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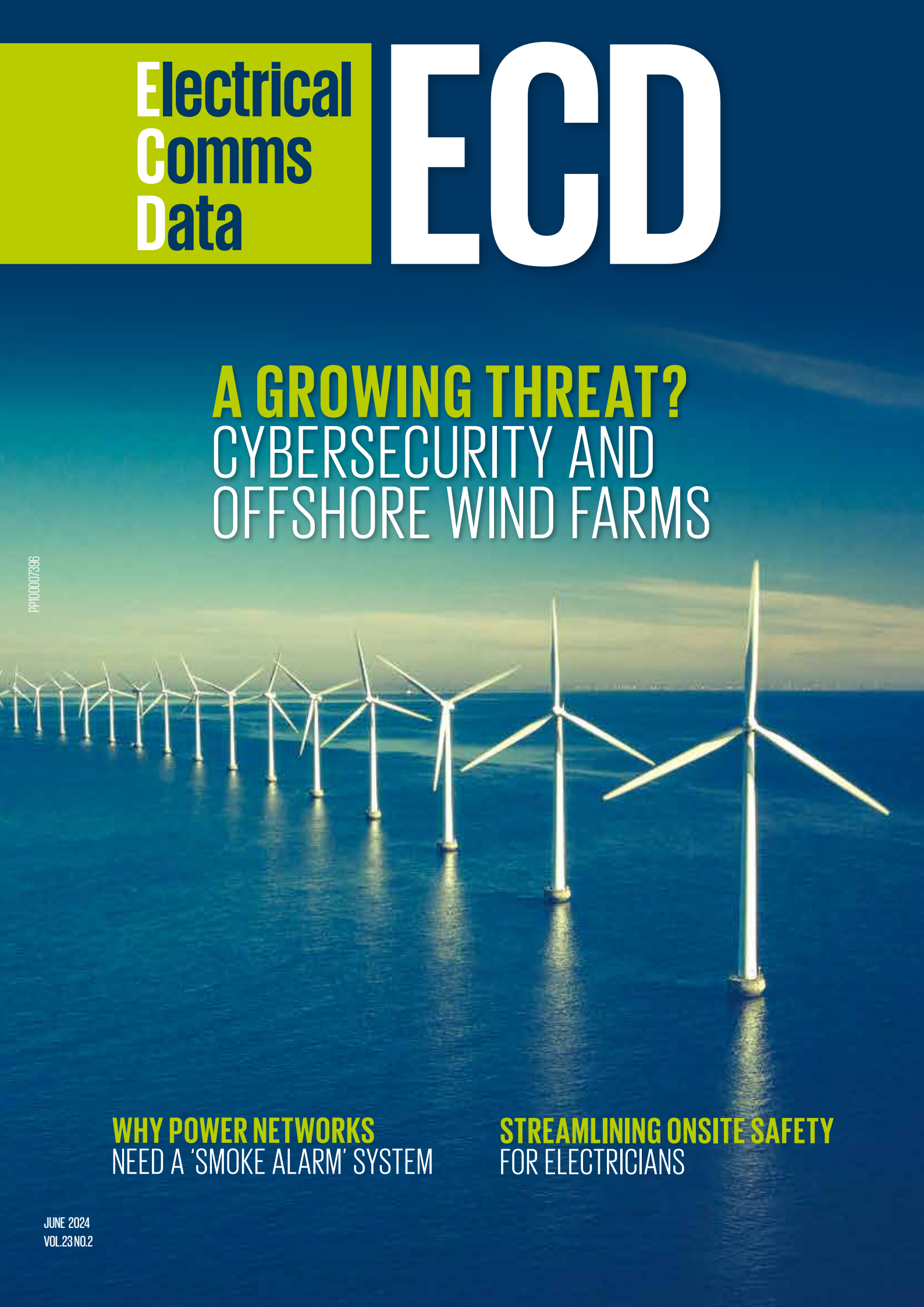
# A GROWING THREAT?
# CYBERSECURITY AND OFFSHORE WIND FARMS



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## WHY POWER NETWORKS NEED A 'SMOKE ALARM' SYSTEM

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JUNE 2024
VOL.23 NO.2

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# CONTENTS



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## FROM THE EDITOR

Australia's ongoing energy transition has brought with it a surge of enthusiasm for offshore wind power projects, with about 50 wind farms projected for development off our coastlines. At the same time, electrical utilities globally are facing an increasing threat from cyber attackers — something that has grave implications for the security of the grid. In this edition's feature, we take a look at the vulnerabilities of the offshore wind farm sector — a developing industry with a lot of complex cyber infrastructure.

The safety and security theme continues throughout the magazine. On page 10, Dan Pollard, founder of tradie tech company Fergus, discusses the benefits of onsite safety software for electricians. On pages 17 and 30, two different teams from RMIT develop technology that's designed to help prevent bushfires by protecting poles and wires. One of these innovations functions as a 'smoke alarm' system for the power network, and is already being used in wildfire mitigation plans in the US and Canada.

Elsewhere, we explore smart home privacy (p 23); protection of power networks from animals (p 20); and the need for better indoor air quality (p 34). While ***ECD***'s annual security issue can reveal some worrying scenarios, it's always heartening to see how the efforts of scientists, engineers and electrical workers on the ground are contributing to making us safer.

On a final note, I'd like to thank and farewell our formidable head proofreader, Deborah Bailey, who is retiring after 27 years in the role. Proofreaders are the unsung heroes of publishing and Deb has been an integral part of ***ECD*** and, indeed, all of Westwick-Farrow Media's magazines. She will be missed!

**Katerina Sakkas — Editor**
**ecd@wfmedia.com.au**

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# A GROWING THREAT?

## CYBERSECURITY IN THE ERA OF OFFSHORE ENERGY

*Katerina Sakkas*

Picture this: It's 2030 and a wind farm off Australia's east coast has just suffered a cyber attack by a hostile nation state. Exploiting a vulnerability in the wind farm's network, the attackers have gained access to critical operational systems. Having remotely seized control of these systems, they can now connect to the larger electrical grid and proceed to shut it down systematically, switching off substations, corrupting files and disabling emergency backup power. Millions of homes and businesses are affected. Trains grind to a halt. There are tragic consequences for some people who rely on electrically powered medical devices.

It's not exactly news that all types of electrical utilities are a target for cybercriminals. Bring down a network and, as the hypothetical scenario above shows, you can disable a city for hours or even days. Examples from recent years include multiple attacks on the Ukrainian grid, starting with the 2015 attack by the Russian 'Sandworm' group which left about 230,000 people without power; two 2021 ransomware attacks on Brazilian utilities; and a 2022 ransomware attack on Energy Australia resulting in the theft of online customer details.

In its 2024 report, 'Attack Surface of Wind Energy Technologies in the United States', Idaho National Laboratory notes that, with multiple cyber attacks and intrusions targeting wind energy in the US in 2022, cybersecurity for the sector is becoming urgently important. The paper references ransomware attacks on Germany's Nordex and Deutsche Windtechnik control centres, the disabling of SATCOM modems serving ENERCON wind turbines and an espionage campaign against wind-energy companies working in the South China Sea.[1]

## Offshore challenges

There are two major factors that make offshore wind farms uniquely vulnerable: their remoteness, which creates a necessity for more cyber infrastructure; and the newness of the sector, which means many risk factors haven't been addressed yet. This state of affairs is steadily drawing the attention of researchers, who warn that serious action needs to be taken in order to protect these complex assets from malicious attacks.

The huge turbines on an offshore wind farm are connected to an offshore substation by cables that run down the turbine tower and under the seabed. At this subsea substation, the voltage is increased to minimise transmission losses. The energy is then conveyed to an onshore substation via high-voltage underwater cables. Here, electricity undergoes further adjustments so that it can make its way into the electrical grid.

As highlighted in a recent study from Concordia University and Hydro-Quebec, these wind farms require a significant amount of cyber infrastructure in order to connect and coordinate their many moving parts — both offshore and onshore. This "complex, hybrid-communication architecture presents multiple access points for cyber attacks".[2]

Unlike the established onshore wind market, offshore wind farms are still in the nascent stages of expansion, but this is set to change, according to RMIT research. In June 2023, RMIT's Centre for Cyber Security Research and Innovation (CCSRI) put together a comprehensive review of the marine renewable energy sector and its cybersecurity issues, with an emphasis on offshore wind farms in the APAC region.[3] While Europe has long been a leader in offshore wind technology and capacity, APAC has recently become a contender, with China driving most of the development. ›

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**WHEN IT COMES TO OFFSHORE WIND FARMS, ATTACKERS HAVE AN ALMOST STAGGERING ARRAY OF CHOICES AS TO WHICH COMPONENTS THEY CAN TARGET.**

Rapid development of more powerful technology combined with the push towards decarbonisation has led to a significant increase in investment for larger offshore wind farm projects in recent years.

Across Australia, there are currently 50 offshore wind farms planned, but none of these has even reached the construction phase, according to RMIT.

## An intensifying threat

Referring to sobering statistics from the International Association of Ports and Harbors (2021), RMIT notes that there has been a surge in cyberthreats towards the marine industry sector as a whole, especially since the start of the COVID-19 pandemic. The Association reported a fourfold increase in cyber attacks from February to May 2020, with attacks against operational technology (OT) systems rising by a whopping 900% since 2017.[4]

Cyber attacks are multifarious, often appearing in the form of malware — malicious software that can invade a system when a user clicks on a dangerous link or email attachment. Popular sub-categories of malware include ransomware (which encrypts the victim's files and demands payment to decrypt them), viruses, worms and spyware.

