

NATIONAL BULLETIN

Bulletin 9 | 2022

SUCCESSFULLY MANAGING THE TRANSITION TO THE FUTURE GRID

By Jeff Allen, National President of the Electric Energy Society of Australia | 20 September 2022

As we all know, unprecedented changes are occurring and will continue to occur across all areas of the electric energy industry.

To successfully manage this much more complex electricity system of the future requires sophisticated business processes, information systems and expert, knowledgeable and experienced people who can balance the best engineering and commercial judgements to ensure prudent risk management outcomes and therefore successfully manage the assets to satisfy the needs of customers and the community for business success.



Jeff Allen, National President of the Electric Energy Society of Australia

Engineers need to understand all the details of their area of work as well as the “big picture” overview of the changes that are occurring and the impact all these changes are having on the transmission and distribution system to ensure a successful transition to this much more complicated world. Maintaining competencies in the ever-changing electric energy area is a challenge. One of the key challenges for businesses will also be having sufficient people with the right skills to successfully manage all the changes necessary to transition to the “future grid.” See the Engineers Australia report (which EESA contributed to) <https://www.engineersaustralia.org.au/publications/strengthening-engineering-workforce-australia> for more background on this area.

There are many engineering changes forecast to occur across a range of areas over the next 10 years. I have reviewed in detail the EECON 2022 program - <https://www.eecon2022.com.au/program/> and I am of the view that the more than 40 presentations will provide a great understanding of the many issues that will be impacting the “rapid transformation of Australia’s electricity system.”

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The issues being covered at EECON 2022 include the impact of the significant increase of solar and wind generation together with roof top PV which will be installed across many locations and will be connected at all network levels. As homes, vehicles and industrial applications switch away from gas and petroleum fuels to electricity, this will further increase demand on our electricity system of the future.

Moving towards a 100% renewable power system requires balancing an increasingly variable resource mix, the provision of inertia and system strength services and the coordination of increasing decentralised participation.

As variable renewable energy increases, and the coal/gas fired synchronous generation fleet retires, large-scale batteries will play in an increasingly crucial role in the electricity grid of the future. Batteries will provide whole-of-system stability services, as well as operating as a shock absorber against local network contingency events. Vehicle-to-Grid connections will also enable Electric Vehicles to also act like a grid-connected battery.

Virtual Power Plant “platforms” will play a critical role as businesses invest in distributed energy assets, storage, and hybrid renewable energy solutions. Virtual power plants are just one of many innovative approaches that will shape tomorrow's energy system

All these Distributed Energy Resources and the electrification of homes and transport will present stability and security issues for the electricity grid resulting in DNSPs looking to innovations in the IoT space. DNSPs will need better data to reduce outages, meet budget constraints and build more resilient networks and thus DNSPs are implementing digital transformation programs to create a digital twin of their networks. Digital twin technology can unlock the value of LiDAR data, asset management data, GIS data as well as external data sources to create a 3D model for network assets and the environment it operates in. Techno-economic modelling and simulation and Distribution System State Estimation are also tools being used in this much more complex future for distribution networks.

The impact of roof top PV generation on power quality, consumer appliances as well as earthing systems for power system security and personnel safety needs to be managed. Voltage rise on LV systems will become a problem and using solutions like Distribution Static Compensator technology is one of a number of options being explored for boosting DER hosting capacity.

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Stand Alone Power Systems (SAPS) - solar panels, battery storage and a backup generator - are becoming the alternative solution for hard-to-access or remote communities. These also assist with managing the risk that climate change and severe weather events pose for customers, the public and DNSPs in certain areas.

With all these changes, there are risks that need to be managed appropriately. From my experience gained over many years, I have come to the view that “risk events” generally are as a result of inadequate “Business Knowledge” and this is usually due to a lack of appropriate data, processes and systems and not having sufficient people with the right skills or experience managing the outcomes. These risks will increase as the electricity systems become increasingly more complex.

Thus, engineers need to have a good understanding of their area of work as well as the “big picture” overview of the changes that are occurring and the impact these changes have on the transmission and distribution systems so that they can successfully manage the transition to this much more complicated future grid. Attending EECON 2022 will certainly assist with that understanding.

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LOCAL NEWS

GOVERNMENT/INDUSTRY PROJECT CREATES SWER FIRE-SAFETY SOLUTION

By Dr Tony Marxsen FIEAust OAM, Chairman IND Technology Pty Ltd

Single-Wire-Earth-Return (SWER) powerlines are a low-cost means of power supply to rural areas with few customers. SWER powerlines make up less than fifty percent of rural powerlines in Victoria but are over-represented in catastrophic powerline fires. SWER started many major fires in the 1977 Trentham, 1983 Ash Wednesday, and 2009 Black Saturday tragedies, including the deadliest Black Saturday fire that killed 120 people. SWER powerlines still start fires each year in Victoria at a rate that becomes much higher on days of high fire-risk weather.

A lot of work has been done in recent years to make Victoria's SWER more fire-safe: remote controlled fast sensitive reclosers, vibration dampers, LIDAR scans, more frequent inspections, etc. However, techniques to limit earth fault current that work so well to prevent fires from polyphase lines, cannot work for SWER as earth fault current flows on the same path as customer load current. SWER protection systems must allow 10-20 amps of earth current to flow so customers' lights stay on, but it takes only a half-amp of earth fault current to start a catastrophic fire on a Code Red day.

New technology that monitors powerlines at radio frequency (RF) is a proven way to find defects that are precursors to fire-starting powerline faults. In 2017-2019, a trial of Early Fault Detection (EFD) technology that monitors powerlines in the 1-130MHz band on 250 kilometres of Victoria's total SWER inventory demonstrated EFD could find high fire-risk defects before faults occurred. Victoria's EFD investment since then has focused on polyphase networks, not SWER. This concerns those of us who want a fire-safety solution for SWER as good as Victoria's billion-dollar REFCL investment is proving to be for polyphase lines, preferably before the current La Niña conditions swing back to the hot dry summers of El Niño in a few years.

In 2020, the Victorian Government opened a new round of Powerline Bushfire Safety Program R&D grants. IND Technology, the Melbourne-based manufacturer and global exporter of EFD systems, with the support of AusNet and Powercor proposed a bigger SWER EFD Trial to halve the cost of SWER EFD deployment and confirm EFD fire-safety benefits on a larger scale – more than 1,000 kilometres of powerlines across a diversity of Victoria's local rural environments. The concept won government support and the FireSafe SWER EFD Trial launched in early 2021. The final report of the project was submitted mid-June 2022 and is now public at www.delwp.vic.gov.au.

In summary, the project cut the cost of EFD deployment on SWER by nearly two-thirds compared to the 2019 trial. A new radically re-engineered FireSafe SWER EFD product is now deployed on nearly seventy SWER networks to monitor 1,100 kilometres of SWER powerlines. Early results indicate detection and location of high-risk powerline defects has not just been preserved, it may even be enhanced. After fine-tuning, the Trial will start its two-year monitoring and optimisation phase during which the functions and performance of the FireSafe SWER EFD systems will be progressively improved via Internet-delivered firmware updates.

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Cutting deployment cost by two-thirds

EFD powerline monitoring systems use dispersed Data Collection Units (DCUs) to gather information on RF signals travelling on powerlines. Taking a retrospective look at the DCU design used in the 2017-2019 EFD SWER Trial (Figure 1), it was clear there were three main interlinked drivers of cost: solar power, the high-voltage sensor that collects the RF signal, and the size and weight of the EFD control enclosure. Together they added cost and constrained DCU locations to the middle of paddocks or roadside reserves – situations where crew access can be challenging.

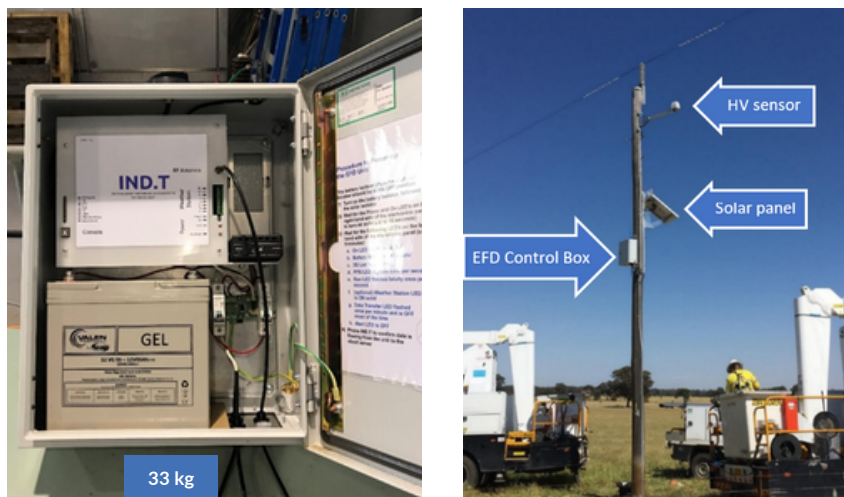


Figure 1: the EFD data collection unit - 2017 design

Elimination of the high-voltage RF sensor would cut costs four ways: one less item on the pole; DCUs could be installed on customer substation poles where crew access is better; no need for solar power; and, only low-voltage wiring would be involved, greatly simplifying installation. The key question was “Could the RF signals on the high-voltage powerline be collected on the low-voltage side of customer supply transformers?” Laboratory tests indicated they could, and this was adopted as a working design assumption pending confirmation in proof-of-concept tests on real powerlines. The option to add a high-voltage RF sensor later was retained as a safety net.

Examination of the bill-of-materials for the 2017 design showed several areas for further savings. Some costs could not easily be modified, such as the chip set, but others were flexible. A move to plastic would cut the enclosure cost by eighty percent and allow the GPS antenna to be internal. A switched mode mains power supply cut cost and weight, as did compacting the printed circuit boards into a block with less inter-board cabling. Water-ingress risk was cut with the 4G/3G communications antenna and connectors moved to the base of the unit facing downwards.

The final design was seventy percent smaller, ninety percent lighter, and fifty-four percent cheaper than the 2017 design. Best of all, installation cost was cut seventy percent. Overall ‘procure and install’ cost was cut by two-thirds. All mainstream EFD functions were retained. The design is a long-term hardware platform for future firmware to deliver high-value EFD functions like fault location.

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Rollout

Between February and May 2022, AusNet and Powercor each installed about 150 of the new FireSafe SWER EFD units to monitor SWER networks in a diversity of environments across Victoria. Fifty of the units had add-on weather stations to assess the operational value of granular real-time weather data in high fire-risk conditions. Units also measure customer quality of supply each second.

The EFD systems are now going through a 'run in' period though they are already finding powerline defects. Two case studies are documented in the project final report: vegetation encroachment detected at an unprecedented distance of 600 millimetres (Figure 2), and a noisy conductor splice of a type marked for replacement due to known dissimilar metal compatibility issues. Several others await inspection and investigation.

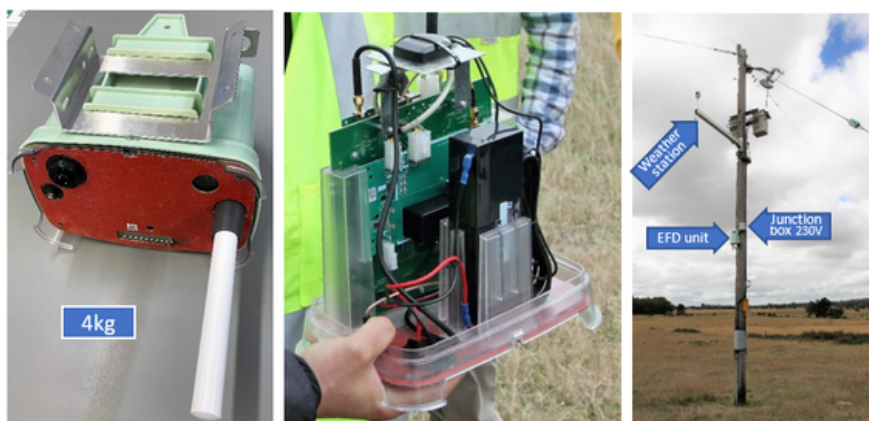


Figure 2: the EFD data collection unit - 2022 FireSafe SWER design



Figure 3: Vegetation encroachment detected by FireSafe SWER EFD (conductor has been emphasised for visibility)



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Next steps

The FireSafe SWER EFD Trial will now enter a two-year monitoring and assessment phase in which different aspects of value are quantified. Progress reports will be published at six-month intervals.

Deployment of the new FireSafe SWER EFD product to monitor all Victoria's SWER powerlines would take less than \$30 million capex. Existing EFD customers here and in the US are also keen to trial the new product as a low-cost way to monitor long two-wire spurs (tap-lines in US parlance) to complement existing mainstream EFD coverage of the three- or four-wire feeder backbone.

This project has been a great example of how government and industry can work together to take a step forward in powerline bushfire safety. The collaboration and joint governance in the project were excellent.



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AEMO MARKET SUSPENSION REPORT: ANATOMY OF A CRISIS

By Ben Skinner | 25 August 2022 | Source: [Australian Energy Council](#)

On 18 August the Australian Energy Market Operator (AEMO) published its much anticipated statutory report on the National Electricity Market (NEM) events in the fortnight between 10 and 24 June 2022. While the terms “crisis” and “unprecedented” are over-used in industry commentary, the scale of the events portrayed by the report most definitely justify them. The seeds of the crisis were sown with international events months earlier, at the end of the pandemic and the start of the Ukraine war, spiralling into a perfect storm of bad luck by June. And, just when the industry needed them the most, the market rules failed it. A price capping regime, conceived for different circumstances, greatly inflamed an already tight situation and forced AEMO to suspend the market. Many of the systems used to manage an extremely complex market became dysfunctional and whilst AEMO did its best to work around them, there were times that, as a result, the power system itself was at much more risk than it needed to be. Through great efforts by AEMO and the industry, no customers were blacked out, but a disaster could easily have ensued. Early in the crisis it was unclear exactly what was occurring, and some misinformed commentary pre-emptively blamed generator bidding behaviour, which was then repeated by mainstream media and politicians, unfairly tarnishing the industry’s image. AEMO’s report shows that the crisis was far more complex, and, if blame can be laid anywhere, it rests in rules written two decades earlier. We take a look:

Please find the full article [here](#).

