 Workshop will showcase the rapidly developing innovations within this area from planning through to policy and will be the go-to forum for over 400 international experts.

### TECHNICAL SCOPE

#### THEME 1

##### Integrating new flexibility tools and principles for planning

- Integrated energy system planning
- Enhanced asset management and risk assessment, e.g. traditional investment vs. flexibility
- Integration of local and distributed storage, new loads and load patterns
- Regulatory aspects of new tools and principles, including aggregated storage
- Cross sector and industry tools for decision making

#### THEME 2

##### Opportunities and challenges with operation using flexibility

- Workforce management
- Autonomous network operation and artificial intelligence to operate power systems
- Operational risk management
- Emergency operation
- Case studies, pilot projects and first experience

#### THEME 3

##### Flexibility platforms and the role of future DSOs

- Business models and regulatory frameworks
- The role of future DSOs
- Market/Interaction platforms
- DSO/TSO interaction
- Active customers – prosumers and citizens energy communities
- Energy policies

Accepted papers at CIRED Workshop 2020 will be published in IET Inspec, IEEE Xplore, EI Compendex and Open Access CIRED Journal.

[www.cired2020berlin.org](http://www.cired2020berlin.org)





## WHY CIRED?

CIRED is your chance to meet and share ideas with the global electricity distribution community. CIRED is attended by DNOs, utilities, product and service developers and researchers from both industry and academia.

### Publication Opportunities at CIRED

All presented papers at the CIRED 2020 Workshop will be published in the conference proceedings and submitted for indexing on:

**IET Inspec**

**Compendex**

**IEEE Xplore®**  
Digital Library

**OPEN**

Sponsor:

**ENEDIS**  
L'ELECTRICITE EN RESEAU

Media Partner:

**E&T**

### Key Dates to Note:

Abstract deadline

**25 November 2019**

Notification of acceptance

**24 January 2020**

Full papers deadline

**16 March 2020**



**CIRED 2020 Workshop**  
**4 – 5 June 2020**



## THANK YOU



The Electric Energy Society of Australia (EESA) is a non profit Technical Society of Engineers Australia, established to advance interest in the field of Electric Energy. The key objective of EESA is to provide a continuous professional development program to its members.

The successful functioning of EESA is owed to the support of EESA members and especially those who volunteer their time, effort, skills and expertise for the society. We thank our members and volunteers for their contribution.

### Keeping up with EESA events

To see an up-to-date list of EESA events, check under **EVENTS** on the EESA website or [CLICK HERE](#)

### Missed an event?

Recordings and papers are available under **RESOURCES** on the EESA website or [CLICK HERE](#)



We thank our corporate members for their support.

## Gold Members



### Essential Energy

At Essential Energy we look after the poles and wires that deliver electricity to 95 per cent of regional, rural and remote NSW and parts of southern Qld.



### Horizon Power

Horizon Power is a State Government-owned, commercially-focused corporation that provides safe and reliable power to about 100,000 residents and 10,000 businesses across Western Australia.



### AMSC Australia

AMSC generates the ideas, technologies and solutions that meet the world's demand for smarter, cleaner, better energy.



### Western Power

Western Power's vision is to deliver on the changing energy needs of Western Australians, powered by community trust and the passion of our people.



### EATON

We're dedicated to improving people's lives and the environment with power management technologies that are more reliable, efficient and safe.



### Evoenergy

Evoenergy is owned equally by Icon Water Limited and Jemena Ltd via subsidiary companies. Evoenergy owns and operates the ACT electricity network, and owns the gas networks in the ACT, Queanbeyan, Jerrabomberra, Bungendore and Nowra.



### nVent

We are a \$2.1 billion, high-performance electrical company with a dedicated team of 9,000 people and trusted brands. Known for innovation, quality and reliability, our products connect and protect, consistently delivering value to industrial, commercial, residential, energy and infrastructure customers.



### APD Engineering

APD Engineering have been providing Specialist Electrical Engineering Design and Consultancy Services to Power Utilities, Local Government Authorities, Land Developers, Mining, Construction and other industries for nearly 20 years.



### Wilson Transformer Company

Wilson Transformer Company is a leading specialist in the delivery of transformer solutions. In a changing world, organisations are increasingly turning to our specialist skills to meet their technical, safety and environmental challenges.

## Bronze Members

NOJA POWER

Schneider Electric



NYNAS



ElectraNet



Clarence Consultants



insulect  
VERSATILITY VIA COLLABORATION