An attacker initially might use a phishing approach, sending an email to a target that pretends to be from a trustworthy source in order to gain sensitive information or to install malware. Denial of service (DoS) attacks are also effective, making a computer or resource network unusable by inundating it with traffic from multiple sources.

Yet more attack techniques include man-in-the-middle (attacker intercepts data between two parties without their knowledge), structured query language attack (malicious code inserted into SQL server to obtain confidential information), zero-day (where an attacker exploits an as yet undetected software flaw) and living off the land (using tools that are already present in the victim's system).

## A feast for cybercriminals?

When it comes to offshore wind farms, attackers have an almost staggering array of choices as to which components they can target — assuming robust protections have not been put in place, that is. Turbines, substations, sensors and control centres, SCADA (supervisory control and data acquisition) systems, subsea cables — all of these are subject to potential breaches with very damaging consequences.

In addition to ensuring staff are comprehensively trained in cybersecurity awareness, RMIT advocates a combination of physical and cyber measures to protect assets. Substations should be protected by perimeter fencing, remote surveillance, infrared lighting and smart video analytics; while subsea cables should be buried or sleeved, in addition to being remotely monitored.

All-important SCADA systems should be shielded by protocols based on the latest and most secure standards, and sensors and control centres require a robust built-in data diagnostics (BDD) mechanism that will collect reliable data while proactively identifying and mitigating potential issues such as data corruption.

RMIT also recommends the adoption and adaptation of various theoretical frameworks that have been developed for protection of the IT sector, such as the NIST Cybersecurity Framework (CSF) devised by the United States' National Institute of Standards and Technology; the international information security standard ISO/IEC 27001; and the "practical, actionable" CIS controls designed by the Centre for Internet Security.[5]

## Time is of the essence

Concordia Institute for Information Systems Engineering (CIISE) Associate Professor Jun Yan, a contributor to the Concordia University study, has emphasised the need to strengthen the security of operational technologies.

He said that Concordia was advocating for international standardisation efforts but that the work was just beginning.

"There are regulatory standards for the US and Canada, but they often only state what is required without specifying how it should be done," he said. "Researchers and operators are aware of the need to protect our energy security, but there remain many directions to pursue and open questions to answer."[6]

Here in Australia, the government's offshore electricity infrastructure framework, managed by the Department of Climate Change, Energy, the Environment and Water, is in the early stages of implementation. The only licences currently open for application are feasibility licences, which allow a developer to assess the potential for a proposed wind farm project but do not allow the commercial generation of energy.

The DCCEEW is currently consulting with industry on the draft guidelines for its guidance around the transmission and infrastructure licences that permit undersea cables to be installed. Its guidelines for 40-year commercial licences — allowing a developer to construct, operate and commercially generate electricity from an offshore energy project — are still under development. There might be approximately 50 offshore wind projects on the cards, but nothing is going to happen in a hurry.

It's a situation that, you would hope, leaves enough time to plan in detail how these assets are secured.

1. p 5, 'Attack Surface of Wind Energy Technologies in the United States', Idaho National Laboratory (2024). https://inl.gov/content/uploads/2024/02/INL-Wind-Threat-Assessment-v5.0.pdf?
2. https://www.concordia.ca/news/stories/2024/01/24/offshore-wind-farms-are-vulnerable-to-cyberattacks-new-concordia-study-shows.html
3. 3. RMIT University – Centre for Cyber Security Research and Innovation (CCSRI), 'Identifying Cybersecurity Best Practices for the Marine Renewable Energy Sector' (2023).
4. p 47, CCSRI report
5. p 72, CCSRI report
6. https://www.concordia.ca/news/stories/2024/01/24/offshore-wind-farms-are-vulnerable-to-cyberattacks-new-concordia-study-shows.html

## TASNETWORKS OPTS FOR SPECIALIST CABLE SOLUTION

TasNetworks has worked with Swedish specialist cable producer Amokabel to install lightweight covered conductor in the Neika area south of Hobart. The aim is to increase network resilience and reliability in an area previously known for vegetation-related outages.

Amokabel said the installation is the first full-scale installation of the new generation of covered conductor in Tasmania.

The technology consists of conductive wire surrounded by an insulating jacket made of advanced lightweight insulation materials that improves reliability and adds minimal weight. This means that it can be restrung on existing poles to save the distributed network service provider (DNSP) — and therefore the consumer — the cost of replacing or adding infrastructure. The solution was approximately one-tenth of the cost of undergrounding in the same area.

Lightweight covered conductor is also much more resilient than bare wire and easier to install than older covered conductor technologies, such as CCT, Amokabel said. It is highly resistant to dropped tree branches — a common cause of outages — and safer for people and wildlife.

It can also help to reduce the risk of bushfire by 98.8% compared with bare wire, the company said. This is because, unlike bare wire, an overhead line using covered conductor doesn't produce sparks when it contacts dry foliage or other objects.

Images courtesy of Amokabel

*Installation of lightweight covered conductor in Neika, near Hobart.*

"The Amokabel covered conductor system allows us to mitigate many of the potential risks that traditional open wire networks pose at a very reasonable cost, making it a viable standard replacement alternative. These include customer outage or firestart due to vegetation or animals contacting the conductors," said the TasNetworks team who installed the conductor.

"The area in question is rugged and heavily treed, a perfect location for our products. Our covered conductor offers a range of benefits in terms of resilience, reliability and safety, making it a clear choice for widespread deployment — especially with the effects of climate change creating a challenging environment for our networks," said Steve Rutland, Managing Director of Amokabel Australia.

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## 100 YEARS OF SA'S CLASSIC POWER POLE

This year marks the 100th anniversary of South Australia's distinctive Stobie pole — a steel-beamed power pole that was developed due to the shortage of wood for poles in the state, in addition to issues with termites. The invention of engineer James 'Cyril' Stobie, the pole was formally patented in July 1924 by the then Adelaide Electric Supply Company. It has since become something of an icon in SA.

The first pole was installed in South Terrace in the city in 1924. Today, more than 650,000 Stobie poles help South Australians share energy across an area of about 180,000 km$^2$.

"The Stobie is a distinctly South Australian icon, as unique as the Hills Hoist, Coopers Beer and frog cakes," said Paul Roberts, Head of Corporate Affairs.

"The beauty is that while it has served us well for 100 years, it will continue to have a central role in the state's power supply for many years to come, even as we shift to a renewables-based energy system."

SA Power Networks is planning a number of engagements in honour of the humble Stobie this year, including arts, history and community events. The celebrations will culminate in a birthday party at the SA Power Networks Stobie plant at Angle Park in mid-July.

"Every Stobie manufactured at Angle Park this year will be stamped to commemorate the anniversary," Roberts said. "We are particularly looking forward to our 2024 partnerships with the History Trust and Helpmann Academy.

"This year's History Festival in May has the incredibly appropriate theme of 'Power' and the Stobie will be used to honour 100 wonderful South Australians. We also will open the Angle Park facility for public tours during the History Festival.

"Also, we have commissioned a very special arts installation with the Helpmann Academy which supports new and emerging artists," Roberts said.

More details will be revealed over the coming months.

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# HOW TO REWIRE **ONSITE SAFETY** FOR ELECTRICAL WORKERS

*Dan Pollard, Founder, Fergus*

Tradies know that onsite safety is critical to the success of a project — but it's also the difference between life and death or serious injury. More than 1850 injury fatalities have happened in Aussie workplaces in the past decade, while one in 12 workers (8%) have made serious workers comp claims involving more than one week of working time lost.[1] For sparkies in particular, working with live electricity introduces significant risk, making a high level of onsite safety a no-brainer to protect workers.

But the risk to Aussie sparkies isn't just the electricity itself. The National Skills Commission found that 67% of electricians' jobs were in shortage[2], but that the role of electrician was in the top 20 most in-demand occupations, as well as having a longer training gap[3]. In layman's terms, this means there will likely be a larger number of newer sparkies onsite as Australia works to fill its electrical skills shortage, and there's a serious need to keep sites safe for budding electricians.

There's no substitute for proper training and education around the onsite safety risks to electricians. However, emerging technology — such as the introduction of digital safety certificates and job management software — has started to improve how tradies manage their administrative duties. Although digital safety certificates have been around for some time, the issue is that the electrical trades have been slow to adopt them and be vigilant about completing them.

When it comes to safety, these digital tools can't stop a live wire from zapping a worker, but they can certainly make it easier for electricians to check off critical safety steps before starting work. Importantly, they can go a long way towards ensuring both fresh-faced and more experienced sparkies get their safety paperwork in order before stepping a boot onsite.

A Safe Work Method Statement (SWMS) should be one of the most important documents for Aussie tradies, as it is really a legal blueprint for onsite safety. An SWMS plays a big role in protecting the health and wellbeing of sparkies and other tradies onsite, outlining all the steps and precautions workers must take to perform high-risk work safely.

As the world becomes increasingly digitised, paper-based documentation has much less of a place onsite. Instead, digital safety certificates have become more common, helping Australian sparkies make the move towards a more streamlined and efficient digital format and away from easy-to-lose, paper-based documentation.

Sparkies can ensure that all safety measures are reviewed and met before starting a job by completing the digital safety checklists. They can systematically go through each item on the checklist while filling out digital certificates, simultaneously growing a deeper awareness of potential hazards or existing dangers at a worksite while also ticking the box to meet industry regulations. Plus, electrical workers of all experience levels can make more informed decisions that prioritise their safety, and that of their mates onsite, by assessing potential onsite safety risks methodically.