AEMO’S 2022 ELECTRICITY STATEMENT OF OPPORTUNITIES HIGHLIGHTS NEW GENERATION REQUIRED TO COVER COAL SHUT DOWNS

By Terry Miller | 15 September 2022 | Source: [AEMO](#)

The recently released 2022 ESOO forecasts reliability gaps across all mainland regions from as early as 2024 (for NSW). These will be pushed out to later in the decade if the currently anticipated 3.4G of new generation, coupled with actionable transmission projects identified in the Integrated System Plan, are delivered to their current schedules. Anticipated exits of more coal fired stations later this decade will require further capacity enhancement to meet reliability standards:

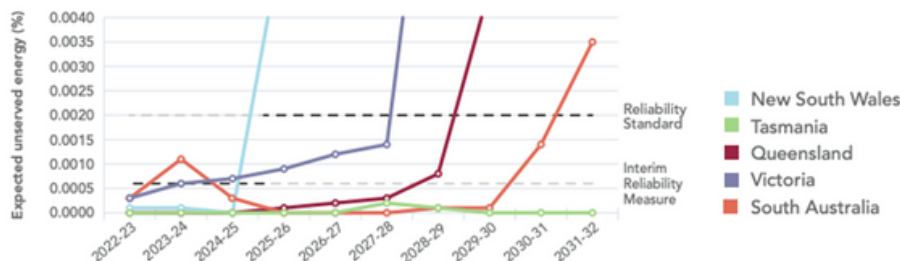
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Reliability forecasts (existing and committed projects)

For the period from 2022-23 to 2031-32, reliability gaps are forecast for all mainland regions:

- against the Interim Reliability Measure* (IRM) in South Australia as early as 2023-24 and Victoria in 2024-25
- against the reliability standard in New South Wales from 2025-26, followed by Victoria (2028-29), Queensland (2029-30) and South Australia (2031-32).

Expected unserved energy – central outlook



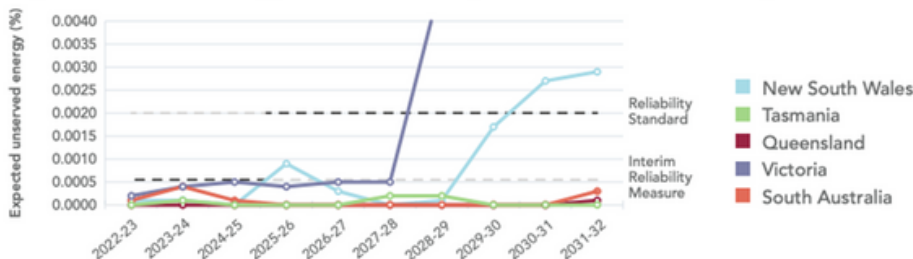
*The Interim Reliability Measure (IRM) was introduced to reduce the risk of load shedding across the NEM, providing a trigger for the Retailer Reliability Obligation (RRO) of unserved energy (USE) of no more than 0.0006% of energy demanded in a region in any year. The IRM is scheduled to expire in June 2025, after which the reliability standard (USE in each region of no more than 0.002% of energy demanded in any year) will again be used to measure reliability.

Anticipated and actionable projects improve the outlook

The 2022 ESOO signals the urgency of progressing generation, storage and transmission developments to maintain a secure, reliable and affordable supply of electricity to homes and businesses.

Should the 3.4 GW of currently anticipated generation and storage projects, alongside ISP actionable transmission projects, be delivered to their current schedules, then reliability standards would be met in all regions of the NEM until later in the decade when more large thermal generators exit.

Expected unserved energy – additional anticipated and actionable developments



The full ESOO can be found [here](#)



LOCAL NEWS

NSW GOVT ANNOUNCES FUNDING FOR 1.75GW OF PUMPED HYDRO PROJECTS

By Laura Chung | 2 September 2022 | Source: [Sydney Morning Herald](#)

The state government will announce funding for five new pumped hydro schemes across NSW, from Illawarra to Bathurst and as far north as New England, as the national energy market operator issues a new warning that the state faces an energy shortfall.

Australian Energy Market Operator chief executive Daniel Westerman warned this week the current list of fully funded energy projects was insufficient to replace the forecast loss of coal power over the next decade as ageing power plants are closed on the east coast.

Treasurer and Minister for Energy Matt Kean will announce today that five pumped hydro projects will receive \$44.8 million to fund pre-investment work such as feasibility studies.

The approved projects are in Lithgow, Yetholme, Wollomombi, Bowral and Muswellbrook. If completed they would provide a combined capacity of 1.75 gigawatts. The state government has a target to build at least 2 gigawatts of new long-duration storage, which includes pumped hydro, by 2030.

Kean said if they proceeded to construction the projects would also create more than 2300 jobs and attract \$4.4 billion of private investment. "NSW has the most ambitious renewable energy policy in the nation, which is needed to replace ageing coal-fired power stations and build a clean energy future for NSW," he said.

Climate Council senior researcher Tim Baxter said the outlook highlighted the need for governments to deploy clean energy solutions and accelerate projects in the pipeline, including key energy storage projects like pumped hydro. "Pumped hydro, batteries and wind and solar have an essential role to play in ensuring the electricity grid into the future as the ageing and decrepit coal fleet comes offline . . . so that Australians can enjoy cheap, clean and reliable power," Baxter said.

Kean said pumped hydro is a key component of the state's renewable energy plans, providing clean, reliable power and creating infrastructure jobs across regional NSW.

Pumped hydro acts like a giant battery for the electricity system. It uses surplus renewable energy to pump water up a hill when it is sunny and windy, and releases the water back down the hill through giant turbines that create electricity when it is still and dark.

Baxter added the previous federal government had been lax in management of the national grid.

"Governments are getting their skates on . . . but there is not a lot of room for failure from here. We need to keep the pressure on state and federal governments to make sure they deliver according to their plans. Their plans are enough but there is a big difference between a plan and delivery," he said.



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Just months after the east coast electricity market shutdown, the power grid remains fragile. Wholesale power and gas prices have been trading at far higher than average levels amid a burst of cold weather driving up demand for heating, while a series of coal-fired power plant failures have forced gas-fired generators to fill the gap.

Energy experts say it highlights the need for diverse energy resources. Climate Energy Finance director Tim Buckley said this included investment in solar, windpumped hydro and other technologies. "The need for the energy transition is clear and necessary and economically logical," he said.

"The recent flooding in Pakistan underscores the science of climate change is real and accelerating and the cost of that is extreme."

TRAIL BLAZING COMMUNITY SOLAR AND BATTERY PROJECT PREPARES TO POWER UP

By Sophie Vorrath | 24 August 2022 | Source: [One Step Off the Grid](#)



One of Australia's first community-funded solar and battery storage projects, the Latitude Solar Farm, is complete and ready for energisation on the New South Wales Essential Energy grid.

The project, combining 4.99MW solar and a 4.99MW/11MWh lithium-ion battery storage system, is named for its location in Boggabilla, which lies at the same latitude as Byron Bay, but around six hours to the west.

Developed by Byron Bay Solar Farm Holdings, the project was first conceived in 2017, and has been realised through a combination of debt, state government grant funding and equity contributed by wholesale and sophisticated investors who live locally in regional NSW.

Project director Craig Johnston, himself a local Byron Shire resident, says the project is currently around one-third community owned. The \$3.5 million in grant funding was awarded through the NSW government's Regional Community Energy Fund.

As well as being one of the first community solar and battery projects to have been completed in Australia, the Latitude Solar Farm is also claiming to have delivered one of the first utility scale battery systems on the NSW Essential Energy network.



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"We're immensely proud of this project and thankful to Byron Shire community groups such as Zero Emissions Byron, Resilient Byron, Enova Community Energy and others for supporting this project," Johnston said in a statement this week.

"We're looking forward to delivering the benefits to regional NSW which include grid decarbonisation and improved grid stability."

Johnston says that with the completion of works on the Latitude Solar Farm, energisation of the project is now expected to take place on September 16, with the commissioning of its inverters set for October 5 and 6 by Essential Energy.

Following closely behind the Latitude project is the 4.99MW solar and 4.99MW/5.2MWh battery Orange Community Renewable Energy Park, being developed by ITP Renewables around 6km north-west of the town centre of Orange, also on the Essential Energy grid.

That project got the all-clear for construction in March of 2021 and then in November of the same year opened the door to investors from outside of the local community and allowing anyone in Australia to buy a stake.

The group behind the crowd-funding part of the Orange project, Energy Democracy's Central West NSW Co-operative, owns a 44% share in the solar farm that it bought with the help of grant funding, also from the NSW government's Regional Community Energy Fund.

LOCAL NEWS

AGL GOES OFF-NETWORK WITH SOLAR AND BATTERY MICROGRID FOR NSW ALMOND FARM

By Sophie Vorrath | 13 September 2022 | Source: [One Step Off The Grid](#)



Major Australian gen-tailer AGL Energy will partner with a fruit and tree nut farmer in the New South Wales Riverina region to shift the irrigation system of a commercial almond orchard from diesel power generators to a mix of solar and battery storage.

AGL says the microgrid, to be built on-site at Cadell Orchards' Sunraysia almond orchard, will combine a 4.9MW solar farm, a 4.4MWh battery system, underground powerlines, an inverter, grid stability unit and microgrid controller and communications.

The relatively newly planted 1,690-hectare almond orchard is not connected to the grid at its location outside of the town of Balraland, and so is irrigated with electric pumps that are currently powered by diesel generators.



The solar and battery microgrid is expected to reduce the orchard's reliance on diesel fuel by 85 per cent and slash its energy costs by up to 40 per cent a year, just as the orchard's trees start to reach maturity in the 2023/24 season.

In a statement to One Step Off The Grid on Tuesday, AGL said it was not yet releasing battery or solar vendor information, but could confirm that the microgrid would be designed around a single central solar inverter which would also run the DC coupled battery.

The gen-tailer says a grid stability unit will use a smaller, rapid-discharge battery to eliminate the need to have a diesel genset operating to provide spinning reserve and maintain system stability.



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AGL is not yet a major player in the renewable microgrid sector in Australia, but says the Cadell Orchards facility, which it modelled and designed around the farm's energy usage, is its second major microgrid announcement for 2022.

"AGL is committed to renewable energy and it's through partnerships like this that we're delivering on a low-carbon future with our customers and communities as we transition towards net-zero," said AGL chief customer officer Jo Egan.

"With enough renewable energy to power a small town, this new solar farm is the size of two MCGs and will help Cadell Orchards cut thousands of tonnes of CO2 emissions each year," Egan said.

AGL says the installation of the microgrid is due to start in April 2023 and should start to provide electricity by October 2023.

AGL will build, own, and operate the solar-powered microgrid under a long-term power purchase agreement, which will provide most of Cadell's electricity needs.

David Armstrong, the CEO of Australian Farming Services, which manages Cadell Orchards, says the microgrid is about sustainability, good economics and building energy resilience for the business.

"We manage more than 4,400 hectares and nearly 1.5 million trees in some of Australia's most productive horticultural regions," Armstrong said.

"Working with AGL, we'll be able to generate clean and renewable solar power which will cut our emissions, reduce our reliance on diesel fuel by 85 percent and deliver up to 40 per cent energy cost savings each year.

"Our orchard will also benefit from energy price certainty and better energy resilience and reliability."

LOCAL NEWS

WILL ALUMINIUM SULPHUR BATTERY WITH LOW TEMPERATURE MOLTEN ELECTROLYTE SOLVE THE LITHIUM SUPPLY CRISIS?

By Amalyah Hart | 1 September 2022 | Source: [Renew Economy](#)



The three primary constituents of the battery are aluminum (left), sulfur (center), and rock salt crystals (right). Image: Rebecca Miller

Researchers based out of MIT in the US say they've invented a new kind of battery, made from abundant and low-cost materials, that could compete with lithium-ion batteries and help plug the gaps caused by renewable intermittency.

The new battery uses the elements aluminium and sulphur as its two electrodes, with an electrolyte made of molten salt in between, and is described in a new paper by an international team of researchers in the journal Nature.

"I wanted to invent something that was better, much better, than lithium-ion batteries for small-scale stationary storage, and ultimately for automotive [uses]," explained Professor Donald Sadoway, Professor Emeritus of Materials Chemistry at MIT.

Lithium-ion batteries have been the problem child of the renewable sector. Lithium is particularly good at storing large amounts of energy, but it's expensive, because demand has rapidly outstripped supply in a decarbonising world. It's also comparatively rare, though it's mined in troves in places like Chile, China and here in Australia.

Lithium-ion batteries are also flammable, making them risky to transport. Then there's a whole host of problems with sustainability – lithium mining requires epic volumes of water, and waste chemicals produced during mining can pollute local waterways.

To circumvent the problem, Sadoway scoured the periodic table for cheap, abundant materials that could stand in for lithium in a new type of battery. Aluminium – the most abundant metal on Earth – fit the bill.

"So, I said, well, let's just make that a bookend. It's gonna be aluminium," he said.

The team paired aluminium with sulphur, one of the cheapest and most abundant non-metal elements, and sought a non-volatile compound for the electrolyte – the medium through which charge balancing positive ions can flow.



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The team didn't want to use the sorts of flammable organic liquids that can cause dangerous fires, so they looked at a variety of molten salts with low melting points – that's because, under low temperatures, a battery doesn't need special insulation.

"The ingredients are cheap, and the thing is safe – it cannot burn," Sadoway said.

Experiments showed that the battery could endure hundreds of cycles with high charging rates, but at low cost – the cell-level cost of the new battery is predicted to be less than one-sixth that of current lithium-ion batteries.

The team's aluminium-sulphur complex isn't the only alternative to lithium-ion batteries. In recent years researchers have explored batteries made of salt, magnesium, glass and various liquids.