It's worth noting that digital safety certificates are not the only administrative

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measure helping to boost safety measures on risky job sites. Smart job management software complements the use of digital safety certificates, giving electricians and their support team access to a solution that manages all aspects of job administration, including the storage and organisation of digital safety certificates. This means that, no matter how big or small a sparky's team is, they can easily access previous safety certificates, track their completion of safety checklists for current jobs and monitor the safety status of ongoing projects. Most importantly, it means that they have access to essential safety information at all times for compliance and protocols.

Beyond digital documentation, job management software also has a few other benefits linked to workplace safety, such as:

- Simplifying communication between team members. Sparkies can share safety-related information and updates in real time using the software to make sure that everyone onsite is aware of any potential hazards. This helps to address any safety concerns that may be flagged during a project.
- Automating notifications to schedule safety training sessions and reminding electricians to complete their safety checklists. This ultimately helps to reduce the admin burden for sparkies.<br>

Simplifying safety-related admin and thorough preparation with digital safety checklists means electricians can focus more on their core tasks while keeping compliant with safety regulations.

It can be easy to become complacent on a job site, especially when paperwork becomes overwhelming and distracts workers from the risks, but onsite safety should never take a holiday.


1. https://data.safeworkaustralia.gov.au/insights/key-whs-stats-2023
2. https://www.jobsandskills.gov.au/sites/default/files/2022-01/34%20Electro%20%26%20Telecoms%20Trades.pdf
3. https://www.jobsandskills.gov.au/publications/towards-national-jobs-and-skills-roadmap-summary/current-skills-shortages


*Plumber-turned-tech-entrepreneur Dan Pollard founded Fergus in 2012. Having done the hard yards as a plumber for over 20 years, he was determined to come up with an easier way to manage the end-to-end operations of his trades business. Dan has a passion for helping tradies realise their true potential and a wealth of knowledge when it comes to what it takes to run a successful trades business.*

# Electrical Comms Data news

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## VIRTUAL POWER PLANTS INSTALLED AT REGIONAL SCHOOLS

The WA Government's initiative to install virtual power plants (VPPs) at regional schools has reached the halfway mark, with the technology now in place at three schools in Geraldton and one school in Kalbarri.

VPPs are made up of a network of distributed energy resources, such as rooftop solar panels and batteries, which feed into and support the electrical grid.

Seven regional schools are participating in the project, which is being delivered by the Department of Education and Synergy and supported by the WA Government's Schools Clean Energy Technology Fund.

Education Minister Tony Buti said the VPPs would provide fantastic educational opportunities for staff and students.

"The Schools VPP Pilot Project will provide learning opportunities related to STEM education, including how energy is produced and used, as well as about technologies that help to create a more sustainable future," he said.

"Schools may also benefit from reduced energy consumption while supporting the electricity networks in Geraldton and Kalbarri."

The Schools VPP Pilot Project is currently in place at Geraldton Senior High School, Waggrakine Primary School, Champion Bay Senior High School and Kalbarri Regional District High School.

VPPs will soon be installed at the three remaining schools: Hannans Primary School, Kalgoorlie Primary School and O'Connor Primary School.

"I am pleased to see schools in Geraldton and Kalbarri given access to renewable energy resources through Synergy-installed batteries with their own solar PV systems," said Energy Minister Reece Whitby.

"Regional VPPs will inspire the next generation of energy leaders to explore new possibilities for WA's energy future."

More information about WA's Schools VPP Pilot Project is available on the Synergy website.

## LOW-ORBIT SATELLITES HELP OUT ELECTRICAL CREWS

SA Power Networks is now utilising Starlink — the low-orbit satellite communication system owned by Elon Musk's aerospace company SpaceX — to provided internet connectivity in areas where it was previously not available. The network said it is the first energy distributor in Australia to do so.

Internet connectivity is crucial to maintaining the electricity network, with crews using it to coordinate safe switching and other key tasks.

"Regional crews can now access consistent high-speed internet from anywhere at any time, making it faster and safer to carry out restoration and maintenance tasks and to keep the business and customers informed of their progress," said Paul Salter, Head of Powerline & Electrical Services at SA Power Networks.

As part of a pilot project last year, SA Power Networks fitted 11 vehicles with Starlink systems, Salter said. This included elevated work platform (EWP) trucks based at Wudinna, Port Pirie, Yorketown and Kingscote depots. "We're now moving to fit more than 150 of our vehicles with the technology by the end of 2024."

Because Starlink's thousands of satellites are positioned only about 550 km from Earth, the latency — ie, the round-trip data time between the user and satellite — is significantly lower than it is with traditional satellites, which are about 35,786 km away.

According to SA Power Networks, with a Starlink antenna attached to their vehicles, all crew members need is a clear view of the sky and Wi-Fi mode on their devices and they can receive faster internet than most people get in their homes (the speed is up to 500 times faster than the technology used in the past by the energy distributor).

Starlink enables constant contact with crews as they traverse the state, giving leaders peace of mind about their safety. This also means that real-time safety information is consistently available to everyone who needs it, especially during emergency response situations such as storms or bushfires.

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Images courtesy of Endeavour Energy.

*The Shell Cove community battery and associated electrical assets feature the artwork entitled Turtle Dreaming by Gamilaroi man Daren Dunn.*

## SHELL COVE COMMUNITY BATTERY LAUNCHED ON NSW SOUTH COAST

The NSW South Coast has gained its first community battery thanks to Endeavour Energy.

The Shell Cove battery is the second one to be installed in Endeavour's region. A further eight batteries are being delivered in the Campbelltown, Kiama, Liverpool, Shoalhaven, Wingecarribee and Wollondilly areas, and 44 more will be installed over the next 18 months as part of the Commonwealth Batteries for Household Solar Program.

"Endeavour Energy has been providing power to this region for more than 100 years, and as part of the energy transition we are excited to deliver clean, green storage to the South Coast of NSW," said Colin Crisafulli, General Manager, Future Grid & Asset Management at Endeavour Energy.

"The Shell Cove community battery will help customers save on household electricity costs and reduce their household carbon footprint. Community batteries will also help to lower costs for customers across our entire region by improving the efficiency of the network."

Endeavour will partner with Origin Energy on the battery trial, with Origin providing the platform for customers to participate. Origin will also orchestrate the energy stored in the battery, including dispatch to the wholesale market, and work with Endeavour to support electricity demand management.

"We're pleased to be working with Endeavour Energy on this battery project which will provide households in the Shell Cove community the opportunity to save on their energy costs," said Origin's Executive General Manager – Future Energy & Technology, Tony Lucas.

"Community batteries allow people to share in the benefits of battery storage, whether they have solar panels or not, without the upfront costs attached to purchasing a battery for their home. We look forward to people accessing this trial and reaping the benefits that come with harnessing renewable energy."

Endeavour Energy has proposed a further 32 community batteries.

## IMMERSIVE VR TRAINING FOR ELECTRICIANS

Siemens is collaborating with 3D software platform BILT to provide immersive, step-by-step training for electricians.

The two companies have designed their electrical instruction guides in the form of spatial models for Apple Vision Pro, Apple's 3D camera.

"This is a great example as to how we are maximising digitalisation to enable the next generation of electricians," said Andreas Matthé, CEO Electrical Products at Siemens Smart Infrastructure.

"The ability to pick a digital representation of electrical equipment and work with it in the physical space in front of you transforms the educational experience, creating a safer, low-cost and innovative way of learning."

Via Apple Vision Pro's ultra-high-resolution display system, BILT provides users with a photorealistic digital twin combining the real and digital worlds. Users can perform natural, intuitive gestures with their eyes, hands and voice to interact with each element of the product, enlarge or minimise parts, and see animated step-by-step assembly instructions.

"Closing the skills gap and empowering the next generation of electricians is what we at Siemens aim for. By partnering with innovative companies like BILT, we are revolutionising the learning experience," said Siemens Chief Technology Officer Peter Koerte. "We are excited to welcome BILT as the newest partner in our Siemens Xcelerator ecosystem — further expanding our transformative workforce offerings together."


*A man wearing an Apple Vision Pro next to a Siemens P5 power panel. He is looking at a digital overlay of BILT immersive instructions including a 3D rendering of the panel and a text window.*

"Siemens is an industry innovator," said Nate Henderson, Chairman and CEO of BILT. "They're making it possible for apprentices and new electricians to upskill faster, install with confidence and follow safety guidelines more easily. BILT for Apple Vision Pro enables them to provide tactical and intuitive training that fits the needs of a new generation of learners."

## AMPCONTROL AND SIEMENS PARTNER ON RENEWABLE ENERGY SOLUTIONS

Ampcontrol and Siemens have announced a collaboration agreement to work on technology solutions for battery energy storage and grid applications in the Australian renewable energy market.

The two organisations already have a history of working together on major energy and renewable projects. Under the new agreement, Ampcontrol will become the exclusive Australian supplier for solutions designed around Siemens' SINAMICS S120 inverters. These inverters provide virtual synchronous generator functionalities for system strength and grid stability in the network.

"We have great respect for Siemens. Not only do they bring benchmark technology to the market, but they are also committed to providing the right-fit solutions that match some of the critical needs of our industries," said Rod Henderson, Ampcontrol Managing Director & CEO.

"The influx of renewable energy sources in Australia means the greater the challenge for stable and sustainable storage and transmission solutions. Our collaboration with Siemens will ensure that we can deliver these solutions to our customers quicker than we have ever been able to, helping industry to decarbonise and help make net zero a reality."

The collaboration is intended to produce innovative, custom solutions to complex problems, with the ultimate goal of decarbonising industry. Ampcontrol was recently named as one of Australia's top 10 Most Innovative Manufacturers for 2024 by @AuManufacturing.