This battery in particular carries an unexpected advantage: the chloro-aluminate salt actually prevents the formation of dendrites, narrow spikes of metal that build up on electrodes and can short circuit the battery.

"If we had started off with trying to prevent dendritic shorting, I'm not sure I would've known how to pursue that," Sadoway said. "I guess it was serendipity for us."

According to the team, this new style of battery – small and low-risk – would be ideal for powering a single home, a small to medium-sized business, or an electric vehicle charging station – though it may not be efficient for larger installations.

Sadoway and business partner Luis Ortiz have founded a new company, Avanti, which has licensed the patents for the system.

The research team included members from Peking University, Yunnan University and the Wuhan University of Technology, in China; the University of Louisville, in Kentucky; the University of Waterloo, in Canada; Oak Ridge National Laboratory, in Tennessee; and MIT. The work was supported by the MIT Energy Initiative, the MIT Deshpande Center for Technological Innovation, and ENN Group.

LOCAL NEWS

ESSENTIAL ENERGY TRIALS SOLID-STATE HYDROGEN STORAGE IN 100% RENEWABLE STAND ALONE SYSTEM

By Sophie Vorrath | 23 August 2022 | Source: [One Step Off the Grid](#)



A 100 per cent renewable stand-alone power system made up of solar PV and an innovative hydrogen storage solution is being trialled on the fringes of the Essential Energy grid, after being installed by Tempo Australia.

Tempo said on Monday that it had been awarded “Practical Completion” on the Stand-Alone Power Supply (SAPS), that includes the company’s greenHy2 system based on GKN hydrogen storage technology.

The heart of the system, installed in a remote location a three-hour drive north of Sydney, is solid-state metal hydride hydrogen storage that can store almost half a megawatt-hour of electricity and more than 40 days of forecast storage for the facility.

Essential Energy began investigating the use of SAPS – usually solar with battery storage and back-up diesel – on its New South Wales and south Queensland grid back in 2018, and then ramped up the process after the Black Summer of bushfires in 2019-20.

Originally, the distribution network company looked into SAPS as a way to provide temporary power while restoring poles and wires, but these days they are seen as a long-term off-grid power solution for customers whose properties are located on long powerlines, at the grid’s edge.

DNSPs like Essential Energy have come to recognise the many benefits SAPS offer over traditional poles and wires in some parts of the grid, including a more reliable and resilient supply for customers, less costly infrastructure maintenance, and reduced environmental impact.

Recent rule changes made by the Australian Energy Regulator aim to support networks in taking more customers “off-grid”, through a streamlined waiver process that weighs the risks to market competition against the benefits to consumers and the broader grid.

As noted above, SAPS rolled out to customers by network companies usually combine solar, battery storage and back-up diesel generators.

LOCAL NEWS

In this instance, however, Essential Energy is testing out hydrogen storage technology, and its potential eliminate the need for any back-up fossil fuels at all, by creating a reliable and 100% renewable energy supply.

The GKN developed technology uses a metal alloy powder from hydrides, compacted into high-density pellets, to create an efficient material to store hydrogen as a solid, rather than a gas.

Significant advantages of using metal-hydrides

HYDROGEN STORAGE BASED ON METAL-HYDRIDES

Metal powder
100% recyclable,
no hazardous elements



Pressed pellets
of metal hydride



H₂ storage
compact and safe



ADVANTAGES

Low pressure 10 - 40 bar @loading/ deloading

Low temperature 20°C - 60°C @loading/ deloading

Compact footprint – excellent energy density

Safe operation

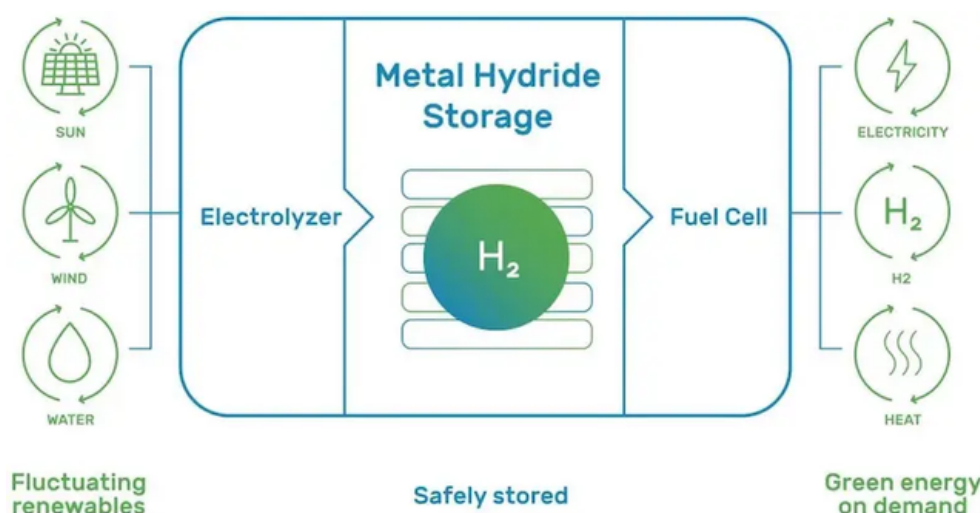
Self-retaining in case of vessel damage

Long-life high cycling capability

High H₂ purity → long life-time of fuel cells

Tempo says this method of storing hydrogen is considered the safest and most efficient available, enabling low pressure (max 40 Bar), ambient storage with a volumetric energy density far greater than that of lithium-Ion Batteries and compressed (liquid) Hydrogen at 700 Bar.

The storage is fed directly from a hydrogen electrolyser and, in turn, directly feeds a fuel cell, both without recompression, Tempo says.





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The companies say the system, which includes a state of the art digital monitoring and operating platform with detailed data analysis, will be monitored for performance over the coming year.

Tempo says the digital platform provides real time performance of the SAPS and includes artificial intelligence to optimise it over time.

ASX-listed Tempo, an engineering and construction contractor and asset manager, has been shifting its operations further into the renewable energy sphere since 2019, when it made a shaky start on its first solar farm project in Victoria.

Its website describes its metal hydride storage solution as “the most reliable and secure hydrogen storage solution on the market,” using components that are 100% recyclable, and offering a 15-plus year lifetime and minimal capacity loss.



LOCAL NEWS

ARE HYDROGEN TARGETS THE ANSWER FOR GAS NETWORKS?

By Graham Pearson | 25 August 2022 | Source: [Australian Energy Council](#)

Hydrogen continues to enjoy extraordinary political and business interest, with a spread of policies, plans and projects being announced to support commercial development of the industry.

Western Australia is leading the charge with the State Government exploring options to establish targets to support hydrogen blending in gas networks and introducing an obligation on electricity retailers to buy an amount of electricity sourced from renewable hydrogen – a Renewable Hydrogen Target. Below we take a look at what is currently being proposed and some of the challenges that need to be considered.

Background

WA released its Renewable Hydrogen Strategy in 2019 and updated it two years later. This laid out an ambition for the state to be a significant producer, exporter and user of renewable hydrogen. The state sees local advantages from its renewable energy resources, land availability, existing infrastructure and access to markets, particularly export markets. Amongst the goals of the strategy is approval of a project to export renewable hydrogen from WA and to blend up to 10 per cent renewable hydrogen into the gas network by 2030.

A key challenge to achieving these goals is the limited domestic demand for hydrogen and its high cost, which means it is not currently financially viable.

To deal with these challenges WA's Department of Jobs, Tourism, Science and Innovation (JTSI) and Energy Policy WA (EPWA) have been asked to consider two separate ways to stimulate renewable hydrogen demand. These are:

1. Explore policy options for hydrogen blending the gas network (JTSI).
2. Investigate an obligation on electricity retailers in WA's main grid, the South-West Interconnected System (SWIS), to buy a percentage of electricity fuelled by renewable hydrogen.

Hydrogen Blending Target

Earlier in the year, JTSI began considering options for achieving a hydrogen blending target, the implications of the target and how it could contribute to decarbonisation efforts. Options that are emerging include:

- Requiring government to buy a certain amount of hydrogen,
- requiring gas pipeline operators to procure a certain amount of hydrogen
- Creating certificates which liable entities are required to procure and then surrender to the regulator. Those liable entities could include gas retailers, gas generators, wholesale gas users, electricity retailers and electricity wholesale users.



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The next step is expected to be development of a policy framework.

Market participants have widely supported the Energy Transformation Strategy (“ETS”) and incurred costs and used substantial resources to implement the reforms. In this context, proper consideration should be given to the appropriateness of the electricity sector now being required to support the development of another sector and whether it is sensible for market participants to switch focus away from implementing the WEM reforms and being ready for the new market, to instead address the considerable challenges that the Renewable Hydrogen Target brings.

The AEC notes that JTSI & Energy Policy WA’s consultation did not expressly consider whether gas blending is technically feasible, the impact of gas blending on gas generators or how much hydrogen can safely and cost-effectively be put through a gas turbine.

Renewable Hydrogen Target

In May, the WA Government announced its intention to investigate a Renewable Hydrogen Target, the first of its kind in Australia, to help “drive local demand and assist emerging hydrogen production projects, which are essential to developing our hydrogen industry”.

The target would require energy retailers in the SWIS to buy a certain percentage of electricity from renewable hydrogen generation. EPWA has been tasked with undertaking the detailed design work for a target, “in consultation with industry and other stakeholders”. That work is expected to be finalised and taken to Cabinet late this year with the aim of having a target in place by 2024. This is a very ambitious timeline to design such a far-reaching policy and it seems unlikely that renewable projects would be operational to deliver hydrogen by the end of 2024 given the current timeframes to develop projects as well as existing transmission limitations.

The AEC believes WA’s approach would effectively see electricity retailers and, ultimately, their customers subsidise hydrogen projects that are unlikely to benefit them. These projects are more likely to be developed to service export markets.

Most significantly, the Renewable Hydrogen Target is being progressed at pace and without a detailed cost benefit analysis undertaken to consider whether the benefits outweigh the costs to consumers.

There needs to be merit for such a target and a cost benefit analysis should be undertaken to consider the supply chain costs, the costs of storing and transporting hydrogen, the cost of augmenting existing generators (that are not designed to operate with hydrogen as a fuel) as well as the costs to market participants.

Current Cost Assessments

As we have noted in a recent discussion paper on hydrogen it requires multiple processes: production, compression, storage, transport and use in generators and other industrial processes and each of these stages is challenging.

Independent reviews of the cost of producing, compressing and storing hydrogen vary, as is common for an emerging technology. There is wide diversity in what is considered the most efficient technique for storage. Cost effective storage of pure hydrogen is technically challenging and energy intensive.

LOCAL NEWS

The subject of the actual versus potential costs of hydrogen production remains highly speculative, and estimates vary for current costs let alone future costs. The Australian Renewable Energy Agency has estimated the potential cost of hydrogen to be \$18.70/kg, falling to \$11.30/kg if batteries were integrated in the process.

It is important to note that the conversion rate when being blended into natural gas is \$8/KG. Therefore, when determining the input cost for hydrogen in the gas market, these numbers must be multiplied by a factor of 8.

The new Hysata electrolyser design is claimed to operate at a much higher efficiency than other technologies (98 per cent compared to 64 per cent). If replicable at scale, then this offers scope for lower costs.

Analysis prepared for the International Council on Clean Transportation estimated the current and future cost of hydrogen production ranged from between \$10/kg and \$32/kg now and \$7/kg to \$19/kg by 2050².

The International Renewable Energy Agency (IRENA) produced a report in 2020 suggesting the cost to make green hydrogen could currently be between \$4.50 and \$9/kg³, but these costs could fall further. The International Energy Agency has also assessed the costs for production of green hydrogen.

Cost to Consumers

The Renewable Hydrogen Target would impose additional costs on electricity consumers at a time when they are facing higher costs from Western Power's Access Arrangements proposal and big increases in the market operator's fees. In fact the **WA Economic Regulation Authority** has already flagged that the pass through of these increases "will be particularly acute, given current cost of living pressures experienced by consumers".

The use of hydrogen in generation is still an area for development. While hydrogen generation projects have been proposed since 2018, to date they have so far tended to stall between announcement and delivery. Solutions to the technical challenges of using hydrogen in generation continue to be explored.

While manufacturers have developed turbines that can withstand a blend of hydrogen and natural gas for generation, the level of hydrogen in the mix remains relatively low.

According to a Hydrogen Council report, baseload supply hydrogen will only be relevant in "regions constrained in renewables potential and situations where alternatives like fossil fuels with direct CCS or biomass ... are not an option". To refit existing gas generators, if achievable, would involve considerable reconfiguration of many elements of a plant.

Support mechanisms

There is widespread support for the hydrogen to succeed as it has the potential to play an important role in decarbonisation. Progress on hydrogen technologies is being made, but there is still uncertainty in key parts of the supply chain over optimal technology (for electrolysers), costs and applications.



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There is a role for government to support emerging technologies and there are a number of mechanisms by which this can be achieved, rather than via a subsidy from the electricity sector and end users to another industry.

The best, most cost-effective way to support hydrogen needs to be carefully considered. The AEC has long argued the best way to encourage the entry of new technology into the SWIS is through market mechanisms in the WEM, such as its reserve capacity mechanism, essential system service markets and the energy market, instead of subsidies from the energy sector that are passed on to consumers who are unlikely to directly benefit.

Additionally, it is unclear why hydrogen is preferred for subsidisation over other emerging and required technologies, such as dispatchable long duration battery storage, which will be needed to support the energy transition and are not commercially viable based on the existing revenue streams in the WEM.

The AEC encourages Energy Policy WA to undertake a thorough review of the merits of a Renewable Hydrogen Target and assess if there is sufficient cost benefit to warrant it being progressed further.



LOCAL NEWS

WHY HYDROGEN IN THE GAS GRID IS NOT A GOOD IDEA

By Tim Forcey | 24 August 2022 | Source: [Renew Economy](#)



Previously I've written how blending hydrogen into the fossil gas grid is being used as a "Trojan horse" by Australia's incumbent and foreign-owned gas distributors in order to sustain their business-as-usual.

Worryingly, in their recently-released Gas Substitution Roadmap, the Victorian government is inviting that Trojan horse into Victoria.

I worry because overseas, detailed analysis warns that forcing hydrogen into the gas grid is another delay tactic, a diversion, distracting us from investing in real climate solutions like electrifying our homes.

Friendly plumbers – no body armour required

Recently in Albury (NSW), I was invited to present on electrifying (getting the gas out of) Victorian homes to an unlikely audience: the Plumbing Sheetmetal Coopersmith Instructors Association (PSCIA), aka the people that train the plumbers. I thank them for the opportunity.

The organisers were wise enough to see that the all-electric home is now a popular thing in Australia. It's a topic appearing more and more in mainstream news articles. PSCIA members were keen to figure out what plumbing trainees might need to know about this growing trend.

Worryingly, the PSCIA conference organisers warned me I had about as much chance as Ned Kelly of leaving that part of the world in one piece, were I to declare that the practice of piping gas into homes was past its use-by date.

But it turned out I had no need for Ned's sheet-metal body armour. My talks were well received by the plumbing types.

One fellow came up to tell me that although he may still teach plumbers how to pipe gas, he'd have none of that in the new home he'd just built. "All-electric is the way to go." Another encouraged me to listen to a UK heat pump podcast.

The gas can go – but the sewerage stays

It's not as if the all-electric home needs no plumbers. As we see again and again amongst our 65,000 members at My Efficient Electric Home, we desperately need plumbers to become more familiar with hot water heat pumps.

Some plumbing trainees will go on to work with space heating and cooling heat pumps too (i.e. reverse-cycle air conditioning). And the all-electric home will need just as much plumbing expertise to manage rainwater, potable water and sewerage as any other home.



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So it's only the fossil gas that can get in the bin.

At the conclusion of my talks, there was robust Q&A about issues such as the impact of home electrification on the electricity grid, with the AEMO electricity market shutdown front-of-mind.

But there was also recognition of the inflationary impact on eastern Australian gas prices caused by seven years of Queensland Liquefied Natural Gas (LNG) exports, by the continuing step-down of Bass Strait gas output and, more recently, by the Russia-Ukraine conflict.

And there was recognition that heat pumps can provide space and water heating far more cheaply than gas, and that contrary to what can be done with a reverse-cycle air con, you can't cool your house in summer with a gas heater!

Pushback?

I was expecting more pushback. Finally I did get some from, of all places, a representative of an energy-safety regulatory body who seemed to be in favour of continuing the practice of piping hazardous chemicals into millions of Australian homes.

The case was made by the safety rep that we shouldn't rush to electrify homes, but rather should offer households "choice". He seemed to say we should look forward to the day when expensive and maybe even renewable hydrogen would replace fossil methane in the (largely foreign-owned) eastern Australian gas distribution networks.

Burning attraction

Since I am a bit slow, the irony dawned on me only later: A safety regulator seeming to advocate for the use of hazardous chemicals in our Australian homes – fossil gas today and hydrogen tomorrow – where said chemical is then burned and chemically reacted to form a range of other hazardous and harmful compounds that permeate throughout our homes.

Problems such as gas cooktops producing nitrous oxides that contribute to childhood asthma don't go away if the fuel is switched from methane to hydrogen. Nor does the explosion and fire risk, because for sure like methane, hydrogen also burns and can explode.

In fact, mixing hydrogen with methane and then sending it to your cooktop can enhance the creation of carbon monoxide right there in your kitchen. The new hydrogen safety advice will have to include opening a window when slaving over the spag bol!

Hydrogen in the gas grid: A "suboptimal pathway"

But here's a problem. Hydrogen in the gas grid is no climate solution. In fact, any time, and money spent by policy makers, technologists, economists, regulators, and others assisting the gas industry to get hydrogen into eastern Australian gas grids is a total waste.

Why do I think this? Or to paraphrase the President of France, why do I know this?



LOCAL NEWS

Because in Germany, they've actually had a look at the issues around putting hydrogen into European gas grids and they've declared it's all a waste.

In their recent report "The Limitations of Hydrogen in the European Gas Grid", the Fraunhofer Institute for Energy Economics and Energy System Technology ensures us that hydrogen will play a role, if a limited one, in our future carbon-free economies where it will displace "grey hydrogen in industry and shipping".

But hydrogen won't be widely used in gas grids. Fraunhofer warns that "blending green hydrogen into the grid indiscriminately... risks 'wasting' hydrogen by having it deployed to sectors like heating where more efficient and cost-effective solutions such as direct electrification using heat pumps are possible". In this, Fraunhofer is only restating some fairly obvious techno-economics previously published also by Australia's CSIRO.

Fraunhofer reminds us that there are greater greenhouse gas savings to be had by using green hydrogen where it makes sense (e.g. in industry and for shipping) rather than for indiscriminate use via a widespread gas grid connecting to our homes.

Intergalactic hydrogen (price)

With respect to quantitative costs and economics, Fraunhofer finds that adaptation measures for blending into the gas grid even at small levels of hydrogen (~ 7% based on energy content) will increase fuel prices for households by up to 16% and for industrial users by up to 43%.

In other words, if you run a gas-consuming business, and you want to see your gaseous fuel costs skyrocket even higher, right out of the galaxy, blend in a little hydrogen.

Fraunhofer concludes, "blending [hydrogen into the gas grid], even at low percentages, constitutes a sub-optimal pathway for the deployment of hydrogen and should be avoided..."

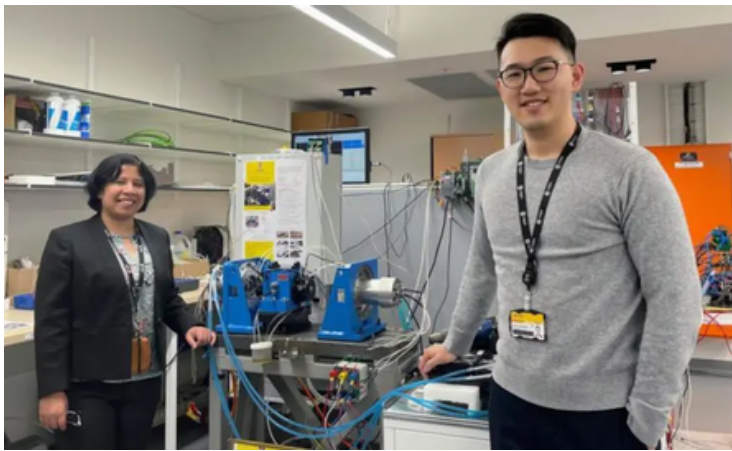
The PSCIA people that I met – the people that train our plumbers – they understand we have no need for hydrogen in homes. It's unfortunate that, so far, our governments and regulatory bodies do not.

Tim Forcey is an independent energy researcher and commentator.

EV NEWS

UNSW RESEARCHERS DEVELOP “VERY FAST” HIGH SPEED MOTOR THAT COULD BOOST EV RANGE

By Joshua S. Hill | 13 September 2022 | Source: [The Driven](#)



A group of researchers from the University of New South Wales (UNSW) Sydney have taken inspiration from a bridge in South Korea to develop a new magnetically driven “very-high-speed” motor which significantly reduces the use of rare earth materials and delivers improved power density.

Engineers from UNSW Sydney have designed and built a new high-speed motor which they say has the potential to increase the range of electric vehicles while simultaneously reduce the amount of rare earth materials needed.

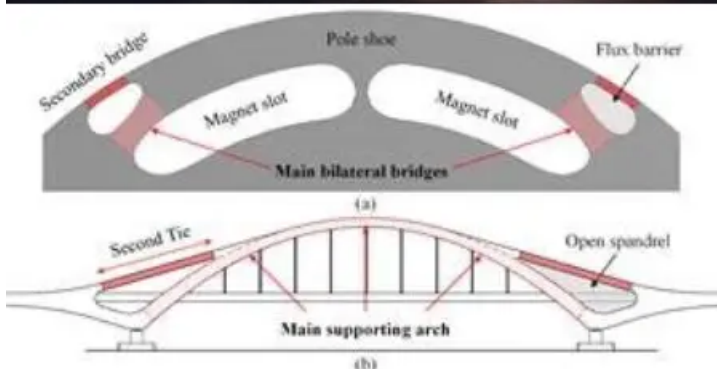
The new Interior Permanent Magnet Synchronous Machine Motor (IPMSM) was inspired by the shape and engineering properties of the Gyopo rail bridge, the longest railroad bridge in South Korea.



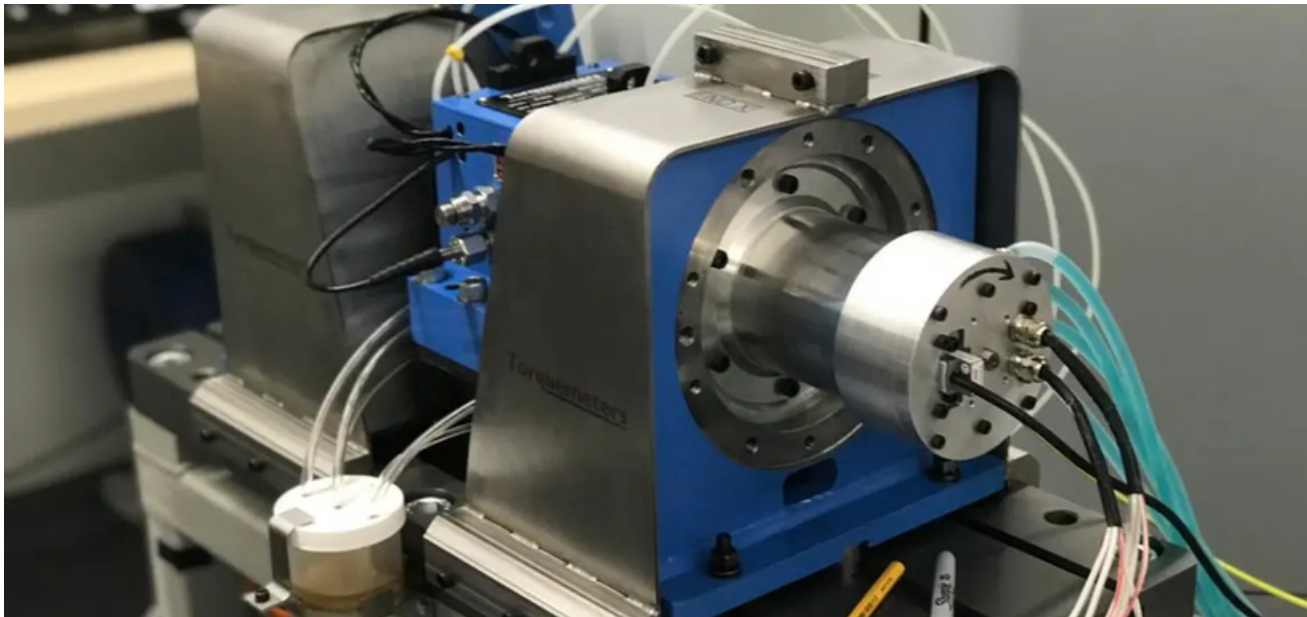
An IPMSM type motor uses magnets embedded within its rotors to create strong torque for an extended speed range, but existing IPMSMs suffer from low mechanical strength due to thin iron bridge in their rotors, which in turn limit their maximum speed.

These limitations have been overcome, however, by the research accomplished by the UNSW team, who developed and patented a new rotor topology which significantly improves robustness while also reducing the amount of rare earth materials per unit of power production.

According to the UNSW engineers, their new IPMSM type motor has already achieved speeds of 100,000 revolutions per minute, successfully exceeding and in fact doubling the existing high-speed record of laminated IPMSMs, making it the world's fastest IPMSM ever built with commercialised lamination materials.



EV NEWS



More importantly, however, is the fact that the new IPMSM is able to produce a very high power density, potentially helping to reduce overall weight in electric vehicles (EVs) and therefore increasing the range of an EV.

“One of the trends for electric vehicles is for them to have motors which rotate at higher speeds,” said Dr Guoyu Chu, from the UNSW School of Electrical Engineering and Telecommunications who, along with Associate Professor Rukmi Dutta, led the team which developed the new IPMSM.

“Every EV manufacturer is trying to develop high-speed motors and the reason is that the nature of the law of physics then allows you to shrink the size of that machine. And with a smaller machine, it weighs less and consumes less energy and therefore that gives the vehicle a longer range.

“With this research project we have tried to achieve the absolute maximum speed, and we have recorded over 100,000 revolutions per minute and the peak power density is around 7kW per kilogram.

“For an electric vehicle motor we would actually reduce the speed somewhat, but that also increases its power. We can scale and optimise to provide power and speed in a given range – for example, a 200kW motor with a maximum speed of around 18,000 rpm that perfectly suits EV applications.”

The development of this new motor could also lead to immediate benefits for the EV industry, according to Chu.

“If an electric vehicle manufacturer, like Tesla, wanted to use this motor then I believe it would only take around six to 12 months to modify it based on their specifications.

“We have our own machine design software package where we can input the requirements of speed, or power density and run the system for a couple of weeks and it gives us the optimum design that satisfies those needs.”

EV NEWS

MID SPEC VW ID.4 ELECTRIC SUVs ARRIVE IN AUSTRALIA

By Bridie Schmidt | 1 September 2022 | Source: [The Driven](#)



Two VW ID.4s are on the ground in Zetland, in Sydney, as the German carmaker prepares for its introduction to the local market in October.

The vehicles have been spotted being prepped by the Volkswagen Group Australia (VGA), and a spokesperson for the group has confirmed with [The Driven](#) that the vehicles are here for media and customer test drives.

The all-electric SUV will be VGA's second all-electric vehicle to become available to Australian drivers, following hot on the heels of the edgy Cupra Born hatchback which was [on show in Sydney at the subsidiary brand's showroom launch in July](#).



One blue and one white ID.4 have been brought into the country, with new photos shared with [The Driven](#) showing the blue ID.4 being "booted up" in preparation for its introduction to customers and reviewers.