"It's great to formalise the relationship with Ampcontrol, who we've worked with for many years," said Darryl Kaufmann, Head of Siemens' Digital Industries Division in Australia and New Zealand. "This comes at a critical time for the renewable energy sector and the energy transition. A successful energy transition requires collaboration — especially to scale up and meet our net zero commitments.

"It also requires innovative and versatile thinking, which is supported by digitalisation and automation," Kaufmann said.

Image Supplied.

*(L-R) Darryl Kaufmann, Rod Henderson and Peter Halliday in the Ampcontrol workshop in Tomago, NSW.*


## Power and control cables

ÖLFLEX — invented by LAPP — is a flexible multiconductor control cable designed to be used by electrical engineers and contractors in a wide range of industrial applications.

ÖLFLEX CLASSIC 110 is a number-coded multiconductor power and control cable that has been engineered and tested to be oil resistant, coolant resistant and chemical resistant.

ÖLFLEX cables can withstand dry, damp and wet conditions, therefore saving money on downtime and lost production.

ÖLFLEX 110 is now also rated for drag chains, including travel distances up to 5 m, up to 1 million bending cycles, dimensions from 0.5–2.5 $mm^2$ and 2–7 conductors.

Backed by LAPP Australia's local service team, the highly flexible cables have been ruggedly deployed in fixed, occasional flexing and power chain applications around the world.

With their wide range of resistances, wide temperature rating and choice of standardised lengths or individual cuts, the cables are suitable for most industrial applications.

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## Miniature inductive sensors

wenglor sensoric group's series of inductive sensors in miniature housing are specially designed for detecting metal objects in tight installation situations. The compact D3 and M4 sensors have a housing length of 22 mm.

With stainless steel housing 316L, an IP67 degree of protection and temperature resistance in the range of –25 to +70 °C, the sensors are robust and durable. High performance is supported through increased switching distances of up to 1 mm and a switching frequency of 3000 Hz. The optional PNP/NPN and NO/NC variants enable simple integration into existing systems.

The eight sensors with PUR cable connection that have been available to date are now each complemented by a variant with pigtail cable, so the range of applications has expanded to a total of 16 inductive sensors in miniature housings.

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## Miniature circuit breakers and RCBOs

Siemens MCBs and RCBOs are comprehensive circuit protection solutions, fostering safety and reliability in industrial and commercial environments. With their innovative design, these devices offer rapid response to electrical faults, helping prevent damage and downtime due to overloads, short circuits and earth faults.

The MCBs offer protection against overcurrent, while RCBOs add a layer of defence against residual currents, crucial for preventing electrical shocks and fires. Their compact, energy-efficient design facilitates easy integration and reduces operational costs, enhancing system longevity and safety. As Siemens' master distribution partner in Australia, APS Industrial provides exclusive access to these advanced circuit protection technologies.

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# AVOIDING ANOTHER BLACK SUMMER

Will Wright, RMIT University

*A power pole with four insulators.*

Australian engineers have developed an innovative material designed to make power-pole insulators resistant to fire and electrical sparking. Their invention promises to prevent dangerous pole-top fires and reduce blackouts.

Pole-top fires pose a major challenge to power providers and communities worldwide. In March 2024, 40,000 homes and businesses in Perth lost power as a result of this type of fire.

The 2020 Royal Commission into National Natural Disaster Arrangements found that power outages experienced by 280,000 customers from various energy providers during the 2019–2020 Black Summer bushfires were mainly triggered by events involving insulators and poles.

These fires can occur when consecutive hot, dry and windy days are followed by damp and misty conditions, according to RMIT University Vice-Chancellor's Postdoctoral Fellow Dr Tariq Nazir.

"Dust and pollution builds up on powerline insulators, which enables electricity to spark and heat metal fixtures that can cause wooden power poles to catch fire," he said.

Nazir, from RMIT's School of Engineering, said power utilities wash insulators on overhead powerlines as a vital maintenance procedure to prevent problems like contamination and electrical sparking, which can cause pole-top fires and power outages.

"Our proposed silicone rubber composite material offers a potential solution that could save power companies time, maintenance resources and ultimately money [by preventing] damage to their assets," he said.

As well as silicone, the composite material comprises chopped fibreglass, aluminium hydroxide and a type of clay derived from volcanic ash as additives.

In collaboration with researchers at the University of New South Wales, Nazir has developed the material at the lab scale. The team's results and analysis have been published in the international journal *Advanced Composites and Hybrid Materials.*

"Our innovation could serve as a protective coating or paint for ceramic and glass insulators, providing extra defence against envifire-retardant paint that is already commercially available in Australia.

ronmental factors such as moisture, pollution and fire," Nazir said.

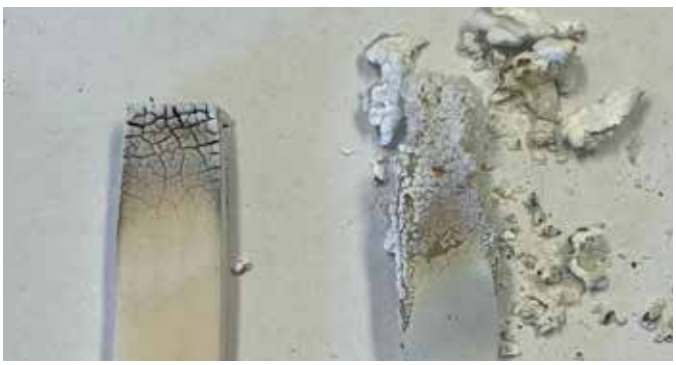
"We are keen to engage with fire-retardant coating manufacturers, electrical utilities, electrical insulation designers, manufacturers of electrical insulation products and regulatory agencies to further develop and prototype this work."

Nazir said the research was novel as it explored the flame retardancy of insulator materials. "Others are working mainly in electrical discharge resistance of material," he said. "I am trying to achieve both sides, whilst maintaining the required electrical insulation level of composites."

With the help of prospective partners, the team has plans to transition to larger-scale production processes for commercial applications as well as conducting more comprehensive durability testing under simulated outdoor conditions.

"Application-specific testing will assess suitability for various scenarios, and integration with existing systems will be explored," Nazir said.

Nazir and his colleagues are behind another fire-protection innovation co-developed with the company Flame Security International — a fire-retardant paint that is already commercially available in Australia.



Supplied by the research team.

*Side-by-side comparison: The team's proposed power pole insulation material (left) next to silicone following a fire-resistance experiment.*


## Power MOSFETs

Toshiba has added power MOSFETs with high-speed diodes to its latest-generation DTMOSVI series with a super junction structure. The first two products, TK042N65Z5 and TK095N65Z5, are 650 V N-channel power MOSFETs in TO-247 packages.

Applications include industrial equipment, switching power supplies (data centre servers, communications equipment, etc), EV charging stations, power conditioners for photovoltaic generators and uninterruptible power systems.

The new products use high-speed diodes to improve the reverse recovery characteristics important for bridge circuit and inverter circuit applications. Against the standard DTMOSVI, they achieve a 65% reduction in reverse recovery time and an 88% reduction in reverse recovery charge, according to values measured by Toshiba.

A reference design, '1.6 kW Server Power Supply (Upgraded)', that uses TK095N65Z5 is available on Toshiba's website. The company also offers tools that support circuit design for switching power supplies.

***Toshiba (Australia) Pty Ltd***
*www.toshiba.com.au*

## Network cabinet

R&M has expanded its Freenet cabinet system with the Freenet Superior line, a heavy-duty version for data centres.

Freenet network cabinets are based on a uniform frame construction in accordance with the 19″ scheme. The base frame can be upgraded with cross rails to the Superior version with a load capacity of 1500 kg — this means the cabinets are suitable for installing a larger number of heavy devices.

The modular system makes it possible to flexibly plan infrastructures in computer rooms and adapt them to new requirements. Areas of application are company, edge, modular and colocation data centres.

Features include electronically controlled and mechanically operated door systems for containments, and roof elements for corridors that are available with a lowering mechanism, which reacts automatically in the event of a fire. Air guide plates for the individual cabinets can be used to separate cooling air and waste heat.

Available in widths of 600 and 800 mm and depths of 800, 1000 and 1200 mm, the Freenet cabinet racks are suitable for high cabling density. With a height of 2.27 cm, 48 height units can fit inside.

***R&M***
*www.rdm.com*

## Security system

The Bticino Classe 300EOS is a connected video door entry system that allows for full home automation, with 5″ vertical LCD touch-screen display, built-in Alexa voice assistant, and remote access and control via smartphone using the Home and Control app. It has a 4–50°C operating temperature and 1280 x 720 resolution.

The system includes a physical key for door lock release, as well as capacitive keys for control of the main video door entry functions such as hands-free communication and entrance panel activation/camera scrolling. There is also the option to customise a 'Favourite' key for the most frequently used actions.

The unit is designed for wall-mounted installation using the supplied bracket.

***Legrand Australia P/L***
*www.legrand.com.au*

# How MTDCs can help address today's data centre power challenges


CommScope has reported that for the first time in the history of the data centre industry, the ability to deliver power to the right place and at the right price can no longer be guaranteed. Three primary factors can challenge a data centre's plans when it comes to power:

## Power supply constraints

Sometimes, the forecasted demand for data centre power is enough to prompt governmental action, as when, following alerts from energy providers, the Office of the Mayor of London (UK) published a briefing paper describing a rapid influx of requests for new electricity connections throughout West London. Most new requests were from data centre operators seeking to co-locate adjacent to fibre-optic cables that pass through the region along London's M4 corridor, home to many high-tech companies and one of the largest digital tech workforces in the country.