VW ID.4 Pro confirmed

Notably, the images of the blue ID.4 show the vehicle is a mid-spec Pro variant. While local specifications and pricing have not yet been shared by VGA, the overseas spec ID.4 Pro comes with a 150kW motor, 310Nm torque with acceleration from 0-100/hr in 8.5 seconds.

Powering the ID.4 Pro is an 82kWh battery, which means it will have similar specs to the Cupra Born in terms of range. with an additional 20kWh on top of the ID.4 Pure, the Pro is rated in the US for 450km driving range, and in Europe for 522km WLTP (the former figure being more indicative of real world range.)

Importantly, it can also charge at a rate of 170kW as opposed to the entry-level ID.4 which charges at a top rate of 110kW. On an AC charger is also does better than the entry-level Pure, with a top rate of 11kW compared to just 7.2kW.



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Arrival of Volkswagen ID.4 a milestone

The vehicles' presence is something of a milestone for the German carmaker, which repudiated the former LNP federal government's stance on electric vehicles, which is to say it had none.

In 2021, then VGA boss Michael Bartsch took aim at Australia's persistence in ignoring the potential of electric vehicles to help reduce carbon emissions, calling the country an "automotive third world."

But the change to a Labor government in May has seen a full turnaround for EVs in Australia. This has included the first ever Electric Vehicle Summit, the slashing of fringe benefits and import tax and finally, [fuel emissions standards are on the table for discussion](#).

Importantly, current VGA boss Paul Sansom [said at the recent Electric Vehicle Summit in Canberra](#) that "If we had standards today, we could start bringing in (electric cars) tomorrow."

It all bodes very well for Australian drivers, who are set to benefit from more choice on the local EV market.

Still working on bringing forward production date

But for some, perhaps not soon enough. Production for Australia for the ID.4, which is [set to arrive alongside the ID.5](#) before the group introduces the ID.3 hatch towards or after the end of 2024, is still earmarked for October 2023.

However, VGA says it is still working on moving the production date forwards for the ID.4,

"Start of Australian production is scheduled for Q4 2023," VGA's spokesperson said. "It is Volkswagen's intention to bring that forward to mid-year so that the cars are in showrooms in some 13-14 months from now."

How much the ID.4 will cost though is also still an unknown. The Cupra Born – which likewise will first only be available with a large battery option – is likely to come in around the \$60,000 mark, and the Spanish-based brand positions itself somewhere between premium and volume segments.

While the ID.4 falls in Volkswagen's "mass-market" branding, it is larger than the Cupra Born, and will command a price in line with this.

EV NEWS

EV CHARGERS TO BE MOUNTED ON POWER POLES TO HELP HOUSEHOLDS WITH NO PARKING

By Joshua S. Hill | 30 August 2022 | Source: [The Driven](#)

(Editor's Note: It is puzzling that this article makes no mention of a very critical stakeholder in this commendable initiative, namely the local network operator!)



The Australian Renewable Energy Agency (ARENA) has announced funding for a trial that will seek fifty street-side EV chargers installed on power poles, to assist people living in apartments and units with no off street parking.

According to project leader Intellihub, there is potential for 190,000 street-side chargers in Australia, given that one in four households in the country do not have off street parking. This trial will test the regulatory issues, and grid implications of having up to 1,4500MW of controllable load.

ARENA has committed \$871,000 to the \$2 million project by Intellihub, which will provide street side charging options across nine local government areas in New South Wales. Each charger – rated at 7.4kW – is said to be enough to service the needs of 10 households without home charging facilities.

Intellihub will be supported in the deployment by Schneider Electric who will provide the EV charging infrastructure – which will allow both for top-ups as well as overnight charging – and EVSE who will be managing the charging service.



EV NEWS

Australian utility Origin Energy is also backing the project and will supply 100% renewable power for the EV chargers through matched renewable energy certificates.

The nine NSW councils taking part in the project include Waverley, Woollahra, Randwick, Lake Macquarie, Ryde, Singleton, Parramatta, Northern Beaches, and the Inner West.

“Not all electric vehicle owners have the ability to charge their vehicle at home, which is why we’re excited to partner with Intellihub on this trial that utilises street side power poles, providing a great opportunity to pair with EV charging,” said Darren Miller, ARENA CEO.

“We look forward to seeing the results of the trial from Intellihub and hope to see it rolled out right across Australia.”

Intellihub CEO Wes Ballantine said there are power poles in most public streets, and that presents an opportunity for the EV charging market. “They’re an accessible, safe, and practical option for EV charging,” he said.

Solving the problem of accessible EV charging for inner-city and residential dwellings without driveways – not to mention simply allocating enough space in cities for top-up charging – has been ongoing for some time now, with a number of innovative options being toyed with around the globe.

Maybe the best-known solution we’ve covered is the integration of EV charging stations into lampposts in the UK, a long-term development which has seen continued funding and deployment in both 2019 and 2020.

In 2021, British-Dutch oil and gas supermajor Shell acquired Ubitricity, a leading European on-street charging provider and the largest charging network in the United Kingdom – further proof of the importance of on-street charging.

Ubitricity particularly has made a name for itself by working with local authorities to integrate public EV charging points into existing street infrastructure such as lampposts and bollards.

Meanwhile, the search for more innovative on-street charging has led to the development of EV charging technologies such as pop-up charging designed by UK-based Urban Electric Networks, and the fabled inductive EV charging which requires only that a car pull up over a particular patch of pavement.

Another British pioneer of on-street EV residential charging, Char.gy, began a “world-first” public EV inductive charging trial that will complement the company’s lamp post-embedded EV charging stations in late-2021.



EV NEWS

WHY UTE LOVING AUSSIES ARE FINALLY DEMANDING ELECTRIC CARS

By Tony Davis | 27 August 2022 | Source: [Sydney Morning Herald](#)

Australia has lagged behind much of the developed world in its uptake of electric cars. Now – for more reasons than soaring petrol prices – we’re flicking the switch.

Anne Matheson is sitting in her home office in the northern suburbs of Sydney, hands nervously hovering over her keyboard, waiting for the clock to tick over to 1pm. It’s May 18, 2022, and the former marketing and finance executive, who is 60, has been rehearsing for this moment, working out how to use as few keystrokes as possible. She has to click through to the “pay deposit now” box as quickly as she can.

Matheson is trying to buy an electric vehicle (EV), specifically, a Hyundai Ioniq 5. Before the pandemic, many EVs were being quietly discounted due to lack of interest; now they’re the hottest ticket in town. “They sent me all these emails ... saying a new batch is going on sale,” she tells me. But Matheson realises she is not live (“I must have started a fraction too early”), and has to start again.

As Matheson taps away, Andrew Stamatakis, head of Hyundai Motor Company Australia’s Direct to Consumer division, watches wide-eyed from head office in Macquarie Park, in north-western Sydney. The retail and e-commerce veteran can’t see names or locations on his screen, but can see that there are 4500 people frantically competing for just 68 cars. Every time he hits refresh, another seven or eight have been sold.

“The only thing that would come close,” he says afterwards, “is when I was working at Dick Smith when PlayStation 4 came out [in late 2013]. That volume was incredible. But this is different, we’re talking about an \$80,000 car – not a \$500 console.”

Matheson is keen to do the right thing – she also volunteers for green causes – but wants an EV that is desirable in its own right, a sporty car with style. So she races through the configurator again. Each time she adds an option, it calculates the cost, and takes what seems like a very long time. When she gets to the point of confirming the purchase, it tells her nothing is available. Only a couple of minutes has elapsed.



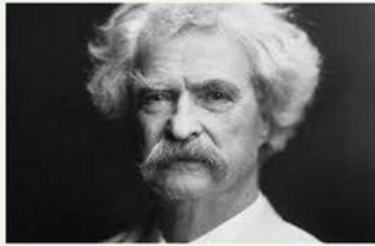
The Hyundai Ioniq 5 production line in South Korea. In May, 4500 Australians competed to buy 68 of the \$80,000 cars. They sold out in minutes.

Australia is seeing a dramatic upswing in interest in electric cars, influenced by state subsidies, improving technology, new models, rising fuel prices and a federal government finally prepared to give a helping hand (albeit a modest one; it has introduced legislation to abolish the 5 per cent import duty on some EVs, to lift the fringe benefits tax, and to spend \$500 million on expanding the charging network. Last week it outlined a plan to work with the states to harmonise EV incentives and policies). But this is happening when EV supply is tighter than ever.

To read the full article go [here](#).

HUMOUR BREAK

MARK TWAIN - THE MASTER HUMORIST

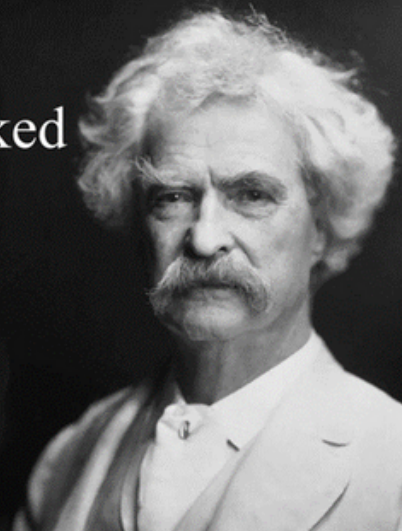


If you don't read the newspaper, you're uninformed. If you read the newspaper, you're misinformed.

- Mark Twain

Clothes make the man. Naked people have little or no influence on society.

Mark Twain



INTERNATIONAL NEWS

HARNESSING DATA FOR UTILITY-SCALE BATTERY ENERGY STORAGE OPERATION AND MAINTENANCE

By Caleb Cooper, Steve Willard | September 2022 | Source: [T&D World](#)



As electric grids become more and more dependent on battery energy storage systems (BESS), access to appropriate levels of data will be imperative.

This is the second piece in a three-part series exploring predictive maintenance of grid-scale operational battery energy storage systems for improved safety and operation. The first article can be found [here](#).

Battery energy storage systems (BESS) are an increasingly popular grid resource, which could provide more resilient, reliable energy systems. While relatively new technology, BESS systems are expected to continue to grow in scale and volume as society continues its global clean energy transition.

One of the most significant challenges facing BESS systems is how to ensure high reliability and operational safety. Having accurate, robust data is paramount to improving standard practice for BESS operation and maintenance. Sufficient BESS data may offer the ability for not only increased system-wide performance but may also aid in predictive efforts for safety, operations, and preventative maintenance. While storage performance standards are still evolving, uniformity in what data available, collected, and used may help ensure BESS meet the ever-growing storage needs of the utility market.

Currently available energy storage systems offer a wide range of data accessibility. For example, some systems only provide inverter AC-level information to the end user. These sparse datasets can allow for integration of BESS but also pose challenges when it comes to longer-term reliability and emerging operation and maintenance practices. Alternatively, some systems present robust and granular datasets, offering insight into system behavior which can alert operators to potential hazards and facilitate targeted service or investigation. The research team at Electric Power Research Institute (EPRI) has analyzed data from both robust and sparse data fielded systems, working with numerous energy companies including Arizona company Salt River Project (SRP) as part of the Energy Storage Performance and Reliability Foresight project.



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In a statement, SRP explained, “SRPs generation fleet includes one 25MW/100MWhr battery and two 10MW/40MWhr batteries. Peak shaving and energy arbitrage are the core functions of these batteries in our system. The advanced controls and data collection offered from the integration of the 25MW/100MWhr battery has given SRP the invaluable opportunity to analyze utility to battery control interactions, as well as battery performance. The Energy Storage Performance and Reliability Foresight project has allowed SRP to enhance its portfolio of battery analytics using site level and module level data, which allows for greater insight into battery performance.”

Systems offering more robust data present greater opportunities to analyze performance and derive best operational practices. In 2017, a two enclosure, 1 MW, 2MWh BESS site was deployed, testing a variety of applications. In this robust data system, visibility was available down to the DC cell-level, with 2380 cells per enclosure and refresh rates of 6 seconds, allowing application of sophisticated analysis techniques. Access to this robust data led to more in-depth findings.

A core metric which arose from this data analysis was the measured standby loss — the percentage of state-of-charge lost in a given period without any power flow in or out of the battery system. A portion of these losses can be attributed to parasitic loads, such as the thermal management system (for a BESS, not using auxiliary supplies), control power, and cell balancing. At this site, standby losses were measured from 2017 to 2021, as shown in Figure 1. Evidently, the distribution over average daily standby loss was bimodal, with “low,” and relatively “high” loss days.

With the robust dataset available, it was possible to retrospectively evaluate information at the cell level in each storage system container once the system operator realized these losses may be an indication on abnormal behavior. Figures 2 and 3 show the standby losses correlated with cell balancing on “low” and “high” loss days, respectively. On days with high losses, rack level balancing was observed and strongly linked to periods of major State of Charge (SOC) decline without any power flow in or out of the BESS.

Low loss days exhibited no notable cell balancing, highlighting that the parasitic loads responsible for high standby losses were attributed to internal balancing; high energy cells discharged into the low energy cells to narrow the SOC distribution on the cell level. Uniformly balanced cells are critical to ensuring maximum system performance with minimal degradation.

Frequent, and power-intensive, cell balancing could be indicative of cell or module level defects, imbalances, potential safety hazards in an early stage, or otherwise dysfunctional equipment. The high standby loss metric provides evidentiary value to a system owner to trigger maintenance and investigation before more serious symptoms or issues develop. Without the data to signal maintenance, or without sufficient granularity, issues like this may fly under the radar until they give off serious alarm at the system level — and when preventative maintenance and intervention is no longer feasible.

In addition to a robust electrical data for this system, module temperatures were available for analysis, as seen in Figure 4. Temperature deviations within individual containers of identical design varied and indicated problems with the thermal management system in Container 1. With the ability to track module temperatures across the enclosure, the HVAC system was able to be effectively modified and augmented to increase temperature uniformity. Without access to this level of individual module temperature, the lack of uniformity would not provide insight for needed temperature distribution improvement. Access to this level of data also provides opportunities for long-term health tracking, preventative maintenance and upgrades, and prolonged life.