## Politics at hand

Recently, Ireland has become a hotbed for data centre building activity, but this success is a double-edged sword. From 2015 to 2022, the power consumed by data centres in the Republic of Ireland increased by 400%, representing nearly 20% of all power generated in the country in 2022. Now, Ireland's government must balance its leading position in the global data centre industry with its responsibility to supply energy to its citizens and protect the environment.

In Eastern Europe, the political decisions that have led to the conflict in Ukraine have had a huge impact on the region's data centre industry.

## Social demography impacts

The third external lever affecting power availability and affordability for data centres is a shift in the world's population centres. For many years, investing in a select number of markets in the United States and Western Europe was the way to go. The US offered data centre operators the conveniences of a common language, regulatory system, supply chain routes and a history of delivering large-scale CapEx builds.

It can be difficult to truly grasp the challenges awaiting hyperscale and cloud providers looking to grow their footprint.

Based on findings from across the APAC region, it is clear that localised growth in data, population and 5G delivery demand is outpacing growth of data centre capacity. This suggests that aggressive build initiatives—at both the government and private levels—are needed if data centre capacity is to keep pace with the population and demand for more data.

## The role of the MTDC: as reported by CommScope

Given the costs and uncertainties inherent in local power supplies, political instabilities and shifting demographics, data centre operators are rethinking their vertical integration strategies and the wisdom of building their own facilities. As a result, more cloud-based and hyperscale operators are opting instead to partner with multi-tenant data centres (MTDCs) that have existing capacity around the world.

MTDC operators are real estate savvy and are optimised to satisfy tenants' evolving demands for world-class white space and reliable and affordable power. Perhaps more importantly, MTDC facilities are located in prime metro areas — perfect for cloud-based and hyperscale operators that need to support low-latency and ultralow-latency mobile edge compute instances for 5G, Industry 4.0 and IoT applications. Best of all, these facilities already exist, enabling larger data centres to roll out services quickly and easily with a high and faster return on investment.

COMMSCOPE®

**CommScope Technologies Australia Pty Ltd**
**www.commscope.com**

# PROTECTING WILDLIFE FROM ELECTRICAL ASSETS — AND VICE VERSA

At a time when ESG (environmental, social and governance) principles are of increasing relevance to modern businesses, biodiversity risk is a key consideration for industry.

Electricity distribution is no exception. While overhead lines are cost-effective and less carbon-intense than underground cable, the exposure of high voltage to the environment introduces a risk of electrocution to wildlife. Managing that risk is the prerogative of electricity distribution businesses, preserving their social license to operate and allowing them to deliver an essential service in a safe and reliable manner.

Fortunately, outages caused by wildlife interaction with assets are largely preventable and are accounted for by modern switchgear manufacturers. Organisations such as NOJA Power provide mitigation techniques to both reduce biodiversity risk and improve asset reliability.

This article explores four key techniques for mitigating biodiversity risk through technical specification of switchgear.

## The impact

Fundamentally, mitigating biodiversity risk is accomplished by introducing barriers between exposed high-voltage conductors and wildlife contact. Wildlife that bridges the gap between an earth plane and a high-voltage terminal introduces a short circuit, causing power to flow through the short circuit.

Faults that occur on switchgear due to wildlife incursion can destroy the asset. Barrier techniques reduce the likelihood of a short circuit occurring, resulting in less biodiversity risk, less outage risk and improved asset reliability.

Since most mitigation techniques are highly cost-effective, NOJA Power Switchgear's installation philosophy is that animal guards should be the de facto standard for installations.

## Bird guards

Bird guards are electrical insulating covers for the exposed terminals of a high-voltage asset. These are installed after the overhead lines are terminated onto the equipment, providing a mechanical barrier between the high-voltage terminal and the outer environment.

While they are not considered a safe isolation for lines operators, they reduce the likelihood of animals bridging the gap between the earthed asset, getting over the bushing sheds and contacting the high-voltage lines or terminals.

Bird guards are available for all terminal types, including surge arrestor terminals and voltage transformer terminals. A comprehensive mitigation strategy includes coverage of all terminals. As an example, NOJA Power switchgear has bird guard types for all exposed terminations on a typical high-voltage installation, for load break switches, reclosers, surge arrestors and voltage transformers.

## Covered conductor cable tails

It is industry practice for the connections between the overhead lines and a pole-mounted asset to be made using a conductor that is covered with an insulating medium, such as XLPE.

Like bird guards, this covered conductor approach does not provide operator-safe insulation, because it lacks an earth screen — but it does provide major risk mitigation for animals bridging the gap between conductors or a conductor and the earthed asset.

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## Animal climbing guards

Animal climbing guards are a metal sheath installed near the base of the power pole installation. This sheath reduces the likelihood of animals successfully climbing the pole and contacting high-voltage terminals.

These are a simple intervention asset that can be installed in both new and legacy installations.

## Cattle guards

In some regions, local OH&S regulations encourage installation of switchgear controllers low enough on a power pole to remove the need for a ladder. This approach reduces fall risk for operators, but introduces a risk of larger animals contacting the equipment.

Bringing the controller down to pedestrian height in rural areas can make the controller become a bovine scratching post — leading to damage of the control cables or communications accessories. To combat this, a cattle guard is mounted on the base of the control cubicle, providing mechanical protection for the cable entry points to the controller.

## Conclusion

Biodiversity risk is a key consideration for any organisation reliant on managing electricity distribution assets. The risk considers both asset reliability outage risk and the impact on wildlife. Both these aspects impact the bottom line, whether through direct loss of productivity or through social licence to operate.

Luckily, mitigations of this exposure are cost-effective, reliable and easy to implement, and modern switchgear manufacturers can supply equipment to address the risk.

Given the minor relative cost to an equipment installation, NOJA Power recommends that animal guards are the default configuration for any installation. For more information, visit www.nojapower.com.au.

This is a common source of confusion for newcomers to switchgear specification, as the cable tail insulation level does not need to match the insulation requirement of the asset. For example, a 38 kV installation may only need cables insulated to 11 kV. The cables are not being used as a working isolation for operators; instead they only provide a mechanical barrier against animal contact.

Installing cables insulated to full network voltage is not practical in an overhead connection scenario, but the 11 kV covered conductor is generally sufficient for most applications and provides appreciable mitigation for biodiversity risk.

iStock.com/ Peter_Virag


## Battery energy storage system

Schneider Electric's battery energy storage system, BESS, is the foundation for an integrated microgrid solution driven by the company's controls, optimisation, electrical distribution, and digital and field services. BESS is offered as a 20-foot NEMA 3R enclosure that is AC coupled and available from 250 kW–2 MW in 2 h and 4 h configurations.

Comprising battery modules, battery racks, a battery management system, power conversion unit and controller, BESS has been tested and validated to work as an integral component with Schneider Electric's microgrid systems. It is also integrated into the company's software suite, which includes EcoStruxure Microgrid Operation and EcoStruxure Microgrid Advisor.

Full integration capabilities enable multiple BESS units to function as a unified entity, encompassing inverters, batteries, cooling systems, transformers, safety features and controls. Designed for fire safety, the solution is fully certified and compliant, using ANSI/UL standards for deployment across multiple geographies.

BESS offers bidirectional connectivity to the grid, providing the flexibility to operate as either grid-connected or off-grid. With the capacity to store energy for immediate access during outages, the unit can deliver up to 2 MW of power when needed. Services and support are available throughout the lifecycle of the product.

***Schneider Electric***

*www.se.com/au*



## Diagnostics tester and test adapter for AC charging stations

Gossen Metrawatt's PROFITEST H+E EXPERT CHECK is a diagnostic tester corresponding to measurement category CAT III 300 V for standard-compliant functional testing of AC charging stations in accordance with DIN EN/IEC 61851-1 (VDE 0122-1). The handheld tester enables electricians to test the functionality, electrical safety and personal protection of single- and three-phase AC charging points in charging mode 3 on a type 2 socket or a permanently connected type 2 cable.

The device provides standard-compliant testing of PE interruptions with a graphical display of measured values. Its functional range includes the verification of vehicle states A, B, C and D; phase tests and phase sequence tests; diode testing; and evaluation of the PWM signal for data communication. It aborts the charging process during short-circuit simulation and determines battery charging levels.

In combination with installation testers from the PROFITEST MF or PROFITEST MASTER IQ series, the device can also be used as a test adapter for electrical testing of charging infrastructure thanks to its measuring inputs and earthing contact socket. In addition to the charging function tests, relevant safety tests can also be carried out in this combination, including low-impedance continuity of the conductors, insulation resistance, tripping of the residual current circuit breaker (RCD/FI), 6 mA sensors, and loop and internal mains resistance. Measured values and test results are shown in plain text on the device display.

***Gossen Metrawatt***

*www.gossenmetrawatt.de/en*

iStock.com/Andrey Zhuravlev

# FOILING HACKERS IN THE SMART HOME ERA

Australian researchers have come up with an innovative camera design that obscures images beyond human recognition, thus preserving the privacy and security of those using smart home devices and Internet of Things technology.

Labour-saving gadgets like robotic vacuum cleaners, smart fridges and baby monitors are increasingly being embraced as part of everyday life. Known as sighted systems, these smart devices use vision to negotiate their surroundings, taking videos and images of our lives in the process.

Devices like autonomous vacuum cleaners form part of the Internet of Things — real-world objects that connect to the internet. While convenient, these smart objects can be at risk of being hacked by bad actors or lost through human error, with their images and videos then vulnerable to being stolen by third parties.

In a bid to restore privacy, researchers at the Australian Centre for Robotics at the University of Sydney and the QUT Centre for Robotics (QCR) at Queensland University of Technology worked on a new approach to designing cameras in which visual information is processed and scrambled before it is digitised so that it becomes obscured to the point of anonymity.