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As BESS installations grow and serve an increasingly critical role in utility operations, access to appropriate levels of BESS data will be needed to ensure performance expectations. The intricacies of BESS equipment present a challenge not only in terms of allowing independent performance analysis but also in terms of defining best operational practices. Traditional utility-based, routine, walk-through maintenance schedules need to be tuned to these new BESS assets. Increasing owner and operator data visibility can allow for a targeted approach for large scale O&M and efficient performance, as well as insight to degradation and problems that need to be addressed before they hinder operation.

EPRI's Energy Storage Integration Council has generated numerous tools to aid understanding storage specifications, data guides, as well as operational reporting, including: Electrical Energy Storage Data Submission Guidelines, Version 2, Energy Storage Operations and Maintenance Tracker, Summary of Energy Storage Control Performance Metrics, and ESIC Energy Storage Technical Specification Template, version 3.0.

INTERNATIONAL NEWS

DOES THE U.S. NEED A NATIONAL DER INTEGRATION INITIATIVE?

By Jennifer Runyon | September 2022 | Source: [Power Grid International](#)



Image by Colin McKay from Pixabay

Better integration of distributed energy resources into the electricity system can increase demand flexibility, increase consumer choice, accelerate innovation, and enhance the grid's reliability and resilience, new reports say.

Distributed Energy Resources (DER) could play an important role in decarbonizing the grid. If we doubled, tripled, or even put 10X the number of solar PV systems, batteries, and bi-directional EV chargers on the grid and were able to tap them for the energy they create (PV) and store (batteries and EVs), we could go a long way toward a grid powered by more clean energy.

That's the takeaway from the Energy Systems Integration Group (ESIG), which released two new reports on September 7 addressing the integration of DER into the electricity system.

DER can provide a wide range of benefits to the U.S. electricity system and its customers. They can increase the flexibility of the demand side (an important element of a system with rising levels of variable renewable generation); help to lower emissions; increase consumer choice, competition, and rapid innovation; and enhance the reliability and resilience of the grid. However, realizing these benefits will require integrating DER into electricity system planning processes, markets, and regulatory processes.

UK and Australia

One report, *Lessons Learned for the U.S. Context: An Assessment of UK and Australian Open Networks Initiatives*, assesses DER integration initiatives in Australia and the UK. The report details two international initiatives, the UK Open Networks Project and the Australian OpEN Project and offers insights that would be instructive for the development of a national initiative around DER integration in the United States, according to ESIG.



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Takeaways from the UK initiative include eight key functions of a distribution system operator (DSO) and a roadmap for the evolution from traditional network operation to new DSO functions.

Australia's OpEN project was created as a result of Australia's already DER-heavy distribution system. The three-year program identified least-regrets actions that distribution network service providers need to implement: to define network visibility requirements and constraints for DERs exporting power to the distribution system, create industry guidelines for DER operating envelopes for export limits, and develop communication requirements for dynamic DER operation.

"The UK and Australian initiatives demonstrate that multi-stakeholder conversations are very important for addressing near-term, least-regrets strategies while developing a vision of long-term challenges," said Priya Sreedharan of GridLab and the task force chair. "A national-level DER integration initiative in the United States can learn from their experiences, developing consensus strategies that can be adapted to local conditions and tackling a range of technical challenges from operations to planning, interconnection, and data access."

U.S. transition plan

The second report, *The Transition to a High-DER Electricity System: Creating a National Initiative on DER Integration for the United States*, proposes a comprehensive, national initiative to develop greater consistency and consensus around DER integration in the United States.

The report suggests that to create an initiative around DER integration, the U.S. needs first a set of common concepts and vocabulary, then more standardized solutions to nearer-term DER integration challenges in order to support FERC Order 2222 implementation, and finally, more alignment across the industry on how to resolve longer-term challenges.

The goals of a U.S. national initiative on DER integration could include:

1. creating consistency in terminology, concepts, and vision around distribution planning and operations, DER interconnection, data access and communication, utility regulation and tariffs, and markets;
2. defining nearer-term, least-regrets strategies for expanding functionality and operational capabilities on the distribution system; and
3. advancing structured dialogue on longer-term issues.

DER integration series

The two new ESIG reports make up the second and third reports in the series on DER integration, building on the first report, *DER Integration into Wholesale Markets and Operations*.

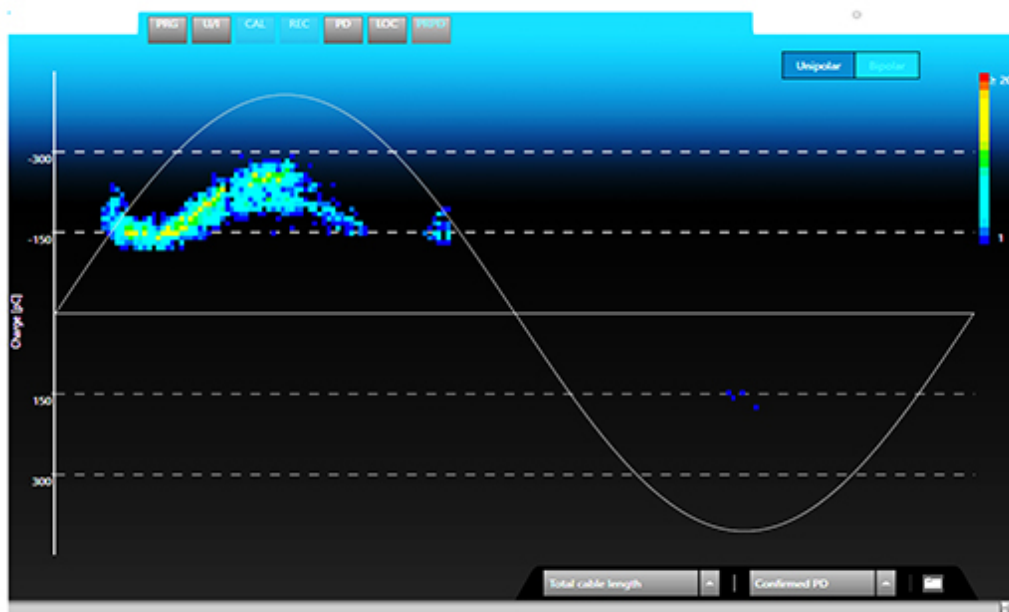
"DER have tremendous potential to help decarbonize the grid," said Debra Lew, associate director of ESIG. "But unleashing that potential will be difficult if every jurisdiction has to reinvent the wheel in terms of coordinating planning and operations and establishing frameworks and practices."

DER for Flexibility and Resilience is a new educational track for DISTRIBUTECH International 2023, coming to San Diego, California, February 7-9.

INTERNATIONAL NEWS

INCREASING CONFIDENCE IN MV CABLE DIAGNOSTICS

09 September 2022 | Source: [INMR](#)



Cable diagnostics has proven the only way to fully understand the condition of an underground medium voltage cable network. For example, application of VLF (Very Low Frequency) ramp-up diagnostics can be used for cable condition assessment. Voltage levels starting from $0.5 \times U_0$ to maximum $1.7 \times U_0$ (U_0 being defined as phase-to-ground voltage) are sufficient for comprehensive condition assessment while avoiding risk of insulation overstress during testing.

New installation

- Before commissioning
- Quality test – warranty
- Assurance that all cable accessories have been properly installed



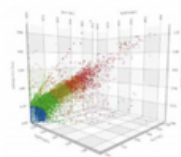
Repairs

- After repairs
- Quality assurance
- Assurance that the repairs have been carried out properly



Regular inspection

- Condition detection
- Categorisation of the cable condition
- Early detection of weak points
- Trend analysis



Cable diagnostics with VLF TanDelta (VLF TD) and VLF Partial Discharge (VLF PD) can be conducted at the same time in a single sequence (VLF TD//PD parallel). For maintenance tests, such as often conducted after repairs and sectional cable replacements, ramp up application is followed by a $2.0 \times U_0$ Monitored Withstand Test. For new installations, a commissioning test (also called an acceptance test) is conducted.

Fig. 1: Application of VLF TD//PD and VLF FULL MWT.

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Fig. 2: Sequence of parallel VLF TD and VLF PD diagnostics.

To verify quality of newly laid cables, including newly installed accessories such as joints and terminations, a ramp up diagnostic sequence is followed by a $3.0 \times U_0$ Monitored Withstand Test (MWT). It is recommended that the MWT is covering the TD loss factor measurement as well as the PD Partial Discharge measurement during the testing period (FULL MWT). Depending on cable condition, test duration can be optimized.

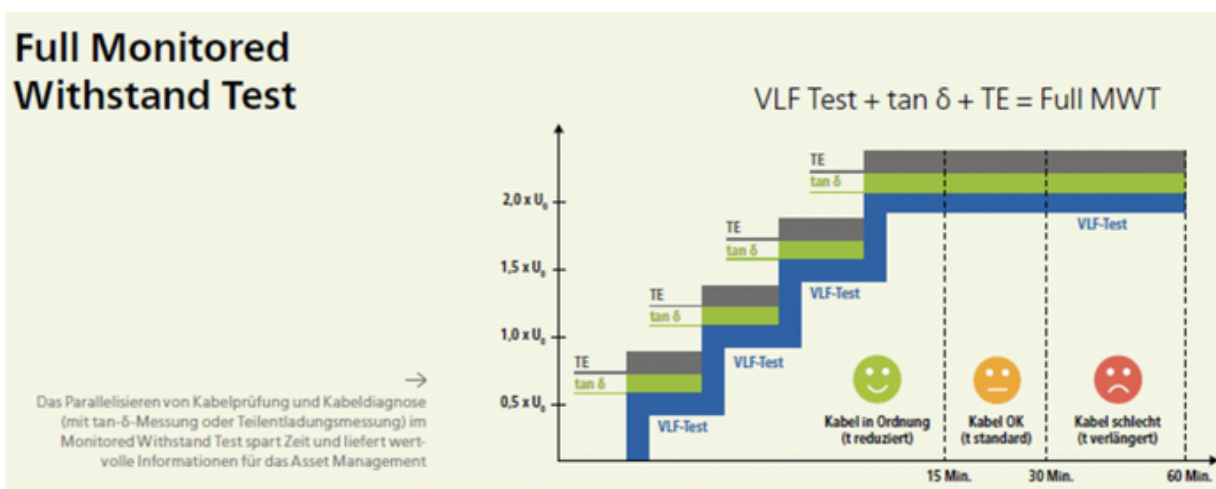


Fig. 3: VLF Full monitored withstand test FULL MWT.

VLF testing and diagnostics for MV cable application is defined and recommended by IEC 60502-2 – 2014 and IEEE 400.2-2013 (IEEE400.2-2013, 2013). Test voltages and the applicable diagnostic methods of VLF TanDelta Loss factor measurement and PD Partial Discharge measurement are mentioned. IEEE 400.2-2013 is the only existing field guide that describes evaluation criteria for VLF TanDelta diagnostics for different cable types.



INTERNATIONAL NEWS

NZ. INNOVATION REMOTE MONITORING OF ISOLATED TRANSFORMER

September 2022 | Source: [Dynamic ratings](#)

Introduction

EA Networks is a rural New Zealand electricity distribution network, with critical assets located in remote mountain valleys and areas with no cellular coverage. Working with ioSphere and Dynamic Ratings, they are the first electricity network in the world to monitor a transformer over the new Swarm satellite network.

Low Earth orbit (LEO) satellites have the power to completely transform the management and control of the world's electricity grids. Getting data back from anywhere on the planet has never been this easy or cost-effective.



The Challenge

Large grid operators like energy networks have billions of dollars invested in critical assets including lines and transformers. Connecting these assets digitally to a 'smart grid' system is a major priority for grid operators who need to squeeze maximum performance and reliability from their infrastructure.

However, the deployment of smart grid IoT (and SCADA) technology has been limited by cellular coverage. Huge numbers of the most critical grid assets lie outside of cellular coverage, so it has not previously been economically viable to digitally connect these assets to grid management systems.

The Solution

Leveraging the flexibility of the ioSphere NEXEO gateway and a Dynamic Ratings B100 transformer monitor, EA Networks have been able to remotely monitor their substation transformer via the Swarm satellite network.

The brand-new Swarm LEO satellite network offers a truly economic solution for remote digital grid management. Swarm offers global coverage, with very low latency, at a data cost that makes the connection of any grid asset feasible.





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"When we set out to create the best, universal industrial gateway for Swarm, electricity utility assets were high on our list of priority use cases," says Stephen Irons, ioSphere's head of firmware development. "Seeing our new Swarm gateway connected to a large substation transformer and seeing the asset performance data flowing smoothly over Swarm, a world first, was a really exciting milestone for the ioSphere team."

The solution, deployed on an EA Networks substation near Ashburton, incorporates an ioSphere NEXEO gateway connected to a Dynamic Ratings B100 Electronic Temperature Monitor, which is connected to the transformer. The system returns the transformer's oil temperature, load current, winding temperatures and surrounding ambient temperature to a web-based dashboard.



Conclusion

Having access to data from very remote transformers is hugely valuable for any utility that operates assets in remote locations. This data can be used to warn of any issues in plenty of time to initiate critical maintenance and can reduce the need to drive (or fly) to remote sites for inspections or condition assessment. The implementation of data-driven, condition-based maintenance can extend asset life and prevent grid outages.

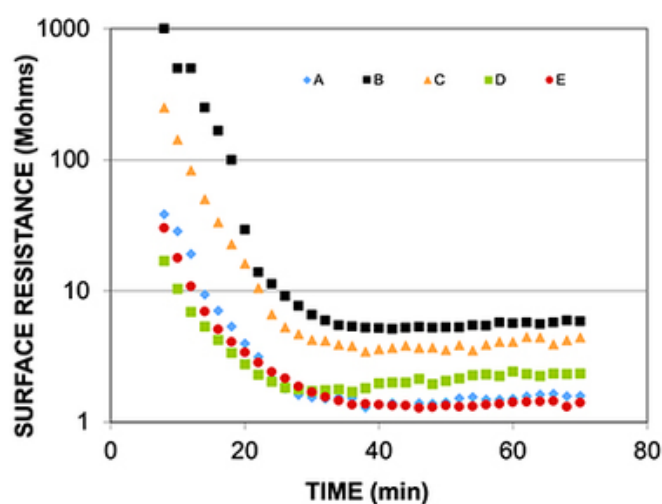
By deploying the new, lower cost, satellite IoT solutions that ioSphere provides, utilities can improve the reliability of energy supply to their community while reducing maintenance costs and deferring expensive infrastructure upgrades.

"We really appreciate the help we had from Logic Wireless, Dynamic Ratings and EA Networks in pulling together this important industrial trial of the new Swarm satellite network", says Donna Henderson, Head of Business Development at ioSphere, "The global adoption of Swarm in the utilities sector is likely to be enormous. It's just great to have the first major proof of concept right here in Canterbury [New Zealand]".

INTERNATIONAL NEWS

IMPACT OF RESIDUAL QUARTZ ON LIFETIME OF HIGH STRENGTH PORCELAIN

September 2022 | Source: [INMR](#)



The expected service life of high voltage insulators has become increasingly important now that the biggest electrification campaign since development of alumina porcelain insulators is underway. The world is moving to sustainable energy sources and this will significantly impact energy generation and distribution in coming years. At the same time, many existing transmission lines are reaching an age where replacement is going to be required sooner rather than later.

Estimated residual life of installed insulators has been studied for many years. But recently, more and more research is being devoted to this, often in close collaboration with energy supply utilities. For example, Korea Electric Power Corp.'s Research

Institute and Sungkyunkwan University in South Korea have recently jointly published studies of different mechanisms behind insulator ageing. Insulators ageing and replacement strategies have also been studied by an IEEE Working Group.

Four different ageing mechanisms have been defined: a) expansion of the cement; b) corrosion of metal parts; c) mechanical and electrical stresses on insulator cores; and d) drying out of the bitumen. Resistance of a ceramic insulator to mechanical and electrical stresses is related mostly to its microstructure.

These days, most high voltage ceramic insulators are made of grades of C-120 alumina porcelain and C-130 high strength alumina porcelain, as specified in IEC 60672. By contrast, cristobalite and quartz porcelain are used as materials for insulators used in distribution applications below 36 kV. Unfortunately, IEC 60672 specifies grades only by their mechanical strength when new, right after production. Ageing, fatigue resistance and microstructure are not even mentioned. In fact, this is one of the major reasons why studies into insulator service life are now becoming so important.

The mechanical strength required of C-120 and C-130 porcelain bodies can be achieved using various mixes of raw materials. But this has resulted in different microstructures and also different service life expectations among competing manufacturers.

Importance of microstructure and its impact on expected service life has been known for a long time due to past publications by experts such as Dr. Johannes Lieberman. He proposed that the ideal microstructure for C-130 should contain $\geq 40\%$ corundum, $\leq 15\%$ mullite and a residual quartz content of $< 1\%$. In fact, although a maximum acceptable content of quartz is not included in IEC 60672, many OEMs have placed this requirement into their technical specifications.

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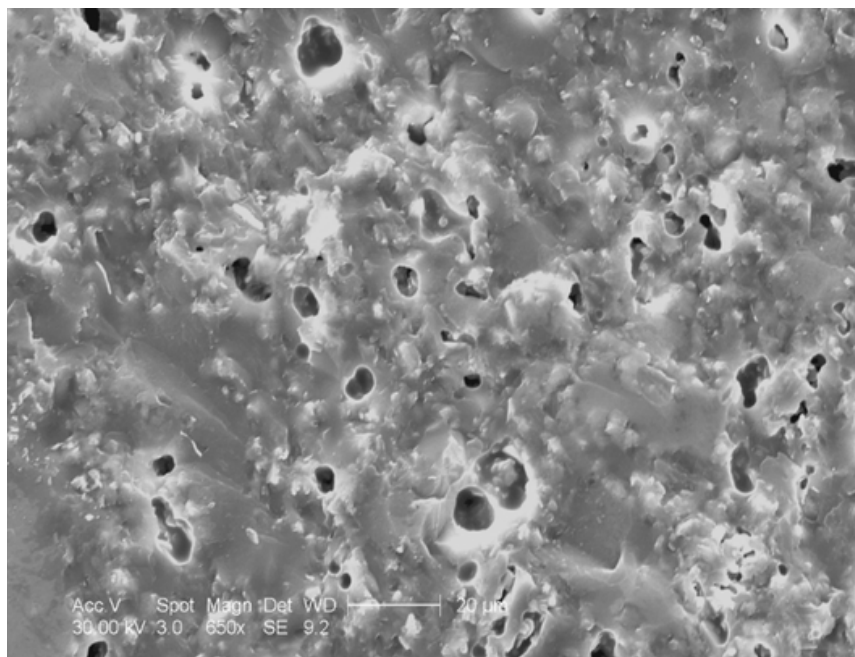


Fig. 1: Microstructure of porcelain dielectric from different manufacturers. Accelerating voltage: 30 kV, magnification: 650 X.

For example, a past study by A. Rawat and R. S. Gorur tested 30-year old insulators and established a clear relationship between microstructure and degradation in mechanical and dielectric strength. Their findings confirmed Dr. Lieberman's ideal microstructure in the Power Frequency Puncture Test since the failed samples in this research all had quartz crystals with size $> 50 \mu\text{m}$ and a high quartz content in general. Moreover, Keekeun Kim et al. demonstrated the role of corundum content as a major element increasing resistance to ageing and were able to establish a model relating corundum content to strength. Indeed, using this model they were able to predict the tensile strength of 43-year old cap & pin insulators within an accuracy of $\pm 2.5\%$.

INTERNATIONAL NEWS

SCIENTISTS DEVELOP RECHARGEABLE CYBORG COCKROACHES

By E&T Editorial Staff | September 2022 | Source: [E&T Magazine](#)

A research team of Japanese scientists have created remote-controlled cyborg cockroaches that could be used to help inspect hazardous areas or monitor the environment.

The RIKEN Cluster for Pioneering Research (CPR) researchers have equipped the robotic insects with a tiny wireless control module that is powered by a rechargeable battery attached to a solar cell, allowing the cockroaches to roam freely for long periods of time.

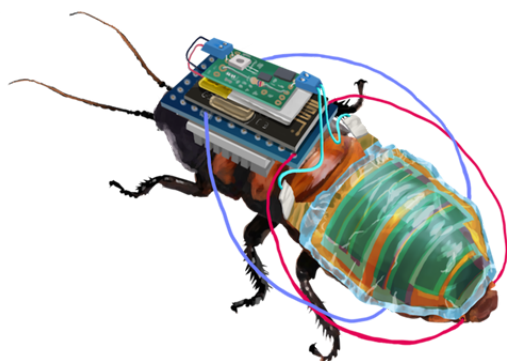
Wireless control of the leg segments has been one of the key challenges scientists have faced when developing cyborg insects. Moreover, in order for the devices to be used for monitoring purposes, it was fundamental that their batteries were long-lasting, to ensure that the cockroaches would be under control at all times.

The scientists at RIKEN overcame this challenge by fitting their cyborg insect with an ultrathin 0.004mm-thick organic solar cell module, which was mounted on the dorsal side of the insect's abdomen.

"The body-mounted ultrathin organic solar cell module achieves a power output of 17.2mW, which is more than 50 times larger than the power output of current state-of-the-art energy harvesting devices on living insects," said lead-scientist Kenjiro Fukuda.

Cockroaches have a limited surface area. Therefore, to successfully integrate these devices into their abdomens, the research team developed a special backpack, ultrathin organic solar cell modules, and an adhesion system that keeps the machinery attached for long periods of time while also allowing natural movements.

As part of the research process, Fukuda's team experimented with 6cm-long Madagascar cockroaches.



After examining natural cockroach movements, the researchers realised that the abdomen changes shape and portions of the exoskeleton overlap. To accommodate this, they developed an ultrathin and fully-flexible solar cell and interleaved adhesive and non-adhesive sections onto the films, which allowed them to bend but also stay attached.

They attached the wireless leg-control module and lithium polymer battery to the top of the insect on the thorax using a specially designed backpack, which was modelled after the body of a model cockroach. The backpack was 3D-printed with an elastic polymer and conformed perfectly to the curved surface of the cockroach, allowing the rigid electronic device to be stably mounted on the thorax for more than a month.



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Once these components were integrated into the cockroaches, along with wires that stimulate the leg segments, the new cyborgs were tested. The battery was charged with pseudo-sunlight for 30 minutes, and animals were made to turn left and right using the wireless remote control.

“Considering the deformation of the thorax and abdomen during basic locomotion, a hybrid electronic system of rigid and flexible elements in the thorax and ultrasoft devices in the abdomen appears to be an effective design for cyborg cockroaches,” Fukuda said. “Moreover, since abdominal deformation is not unique to cockroaches, our strategy can be adapted to other insects like beetles, or perhaps even flying insects like cicadas in the future.”

The team’s findings were reported in the journal *npj Flexible Electronics*, where the team behind the study expressed the hope that their experiments will help make the use of cyborg insects a practical reality.



INTERNATIONAL NEWS

TOP FIVE TRANSPORTATION TRENDS

By Chris Cunnane | September 2022 | Source: [Logistics Viewpoints](#)

Supply chain disruptions have brought about an age of innovation. From a transportation standpoint, this has included major technological advancements. Last week, I gave the keynote presentation at the Dangerous Goods Symposium, sponsored by LabelMaster and the DG Exchange. In my presentation, I highlighted five key transportation trends that are changing supply chains from a technology standpoint. These trends and technologies include the network effect, innovation in transportation management systems, time slot management applications, autonomous trucks, and the future of last mile deliveries, specifically looking at autonomous mobile robots and drones for home delivery.

The Network Effect

The first of the transportation trends is the network effect is at the heart of supply chain transformation. Essentially, the network effect exists when all components of the supply chain technology ecosystem work together to improve the performance of the end-to-end supply chain.

From a transportation standpoint, the network effect relies on communication between applications to make freight moves more efficient. This can mean more efficiently matching loads with capacity, using visibility tools to predict more accurate ETAs, optimizing routes, and ensuring that trucks can be loaded and unloaded as efficiently as possible. Sustainability is a byproduct of the network effect, as load consolidation and route optimization mean less trucks on the road to deliver the same freight, which is important for reducing carbon emissions.

The network effect plays a role in the remaining trends below, especially transportation management and time slot management.

TMS Innovation

The second of the transportation trends is innovation in TMS. Historically, transportation management systems have offered a strong ROI. The primary reason companies buy a TMS is for freight savings. These freight savings can be attributed to simulation and network design, load consolidation and lower cost mode selections, and multi-stop route optimization. As freight costs have continued to rise, companies have looked more and more to their TMS to mitigate these rising costs. A big reason for TMS growth is due to the fact that technology has been steadily improving over the last few years. There are three innovation in particular that are playing a big role.

The first is artificial intelligence. Artificial intelligence has been, and will continue to be, a key component of transportation management systems. AI can be used to “learn” about constraints, such as capacity, regulations, and hours of service, and properly plan shipments. This gives a much better ETA of shipments to warehouses, stores, and end customers. Aside from improved ETAs, AI plays a role in other aspects of transportation management. Shippers learn which carriers meet on-time service levels and which do not, which lanes typically carry more chance for delays, and whether there is an optimal number of stops before shipments become late. AI aids shippers in better understanding how to drive efficiencies without sacrificing service levels.



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The final technology for TMS innovation is IoT. An IoT-enabled fleet management solution can improve visibility and versatility for companies across multiple industries. Versatility is important, as each industry has its own set of unique requirements across fleet management and integrated logistics. The use of an IoT-enabled fleet management solution can boost performance by improving asset visibility and vehicle utilization, reducing wait times at destinations, and providing proactive maintenance-related cost savings.

Time Slot Management

The third of the transportation trends is the growing importance and interest around Time Slot Management. Time slot management helps to organize warehouse resources to prepare for an incoming truck. The warehouse needs to know who is coming and when, which begins with the ETA. Beyond that, warehouse workers need updates on what dock the truck is arriving, when the truck is loaded, what papers they will pick up, what needs to be signed, and when they are leaving the warehouse or yard.

There are elements that are out of your control which will impact shipments. It is really just a matter of how much of an impact will be felt. Time slot management applications can help to reduce the impact of changes. Whether it is due to traffic jams, missed appointments, or a variety of other reasons, loadings and unloadings will need to be rescheduled on any given day.

Autonomous Trucks

The fourth of the transportation trends is autonomous trucks. The jury is clearly still out on autonomous trucks – there have been plenty of pilots and publicity, but are self-driving trucks ready to take to the roads in a critical mass? One of the biggest drivers for self-driving trucks is the driver shortage which continues to grow every year. However, autonomous trucks are not the quick solution to the driver shortage. In fact, similar to autonomous robots within the warehouse, autonomous trucks are not here to replace human drivers. Instead, they are here to collaborate with drivers to make the task easier.

The practice of platooning seems to be a space where the reality of autonomous trucks, could first make an impact. In these solutions, the lead truck is equipped with technology augmentation while a follower truck operates in tandem through a fully autonomous system. The vehicles move in a group or platoon with the trucks driven by smart technology and communicating with one another. Each of the trucks still has a driver onboard for safety and for taking over when exiting the freeway. This allows the follower driver to log off and rest while the truck is in motion. This means that the two trucks, operating in tandem, allow drivers to drive twice as far while ensuring they don't exceed hours of service regulations.

Autonomous Last Mile Deliveries

The fifth and final transportation trend in the future of last mile delivery. One of the most difficult and expensive aspects of the supply chain is last mile and home delivery. However, from a customer experience standpoint, it is also the most memorable and possibly important. As e-commerce continues to grow, we are looking at autonomous last mile deliveries as part of the solution.