Acting as a 'fingerprint', the distorted images can still be used by robots to complete their tasks but do not provide a comprehensive visual representation that compromises privacy.

"Smart devices are changing the way we work and live our lives, but they shouldn't compromise our privacy and become surveillance tools," said Adam Taras, who completed the research as part of his Honours thesis.

"When we think of 'vision' we think of it like a photograph, whereas many of these devices don't require the same type of visual access to a scene as humans do. They have a very narrow scope in terms of what they need to measure to complete a task, using other visual signals, such as colour and pattern recognition," he said.

> SMART DEVICES ARE CHANGING THE WAY WE WORK AND LIVE OUR LIVES, BUT THEY SHOULDN'T COMPROMISE OUR PRIVACY AND BECOME SURVEILLANCE TOOLS – ADAM TARAS.

## A key point of difference

In a crucial step, the researchers were able to confine the visual processing that normally happens inside the camera's computer to within the optics and analog electronics of the camera, which exist beyond the reach of attackers.

"This is the key distinguishing point from prior work which obfuscated the images inside the camera's computer — leaving the images open to attack," said Dr Don Dansereau, Taras's supervisor at the Australian Centre for Robotics and Digital Sciences Initiative. "We go one level beyond to the electronics themselves, enabling a greater level of protection."

The researchers tried to hack their own approach but were unable to reconstruct the images in any recognisable format. They have opened up this task to the research community at large, challenging others to hack their method.

"If these images were to be accessed by a third party, they would not be able to make much of them, and privacy would be preserved," Taras said.

## Towards future security

Dansereau said privacy was increasingly becoming a concern as more devices today come with built-in cameras, and with the possible increase in new technologies in the near future like parcel drones, which travel into residential areas to make deliveries.

"You wouldn't want images taken inside your home by your robot vacuum cleaner leaked on the dark web, nor would you want a delivery drone to map out your backyard. It is too risky to allow services linked to the web to capture and hold onto this information," he said.

The team's approach could also be used to make devices that work in places where privacy and security are a particular concern, such as warehouses, hospitals, factories, schools and airports.

As their next step, the researchers hope to build physical camera prototypes to demonstrate the approach in practice.

"Current robotic vision technology tends to ignore the legitimate privacy concerns of end users. This is a short-sighted strategy that slows down or even prevents the adoption of robotics in many applications of societal and economic importance. Our new sensor design takes privacy very seriously, and I hope to see it taken up by industry and used in many applications," said Professor Niko Suenderhauf, Deputy Director of the QCR, who advised on the project.

Professor Peter Corke, Distinguished Professor Emeritus and Adjunct Professor at the QCR, who also advised on the project, said, "Cameras are the robot equivalent of a person's eyes, invaluable for understanding the world, knowing what is what and where it is. What we don't want is the pictures from those cameras to leave the robot's body, to inadvertently reveal private or intimate details about people or things in the robot's environment."

The research, 'Inherently privacy-preserving vision for trustworthy autonomous systems: Needs and solutions', has been published in the *Journal of Responsible Technology*.

## Mini weather station

The DLW-1243 Mini Weather Station is designed for the real-time monitoring of weather conditions and air quality in various sectors. Applications include IoT and agricultural technology, data management for multiple stations, marine affairs and ports monitoring, large-scale farming and industrial exhaust emissions monitoring.

The device's moulding-in-one design allows for easy installation on either straight or horizontal rods. It provides connectivity options through RS-485 and Ethernet (PoE) communication interfaces and supports Modbus RTU/TCP and MQTT communication protocols. This enables integration with the WISE controller for setting alarm notifications so that users can be promptly informed about critical conditions. When the unit is combined with ExoWISE, users can execute simple logic control settings, enhancing operational efficiency.

Equipped with CE, UKCA, RoHS and WEEE certifications, the DLW-1243 has a mini automated surface observation area with minimised sensors placed on PCB for air quality index monitoring. The positive and negative pressure ventilation system is designed for precise data collection by maintaining airflow and turbulence. The device has IP54-rated protection against water ingress and a replaceable filter patch system that prevents dust and other particles from entering, making it suitable for harsh conditions.

***ICP DAS Co Ltd***
*www.icpdas.com*

## Rack-based alarm unit

Omniflex's Omni16R rack-based alarm annunciator is an upgrade path for various obsolete legacy alarm units, such as Highland Electronics/Rochester Instruments MPAS 90 and the PMS rack-based alarm units. It can handle up to 320 alarm points in a single rack and meets IEC61508 SIL-1 standards. It is also Emphasis-certified for use in the nuclear industry, which has its own stringent safety standards set by the Health and Safety Executive and Nuclear Decommissioning Authority.

The Omni16R is a direct replacement, engineered on the specifications of the MPAS 90 and PMS so it can fit seamlessly into existing panel space and use existing wiring. Furthermore, to add redundancy to the system, each 16-way alarm card on the rack has its own CPU built-in. This reduces single point of failure and means if a CPU fails, at the most only 16 alarms are lost, as opposed to hundreds.

When it comes to displaying alarm conditions, flexibility is key. This is why the Omni16R can be connected to anything from a single 320-way display to smaller distributed displays. Furthermore, the Omni16R can be interfaced to remote monitoring systems to provide 24/7 oversight of critical alarm conditions in real time.

To safeguard against future obsolescence issues, Omniflex provides lifetime support for its products and full technical and service support for all products sold over the past 60 years. The company has a full in-factory repair and refurbishment facility capable of maintaining the entire range of products manufactured and has expert engineers who can provide support from each of its locations in Australia, the UK and South Africa.

***Omniflex (Australia) Pty Ltd***

*www.omniflex.com.au*

## Low-voltage distributed energy resource management system

Itron has launched a low-voltage distributed energy resource management solution (LV DERMS) for the Australian market. The solution delivers a data-driven method for managing consumer energy resources (CERs), such as rooftop solar or battery storage, while maintaining network stability within the low-voltage network.

The system is designed to address the challenges of Australia's energy transition, particularly grid instability originating in the low-voltage network. It offers centralised control and visibility, including insight into the capabilities of CERs within the LV network and orchestration based on real-time understanding of state, forecast and constraints.

The solution uses GridQube's dynamic system state estimation (DSSE) engine for the validation of LV topology and real-time calculation of constraints and dynamic operating envelopes (DOEs). To forecast from high voltage to the premise, it uses the same Itron engines that provide real-time operational forecasts for the National Energy Market and the Wholesale Electricity Market. The system can validate premise-level DOE compliance in near real time within constrained areas of the LV network.

***Itron-Australasia Pty Ltd***

*www.itron.com*

CASE STUDY

# Wall of solar

Fenecon is a leading manufacturer of energy storage solutions, including systems for private households, commercial use, industrial purposes, energy providers and vehicle manufacturers.

Based in Deggendorf, Lower Bavaria, the company has been producing large container storage systems from electric vehicle batteries since 2017. Needing to expand its production as demand for its systems grew, Fenecon opened a new facility at the start of 2024. The CarBatteryReFactory site is located in Iggensbach, about 30 km north-west of Passau.

At the new facility, storage systems will be produced from zero-, first- and second-life vehicle batteries. In addition to the production site, the complex includes storage facilities, development laboratories and offices.

Fenecon planned to generate a large proportion of the energy for its new plant from renewable sources. The company was looking for suitable roof and facade surfaces that could generate solar power through photovoltaic modules integrated into the rear-ventilated curtain-wall facade. Fenecon's planners and contractors decided on a facade system by fischer BWM Fassadensysteme with securely fastened photovoltaic modules. The system was developed in collaboration with Dresden-based module manufacturer Solarwatt.

"The advantage [of solar facades] compared to roof and rooftop systems is that the winter yield of solar facades is higher while the electricity generation is also significantly improved in the otherwise less favourable months," said Benjamin Orths, who was involved in the project as International Product Manager of facade systems at the fischer Group of Companies.

Gaass Florian GmbH from Grainet, Lower Bavaria, was awarded the contract to carry out the work on the facade using Solarwatt's modules. In total, 552 Solarwatt vision GM 3.0 style glass-glass solar modules were installed on a surface of approx 1050 m², generating a peak output of 204.24 kilowatt peak (kWp). The solar modules have a general technical approval that allows them to be used for solar car park monitoring and facades without requiring additional securing.

fischer BWM Fassadensysteme supported the project managers in planning the facade, as well as developing a project-specific fixing solution. "This resulted in a completely secure system suitable in any area such as residential, office and commercial construction, as long as there is an anchor substrate," Orths said. "With our substructure for PV systems, pre-sealed surfaces can be used and existing facades can be utilised to generate renewable energy."

*Solarwatt PV modules permanently and securely fastened to the facade of Fenecon's new building.*

Image courtesy of fischer.

Fenecon's new plant has a steel structure. While the parts of the facade not used for solar energy feature an insulated cassette facade, the PV modules are anchored into the supporting structure by a substructure. Vertical carrier profiles serve as a base structure for the horizontal ATK 103 PV clasp profiles, which were fastened to the vertical profiles with drilling screws. The PV modules were then hooked into the open C-profile of these horizontal elements with pre-mounted clasps attached to the back.

"We made quick progress thanks to pre-mounting the clasps with special screws that precisely fit the horizontal profile," Orths said. The size (1780 x 1052 x 40 mm) and weight (25.5 kg) of the PV modules required comprehensive calculations that took into account the weight and wind loads as well as any necessary current regulations and standards.

The innovative design creates a streamlined appearance with no insertion tracks or brackets, as this type of architectural facade can simply be fastened with clasps. The resulting system is reportedly easy and convenient to install and disassemble as needed. fischer BWM Fassadensysteme described its facade as a permanent and restraint-free construction where modules are securely fastened and can produce energy for decades to come.

***Fischerwerke GmbH & Co. KG***
*www.fischer.de/de-de*

Image ©FENECON GmbH.

*The new production, development, logistics and office building of Fenecon in Iggensbach.*

# Power Supplies and BLDC Motor Drivers from Mean Well in TME

55 V DC variants

264 V AC variants

Mean Well, one of the leading manufacturers of power supply solutions in the world, has just launched a new, innovative **VFD product series** intended for **the control and power supply of industrial brushless direct-current (BLDC) motors**. BLDC motors offer many advantages over traditional brushed motors, such as smaller size and weight, better efficiency, longer lifespan, and easy control.

The VFD series includes eight devices **with power ranging from 150 to 750 W**, operating at **AC or DC** input voltage (depending on the model). The products can be used for **controlling the rotational speed of a motor** as well as **braking**. The parameters are adjusted by means of a separate control card. Thanks to their fanless design, the products ensure noise-free operation. The AC variants are equipped with an integrated **power factor correction circuit**. The products can be open frame (in the form of a PCB) or enclosed in a perforated metal housing.

The VFD products can be used in applications utilising BLDC motors in **fans, pumps, automatic doors, smoke extractors and medical devices** or even in fitness equipment and electric tools. Owing to their relatively high power, they can also be successfully applied in **automated guided vehicles (AGVs)**.

| Specification | |
|---|---|
| Type of converter: | BLDC motor driver |
| Manufacturer series: | VFD |
| Input voltage*: | 20...55 V DC or 90...264 V AC |
| Power*: | 150...750 W |
| Output current*: | 0.8...10 A |
| Number of outputs: | 1 |
| Body dimensions*: | from 101.6x50.8x28.6 mm to 150x100x41 mm |
| Operating temperature*: | -30...70°C |
| Mounting*: | to be built-in |
| Protection: | short circuit protection (SCP) |
| Efficiency: | 91.5...93% |
| Type of housing: | 232G, 249E or 270E |

Text prepared by Transfer Multisort Elektronik Sp. z o.o.

TME® Electronic Components

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**www.tme.com/au/en**

# KEEPING PACE WITH A COMPLEX GRID

iStock.com/Amorn Suriyan

With more renewables coming into the energy market, the complexity of grid integration requirements is increasing. This means that high-voltage (HV) switchboards, control panels and switchgear need to be carefully designed to meet safety and performance criteria for new and demanding applications.

"Switchboard and switchgear requirements differ from state to state, so it's important that any supplier understands the technical requirements for the region they are working in," said Steve Bell, Managing Director at Clean Tech Controls, a Sydney-based company specialising in the integration of renewable energy technologies across Australia.

High-voltage connected sites, which include anything above 1000 V, according to Australian standards, often have different requirements set out by each distributed network service provider (DNSP) in addition to each state's Service Installation Rules.

"In well-designed high-voltage installations, you have to have more electronics, control, measurement and communication devices in the switchboard, all working together in a reliable way," Bell said.

## High-voltage switchgear considerations

According to Bell, switchgear for any application should be tailored to suit each project, but there are a number of features that may need to be included in the HV switchboard or control panels:

- Protection relays, which measure the power and disconnect the fault before it can cause injury or damage.
- Supervisory control and data acquisition (SCADA) panels, SCADA gateways, timeclocks, power supply inverters, programmable logic controllers (PLCs) and remote terminal units (RTUs) — allowing the asset owner to communicate with the asset and monitor its status.
- Integrated uninterruptable power supply (UPS) panels to provide power to the switchboard and control panels if the grid power is lost.
- Rapid earth fault current limiter (REFCL) compatibility, which is a special requirement in some states and regions.
- Factory testing, to ensure quality and reliability.

"At our Tempe facility in Sydney, we perform factory testing on switchgear, including primary injection testing of voltage transformers (VTs), current transformers (CTs), bus resistance and secondary injection testing of the protection relay," Bell said.


Image courtesy of Clean Tech Controls.

*Switchboard and switchgear requirements differ from state to state, so it's important that any supplier understands the technical requirements for the region they are working in.*

## Renewable energy assets

Renewable generation assets such as solar and wind farms often have complex grid integration and control requirements for high-voltage switchgear.

"Solar and wind farms tend to be more complicated than standard ring main units (RMUs) due to the grid integration and control requirements, so having an experienced switchgear provider is even more crucial, both for renewables and for other purposes," Bell said.

Often the DNSP has specific control over the assets involved. "This is normally to monitor or remotely disconnect the site, but could also involve dynamic export limits or other more specific types of control," Bell explained.

Renewable energy projects such as wind, solar or battery installations often trade on the Frequency Control Ancillary Services (FCAS) market, which has its own specific requirements. FCAS is a process used by the energy market operator to maintain the frequency of the system, by injecting or reducing energy to better manage supply and demand.

These renewable generation assets are being used to supply green power to sites including manufacturing, mining, infrastructure and construction, as Australia accelerates its transition to net zero.

## Safety features

"For high-voltage applications, we can build indoor- or outdoor-rated enclosures to house the switchgear and control panels on one skid," Bell said.

For further safety, Clean Tech Controls can construct the switchboard with either upward or downward arc venting. This is because, when there is a fault, a lot of energy needs to be dissipated through the switchgear — often as a fireball — and this must never be allowed to erupt close to where someone might be standing, so a release either above or below is required.

"For upward arc venting, we put a pressure release plenum on top of the enclosure, or for downward arc venting there needs to be adequate space in the pit below the switchboard to meet the requirements for dissipating the pressure," Bell explained.

Clean Tech Controls said it supplies switchboards with arc front lateral rear (AFLR) ratings, meaning a person can safely be standing in front, at the side or behind the switchgear if there is a fault.

# WHY POWER NETWORKS NEED A 'SMOKE ALARM' SYSTEM

Scientists at RMIT University have designed an early fault detection system (EFD) for powerlines that has been adopted in North America, Europe and Australia.

The system helps to prevent bushfires and blackouts by detecting and locating faults before they escalate. "You can think of it like a smoke alarm for the power network," said lead RMIT researcher Professor Alan Wong.

"If you place enough sensors across the network, these sensors or alarm system will send out an alert when it thinks there's a certain risk in the network."

The EFD system is included in several wildfire mitigation plans in the US and Canada.

Wong is CEO of Melbourne-based company IND Technology, which has commercialised the invention and is seeking funding from the Australian Government to assist with rolling out the EFD system across all single-wire earth return (SWER) networks around the country over the next decade. This amounts to about 200,000 km of powerlines.

With 2500 units installed worldwide, the technology now monitors over 12,500 km of powerlines and has prevented more than 750 failures and potentially saved lives, according to RMIT. The technology can cover up to 5 km of powerlines with two units.

"According to a report by Adept Economics that we commissioned, every dollar spent on the EFD technology would generate $4.70 in expected benefits for Australia, in terms of the benefits from preventing bushfires and blackouts," Wong said.

Wong described the system as "a passive-listening device".

"It listens to radio frequency signals travelling up and down powerlines. Some of these radio frequency signals are generated by failing assets on the powerlines. The EFD system uses the radio frequency information collected by the sensors to work out where and which equipment is failing."

The patented sensing method and data processing algorithm can identify the precise location of expected faults down to a 10 m section of a powerline, Wong said, enabling more proactive and cost-effective management of electricity network assets.

Network owners can use the technology to monitor every network asset 24/7, including during extreme weather when asset failures are likely to first appear.

On 7 February 2009, the town of Marysville in Victoria was devastated by bushfire. The fire was allegedly caused by a break in an electrical conductor on a power pole near a local sawmill.

Jenny Pullen, a Marysville fire survivor, said she welcomed technology that could help prevent bushfires. "We went to so many funerals," she said.

"The bushfire took a huge toll and there's still people who are trying to get over it and who will never get over it."

During a trial of the technology, the EFD system developed by Wong's team identified a failing conductor on Michael Thorne's property in Victoria's Porcupine Ridge.

"When I'm driving around the property, I'm looking at the stock or at the pasture; I'm not looking up at the powerline which is well above me, and it would be pretty hard to spot a broken strand even if you were paying a reasonable amount of attention," Thorne said.

"The risk is that the powerline breaks, drops to the ground and starts a grass fire. Grass fires can move very quickly, faster than a bushfire typically because the wind's not interrupted as it flows across the grass and the fire could have swept up to the house, through the sheds and then beyond to adjacent farms very rapidly.

*Professor Alan Wong.*

"In addition to the houses lost in a major fire, there's the lives lost and lives disrupted. Fire can rip apart communities; it can destroy so much that matters," Thorne said.

"The idea of a fire ripping through my community is obviously deeply distressing and … I'm keen to celebrate any tools that we have that can help reduce the risk of the kind of devastation we have seen across towns like Marysville and others in Victoria."

Wong was pleased that his team had been able to discover the failing conductor on Thorne's property, thus preventing a potentially catastrophic fire.

"We always tell people that this technology can potentially save lives and prevent fires. I think in Michael's example it captured all this essence," he said.


## Rugged tablet

Getac's ZX80 is an 8″, Android-powered, fully rugged tablet designed for challenging environments such as utilities, manufacturing and transportation.

Its lightweight form factor (590 g), wide operating temperature range (-29 to 63°C) and 1000-nit 16:10 aspect ratio screen make it suitable for tasks such as forklift truck operation and unmanned aerial vehicle (UAV) control. MIL-STD-810H certification, IP67 certification and 1.8 m drop resistance further enhance its ability to stand up to intensive field work.