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Many companies have been testing drone deliveries for the last few years. The use of last mile drones is still challenging for a variety of reasons including FAA regulations, public perception, and the technology itself. However, more and more companies are exploring the use of last mile drones, hoping to bring down the cost of deliveries while improving customer service. The big names out there right now are Wing, Amazon, UPS, Matternet, Flytrex, and Zipline. Each of these companies has completed drone deliveries of small packages to a variety of locations. It still seems that the use of drones to deliver medical supplies and prescriptions has been the most effective.

The other side of autonomous home delivery is autonomous mobile robots. Many companies have begun testing autonomous delivery bots in cities and on college campuses. For many of these companies, however, the term "autonomous" may be a little bit misleading. In fact, throughout the delivery process, there is a team of human minders that are tracking the vehicle every step of the way. While the behind-the-scene workers mostly monitor the robot, if the bot runs into trouble, the human worker can use a remote control to drive or troubleshoot the vehicle. And if the robot becomes stuck or unable to make the delivery, these workers will come to the rescue to make the delivery themselves. Companies like Starship Technologies, Nuro, and FedEx have completed a number of pilot programs and are deploying delivery bots right now.

Over the last two years, investors have pumped more than \$8 billion into autonomous delivery companies. The big question is what is the public perception of these delivery vehicles? The jury is still out on that, but as they become more commonplace, and the use cases continue to pile up, the use of this technology gets closer to being the normal. Either way, it is a glimpse into what the future holds for home delivery.

CIGRE UPDATE

EDITORIAL FROM POWER TALK - THE CIGRE NEWSLETTER

By Philippe Adam - Secretary General of CIGRE | September 2022 | Source: CIGRE

Dear Readers,

The 2022 Session was an unexpected success in a context still marked by travel restrictions for nationals of certain countries due to health measures linked to the Covid-19 pandemic, or because of the international sanctions imposed on Russia in response to its invasion of Ukraine.

Nevertheless, this Session will be remembered for the number of participants, delegates, exhibitors and visitors, as well as for the number and quality of the contributions, speeches and technical presentations. It will also be remembered for the shared happiness of the reunion after 4 years of forced separation of the members of the community, and for the desire to reconnect with the world of electrical systems which was hyper-represented that week in Paris.



Philippe ADAM
Secretary General of CIGRE

3700 delegates had registered for this first Session of CIGRE's second century, and they were 2500 present in the Grand Amphitheatre of the Palais des Congrès in Paris, to attend the opening ceremony chaired by Michel AUGONNET, President of the Association, and to listen to the guest speaker Dr Arshad MANSOOR, CEO of EPRI.

In this editorial, I would like to thank all those who have worked on the preparation of this event, starting with the architects of the technical programme, i.e. the Study Committees coordinated by the Technical Council, and with the unconditional support of the leadership team and the Steering Committee.

Thanks to all those who came to Paris to confirm their interest in CIGRE and its flagship event.

Thanks also to the Central Office team, reinforced for the occasion and supported by its contractors and partners, for their dedication to the preparation of this Session in every detail.

All the events have been registered and will be available on the registration platform from the delegates' accounts from 15 September.

At the end of the year they will also be available to CIGRE members from e-cigre.

The 10 twice-daily sequences of CIGRE TV are already available with unlimited access from the CIGRE YouTube channel.

Before concluding, I would like to address all Session delegates and invite them to answer the questionnaire we sent them on the evening of the last day of the congress: we need your feedback and your impressions of this event, so that we can offer you even better next time.



CIGRE UPDATE

To all of you, dear Readers, I give you an appointment in 2024, from 25 to 30 August, exactly between the Summer Olympic Games and the Paraolympic Games organised by Paris.

The capital will be at its most beautiful to welcome the national sports delegations and the spectators of the Games, and you will be able to enjoy it like never before. On the other hand, you will have to make your accommodation and travel reservations early on, if you want to avoid unpleasant surprises regarding availability and prices. In the meantime, take care of yourself and your loved ones.

ACTIVE WORKING GROUPS IN CIGRE

The foremost global community for the collaborative development and sharing of power system expertise gather to discuss and learn about the future of the industry for the whole value chain, from generation to distribution.

The latest CIGRE Working Groups created are:

- [TOR-WG B3.65](#) Guidelines for the Selection and Design of escape routes for substations rated above 1kV AC and 1.5 kV DC
- [TOR WG C6.45](#) The impact of distributed energy resources (DER) on the resilience of distribution networks
- [TOR-WG B5.78](#) New requirements of network protection and control for renewable energy integration
- [TOR-JWG B5 C4.79](#) Protection roadmap for low inertia and low fault current networks
- [TOR-JWG A2 D1.67](#) Guideline for online dissolved gas analysis monitoring
- [TOR-WG A3.48](#) 4th CIGRE Reliability survey on transmission and distribution equipment_rev1
- [TOR-JWG C2 B4.43](#) The impact of offshore wind power hybrid ACDC connections on system operations and system design



CIREN UPDATE

CIREN 2023 INTERNATIONAL CONFERENCE & EXHIBITION ON ELECTRICITY DISTRIBUTION

12 - 15 JUNE 2023



CIREN, the Leading Forum where the Electricity Distribution Community meets, holds the major International Electricity Conference & Exhibition every two years in different venues in Europe with a worldwide perspective and participation.

CIREN is always evolving and the 2023 event is the conference 27th edition. CIREN 2023 will take place in Rome, located in the heart of Italy on 12-15 June 2023.

Participation in CIREN 2023 offers an opportunity to meet with up to 2500 experts and benefits from face-to-face interaction with key decision leaders in the field of Electricity Distribution.

An exhibition gathering over 140 companies will be running throughout the conference.

MORE INFO



CIREP PAPER

DISTRIBUTION TRANSFORMER WINDING FAULTS DETECTION AND MONITORING

Paper 1258 | June 2022 | Porto

ABSTRACT

Transformers are one of the most critical and expensive components of electric grids. Recently, concern with fault detection is growing due to the large number of deployed transformers approaching the end of their expected lifespan, while suffering increasing pressure due to the growth of non-linear loads, such as EVs and HVACs. This work presents a computational and experimental study of a set of electrical and magnetic variables under fault conditions. Simulation results are applied to develop a potential winding fault detection and location methodology for distribution transformers. Subsequently, a smaller scale experimental setup is used to assess the scalability of the proposed methods regarding the rated power of the transformer.

DOWNLOAD PAPER



ANNOUNCEMENT

UPCOMING EESA NATIONAL COUNCIL VACANCIES

By Penelope Lyons | September 2022

The Electric Energy Society of Australia will soon be calling for nominations to fill positions on the EESA National Council:

- three elected positions as MEMBER of the EESA National Council
- one appointed position as YOUNG PROFESSIONAL MEMBER of the EESA National Council
- one appointed position as HONORARY TREASURER of the EESA National Council

The 2023 EESA National Council election will operate in accordance with the EESA constitution. Jeff Allen, the National President is close to completing his three-year term and he has decided that he will be retiring from the EESA National Council. Therefore there are three elected positions to be voted on by eligible EESA members this year. Jeff encourages all EESA members to consider this wonderful opportunity to volunteer and contribute their services to the EESA National Council in support of EESA and all its activities across Australia.

The makeup of the 2023 National Council will be:

- One chapter representative from each chapter, who may be the chapter chair or a representative elected by chapter committee members.
- Three elected members - to be selected by the eligible EESA membership by a vote.
- The Honorary Treasurer - to be selected by the 2023 National Council from a pool of nominations.
- A Young Professional Member (under 35 years of age) - to be selected by the 2023 National Council from a pool of nominations.

Nominees for elected member positions must have been an EESA member for at least two continuous years prior to the nomination close date.

Nominees for Honorary Treasurer and Young Professional Member must have been involved with their local chapter committee for at least two years and have their support for the nomination.

Keep a look out for future mailouts about the election and please consider this wonderful opportunity to grow with EESA.



UPCOMING EVENTS

EV integration Recommendations and Project Summary: Electric Vehicle Integration Project webinar #6 (final)

FRIDAY 30 SEPTEMBER 2022

NATIONAL

[VIEW EVENT](#)



Overview:

The adoption of electric vehicles (EVs) poses technical and economic changes for our power grid. Electricity distribution networks were not designed with the consideration of a high penetration of electric vehicles. Charging EVs at home can significantly increase our normal demand, affecting the poles and wires. Read more...

Time: 12:30 PM - 2 PM AEST

Location: Online Webinar

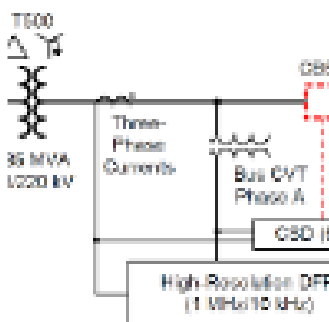
Cost: Free

Using High Resolution Oscillography to Improve the Performance of Controlled Switching of Transformers

WEDNESDAY 5 OCTOBER 2022

SA/NT

[VIEW EVENT](#)



Overview:

Energisation of power transformers at a random point-on-wave can result in inrush currents that far exceed the full-load rating of the transformer resulting in power quality issues and stress on equipment. Controlled switching, in which the breaker is closed at a point-on-wave chosen to minimise the inrush current, greatly reduces the inrush current and its negative effects. Read more...

Time: 5:30 - 6.30 PM ACDT

Location: Online Webinar

Cost: Member \$0
EA Member \$10
Non-Member \$10

Implementing and Using a Digital Twin

FRIDAY 7 OCTOBER 2022

NSW
ACT

[VIEW EVENT](#)



Overview:

Neara is a physics-enabled platform that builds 3D interactive models of critical infrastructure networks and assets, providing the ability to run real-world scenarios, assess current and future risk, and prioritize maintenance and disaster response. [Read more...](#)

Time: 11:00 AM - 12:00 PM AEST

Location: Online Event

Cost: Member \$0
EA Member \$20
Non-Member \$30



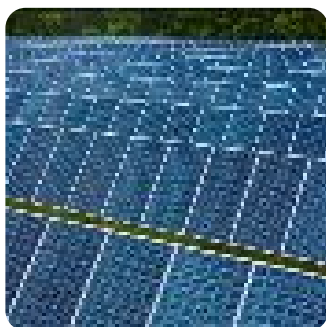
UPCOMING EVENTS

Battery Energy Storage Course

12 - 13 OCTOBER 2022

NATIONAL

[VIEW EVENT](#)



Overview:

A two-day professional development course in battery energy storage applications presented by the Australian Power Quality and Reliability Centre.

Energy storage is often seen as a solution to many of the difficulties encountered due to the intermittent nature of renewable energy resources such as solar PV and wind energy. [Read more...](#)

Time: 2 day event

Location: Online Event

Cost: AUD\$1770



EECON 2022 'Our Energy Future – Unlocking Net Zero'

October 11-12th 2022 at the Royal International Convention Centre Brisbane Queensland.
Pre-conference drinks and tours will be on October 10th 2022.

EECON is coming to Brisbane in 2022! The Australian Government has made a commitment to carbon neutrality, commonly referred to as Net Zero, in the not-so-distant future. With the target set, the questions now in everyone's mind are 'How will Australia (we) get there?', 'What will the future Australian energy mix look like' or 'What future opportunities should we investigate now?'

The Technical Program:

- The future Australian and global energy landscape.
- People, technology and systems unlocking net zero.
- The impact of new generation and of retiring generation.
- Customer-centric developments in the electricity industry.
- The future of utility assets and asset management.
- The relationship between policy, regulatory and economic settings and the evolving grid.

Registration:

Registration is now open through the conference website (www.eecon2022.com.au) with EESA members able to use their membership to receive a discount on conference attendance rates.



UPCOMING EVENTS

Lake Echo Power Station - 1950's hydroelectric power meets the National Energy Market

TUESDAY 25 OCTOBER 2022

TAS

[VIEW EVENT](#)



Overview:

In 1956 Lake Echo Power Station was commissioned, providing 30 MW of hydroelectric power to the Tasmanian power grid. The real value of the Lake Echo Power Scheme is not the energy that it produces but it's ability to impound water in the winter, which is released in the summer, providing a reliable supply of water to seven power stations. Read more...

Time: 5:30 PM - 6:45 PM AEST

Location: Hydro Tasmania, 4 Elizabeth St, Hobart OR online via Zoom webinar

Cost: Member \$0
EA Member \$20
Non-Member \$30

Tasmania's future energy series: hydrogen

THURSDAY 3 NOVEMBER 2022

TAS

[VIEW EVENT](#)



Overview:

This event series will explore the engineering challenges and opportunities on the journey to 200 per cent.

As the nation moves away from older fossil fuel generators, Tasmania is in a unique position to produce more clean renewable energy to power our state. In 2020 the State Government legislated a Tasmanian Renewable Energy. Read more...

Time: 5:30 PM - 7.30 PM AEST

Location: Engineers Australia Tas, Level 5, 188 Collins Street, Hobart OR online via webinar

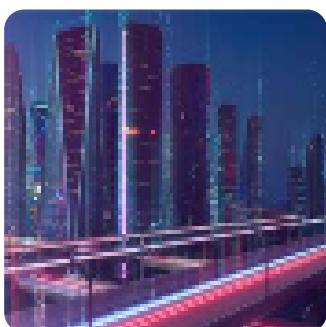
Cost: EESA Member \$30
EA Member \$0
Non-Member \$30

WA Energy and Power Solutions toward Net Zero

TUESDAY 22 NOVEMBER 2022

WA

[VIEW EVENT](#)



Overview:

While Australia and other countries are aiming for Net Zero, electricity supply systems and networks are finding that day to date operations, with high penetration of renewable energies, are already challenging. This technical seminar will look at the likely increase or change in these issues with further coal generation being phased out. Read more...

Time: 8:30 AM - 4:30 PM AWST

Location: In-Person Training Event with One Online Session
Mercure Hotel, Irwin St, Perth WA

Cost: Member \$150
EA Member \$200
Non-Member \$200



THANKS TO OUR CORPORATE MEMBERS

PLATINUM



MISSION

"Through our passion for innovation and always finding a better way, we are taking reliability, customer service and product value- for-money to a new level in the transformer industry."

GOLD



NOJA POWER



SILVER



BRONZE