A configurable design offers flexibility, with key features including a dual SIM design (one physical SIM and one eSIM) that allows for rapid switching between carrier networks and Wi-Fi 6E 802.11ax, Bluetooth v5.2 and optional dedicated GPS offering rapid data transfer and location positioning capabilities. The ZX80 can also be configured with 4G/5G long term evolution (LTE), near field communication (NFC) and a barcode reader to fit different applications as needed.

The ZX80's Qualcomm QCS6490 processor can perform at lower power levels, making it appropriate for a range of Internet of Things (IoT) industrial field applications and commercial use cases. The tablet is also AI-ready, using Qualcomm's AI engine to offer on-device machine learning and the ability to run AI use cases while maintaining battery life. The ZX80 incorporates 12 GB LPDDR5 memory and comes with Android 13 pre-installed.

For users who need full-shift functionality while working away from charging facilities, the ZX80 is compatible with Getac's hot-swappable battery technology, enabling the quick switching of additional batteries while in the field.

***Getac Technology Corp***

*www.getac.com*


## Installation tester

Gossen Metrawatt has expanded its METRALINE series with a multifunctional installation tester. METRALINE MF, certified for CAT III 600 V/CAT IV 300 V, enables all required tests in electrical systems and installations in accordance with the current DIN VDE 0100-600 and DIN VDE 0105-100 standards.

The portable, battery-powered tester features a graphic colour display, easy menu navigation and support functions such as help images and audio signals.

The test spectrum includes low-resistance measurement with 200 mA and automatic polarity reversal; loop and mains impedance measurement with RCD; 3- and 4-pole earthing measurements; insulation measurements up to 1000 V; and RMS voltage measurement. Measurements of commercially available RCDs and RDC-DDs with 6 mA DC for electric charging points can also be performed.

Up to 1000 measurement values and test results can be stored in the large instrument memory and made available via the integrated METRAreport software for generating test reports. Regular firmware updates keep the installation tester up to date.

The METRALINE MF comes with a carry case, power supply unit and rechargeable batteries included.

***Gossen Metrawatt***

*www.gossenmetrawatt.de/en/*

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## UPS systems


CyberPower has launched its range of Smart App Sinewave uninterruptible power supply (UPS) systems in Australia. These devices adopt CyberPower's patented GreenPower UPS technology, which is designed to enhance operating efficiency, reduce heat generation, consume less power and save more energy costs than conventional UPS models.

CyberPower Professional Rackmount Smart App UPS systems have also been designed in compliance with environmental regulations so they can provide stable power to equipment, help users quickly grasp a unit's battery status and enable convenient viewing and monitoring of any system. They feature pure sine wave output, automatic voltage regulation and hot-swappable batteries.

Quick charging technology means the devices will stop charging automatically to prevent overcharging, thus extending battery life. The systems also enable users to turn off the LED, LCD and alarms. They have a low operating noise and all come with a multifunction, rotatable and tiltable LCD panel that can meet many different installation requirements and facilitate proper viewing orientation for users to monitor the system.

***CyberPower***

*www.cyberpower.com/au/en*

## High-current connectors

Designed to meet the demands of the renewable energy sector, including hybrid and electric vehicles and uninterruptible power supply systems, ILME MIXO modules are high-current connectors featuring 300 A and 1000 V ratings. These connectors are available in two variants: a crimp version for silver-plated contacts and a 90°-angled screw version for cable lugs terminals.

The crimp version has double frame slot modules for phase and protective earth (PE) connection, available in two sizes: 01 (regular) for 16–70 $mm^2$ wire cross-section conductors; and 01B (large) for 95–120 $mm^2$, with an increased current-carrying capacity.

The 90°-angled screw version has double frame slot modules for phase and PE connection designed with a special insulating plate and snap-in closing cover to provide an effective 360° finger-proof capability. The insulating plate can rotate and lock in with 90° increments around the module axis for maximum application flexibility. The feature avoids any accidental contact between any conductive element (side-by-side installation).

Both variants feature quick installation, with modules supplied pre-assembled, ready for snapping in the crimped connections. Their PE modules are equipped with a spring plate for direct bonding between the contact and MIXO frame, without additional assembly operation.

***Treotham Automation Pty Ltd***

*www.treotham.com.au*

CASE STUDY

# Meeting demand for off-grid power generation


Image courtesy of Isuzu Power Solutions.

*Dry Hire Sales Manager at Big Chief Hire Mark Foley.*

Adelaide business Big Chief Hire deals in dry hire machinery (that is, machinery that doesn't come with personnel to operate it) as well as a truck fleet.

Recently, the decade-old company has experienced a growing demand for off-grid power generation.

"At Big Chief Hire, we hire out heavy earthmoving machinery, trucks, scissor lifts and more," said Dry Hire Sales Manager Mark Foley.

"We never like to say we can't supply something just because it isn't in our core fleet just yet.

"Power generators are in high demand for civil engineering, as many locations have site huts or demountable buildings that require remote power with no grid in the area yet," Foley said.

To meet this need for generators, Big Chief Hire teamed up with Isuzu Power Solutions (IPS) to expand its hire offering.

"Isuzu Power Solutions generator sets are the first remote power solution product we've stocked," Foley said.

"The Isuzu name is well known in the industry and is popular with our customers, so it seemed like a safe bet to meet customer demand with IPS product when enquiries came in about remote power."

From its South Australian roots, Big Chief Hire has expanded into Victoria, Queensland and New South Wales, with further locations planned, including a depot in Perth flagged for the near future.

The business currently has a number of compact IPS GS020PTY 20 kVA/16 kWe (Prime) generator sets available for hire at hubs in Adelaide and on the Gold Coast.

## Addressing weather and noise

Powered by the Isuzu 4LE1 engine and with a rated voltage of 415 VAC/50 Hz, these 20 kVA generators sets are suited for use in powering construction sites and other mobile applications such as trade services.

The IPS generator sets feature all-weather canopies constructed from thick gauge steel with a powder-coated finish for heavy-duty, long-life operation.

"When we plan for our fleet procurement there is a strong research stage to gather information on viable OEMs and ranges of equipment — we also forecast as to what we may need to add to or remove from the fleet, which is vital to our procurement model," Foley said. "The generators need to be dependable enough to power the site without fail.

"The 20 kVA generator sets began as a bit of an experiment for us but have proven to be very popular."

To mitigate worksite noise pollution, IPS has designed its generator sets with sound-suppressant technology, redirecting both incoming and outgoing air through a series of sound-attenuated baffles.

This acoustic insulation throughout the canopy and crafted exhaust housings works to reduce noise, balancing high and low frequencies for a sound output rating of 51 dB at 7 m — quieter than the average conversation, according to Isuzu.

"We are now in the testing stage at the moment for trailer-mounted IPS generators, making them mobile from the get-go and broadening the range of purposes they can be used for," Foley said.

"We will also be expanding our offerings in the future with 37 kVA and 50 kVA IPS generators for more heavy-duty requirements."

## Preventing breakdowns

Foley said preventive maintenance was key to ensuring that equipment performs at peak efficiency, and vital to the smooth running of the company's hire process, which requires up-to-date service histories for regulatory compliance.

Much of Big Chief Hire's fleet and machinery is maintained by in-house technicians at its own depots, but the new generator sets are serviced by technicians at Northeast Isuzu in Adelaide.

"The most important thing customers look for when selecting dry hire equipment is the reliability of the product, because they want to access it quickly, do their job and not worry about it breaking down on them," Foley explained.

"When a customer rings to book equipment we coordinate with the workshop to have it cleaned and inspected before it can be handed to the customer, and ready to go.

"Our IPS generators are brand new and there's been nothing but positive feedback on them," he said.

***Isuzu Australia Limited***

*www.isuzu.com.au*

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# WHY INDOOR AIR QUALITY IS AN URGENT MATTER

In March 2024, industry leaders from more than 30 organisations gathered in Australia to discuss the science underpinning the need to prioritise clean indoor air.

The international experts, who were brought together by the Australian Academy of Science, the Burnet Institute and CSIRO, provided examples of research and advances in other countries. These include the adoption of regulations and standards in schools and public spaces.

Burnet Director and CEO Professor Brendan Crabb AC said the COVID-19 pandemic highlighted the need to better protect people from airborne viruses and improve indoor air quality interventions to reduce the health, social and economic impacts of transmissible diseases and airborne pollutants.

"Clean indoor air is a human right, just like clean water and clean outdoor air. It is a societal and occupational health and safety issue that is fundamental to our health and wellbeing, with major economic implications due to lost productivity and absenteeism," Crabb said.

"Australians spend 90% of our time indoors, but the air we breathe inside our public spaces — offices, schools and on public transport — is not always safe.

"Air quality has an impact on our health and wellbeing, but many of us have no insight into the air quality of the buildings we inhabit every day," he cautioned.

Australian Academy of Science Chief Executive Anna-Maria Arabia said there is clear scientific evidence that poor indoor air quality has significant detrimental impacts on human health.

"We have made vast improvements in relation to outdoor air quality in relation to monitoring and standards, but we now need to turn our attention to indoor air quality, given we spend 90% of our time indoors," she said.

"We have evidence-based technological solutions to improve air quality through monitoring, ventilation and filtration; now we need political leadership to implement these solutions."

Crabb pointed to studies showing that poor indoor air quality is linked to lower performance. "Multiple studies in classrooms and offices have shown that high levels of carbon dioxide, a marker of poor indoor air quality, is linked to reduced academic and work performance," he said.

"The good news is that we have the science and the engineering solutions available now to address these negative impacts. We can start by monitoring indoor air quality and working towards setting standards like we do for outdoor air.

"This needs to be coupled with greater awareness across the community and by policymakers of the benefits of clean indoor air," Crabb concluded.

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