Electrical Comms Data

ECD

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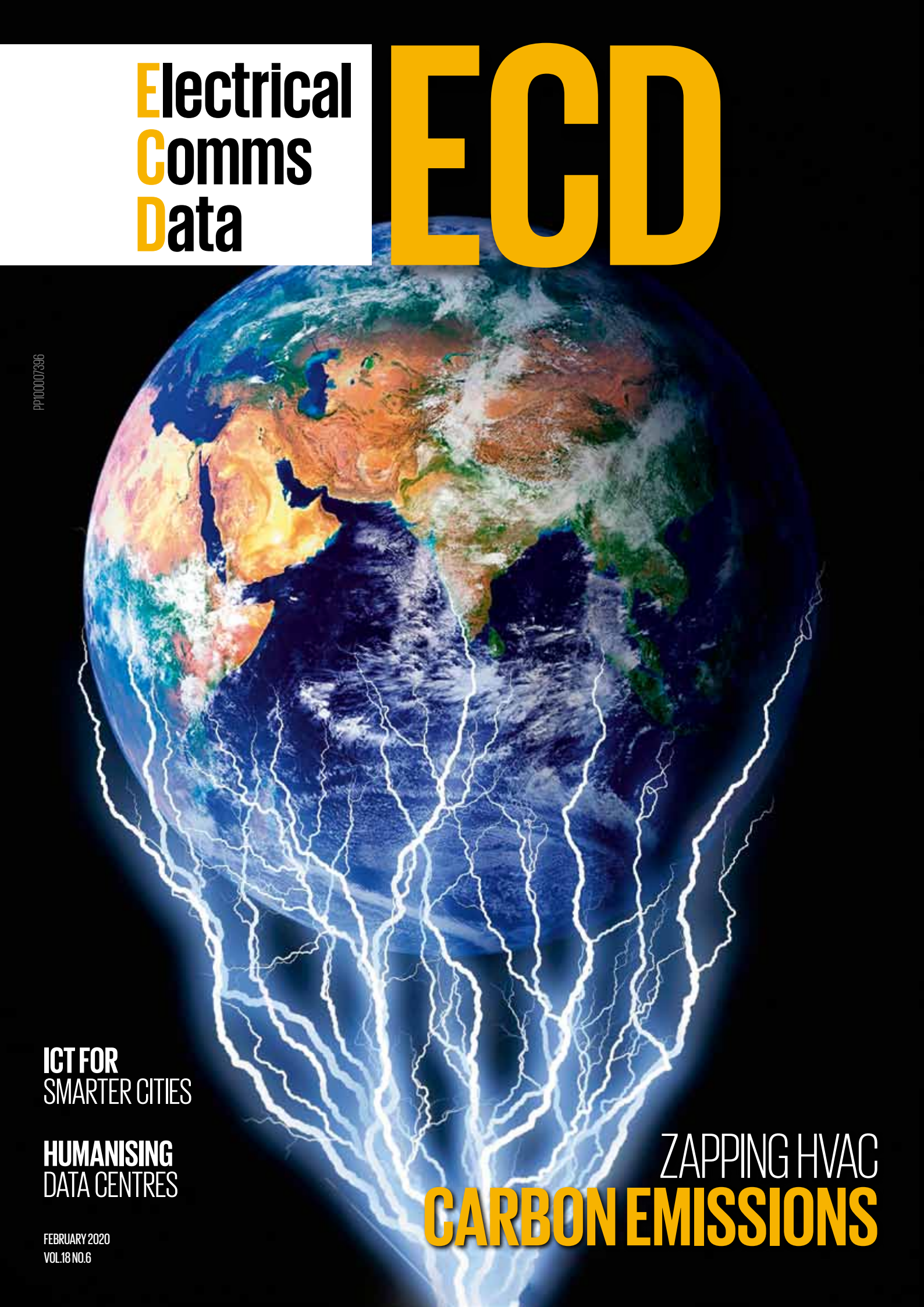

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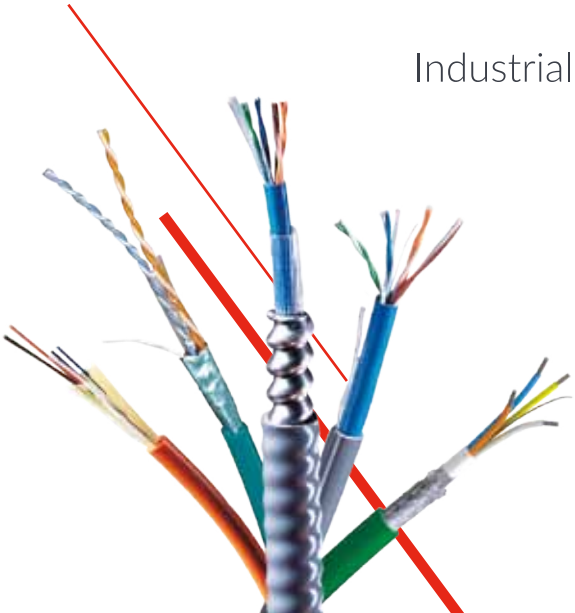

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FROM THE EDITOR

Welcome to the first edition of ***ECD*** for 2020, and I hope you have had a safe and restful Christmas break.

Many of us saw in the new year under a thick blanket of smoke, caused by bushfires of unprecedented ferocity raging across the country. Since the fires began, more than 8.4 million hectares have been burned, almost 2000 homes lost, and tragically, at least 26 people have died. These fires have also resulted in extensive damage to power transmission lines, with the New South Wales power grid coming under threat in January. This situation prompted the Australian Energy Market Operator to issue a forecast Lack of Reserve 2, calling on consumers to limit their energy use in order to reduce stress on the system.

Circumstances such as these inspire reflection on how we might mitigate threatened or actual loss of power in the years to come. According to the Australian Energy Market Commission, reform is needed so that the grid of the future can accommodate renewable energy, as well as avoid the need for significant new network investment.

With the HVAC&R sector being a particularly large consumer of Australia's energy — responsible for around 50% of peak demand on the electricity grid — this issue also explores initiatives that are designed to support an industry-wide energy transformation. Leading businesses and institutions are coming together to find new ways of integrating renewable technology with HVAC&R equipment, and ultimately lowering carbon emission output across the sector.

Amy Steed – Editor
ecd@wfmedia.com.au

REDUCING THE HVAC&R CARBON FOOTPRINT

Amy Steed

The Australian HVAC&R industry is a huge consumer of energy, with air conditioning and refrigeration alone accounting for 22% of the nation's entire electricity usage.

The industry is also responsible for around 50% of peak demand on the electricity grid, according to figures from the Australian Renewable Energy Agency (ARENA).

In an effort to lower these numbers, a new initiative led by the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) is aiming to help the industry transition to a low-emissions future.

Known as the Affordable Heating and Cooling Innovation Hub (i-Hub), the three-year project is designed to support energy transformation within the HVAC&R sector. It has a budget of $18 million, including cash and in-kind contributions of nearly $12 million from the participating institutions — CSIRO, Queensland University of Technology, the University of Melbourne and the University of Wollongong. ARENA has also provided $6.5 million in funding for the initiative.

The Australian HVAC&R industry is a large one. It consists of approximately 17,000 people, employed in more than 20,000 Australian businesses, which contribute 1.7% of GDP. i-Hub brings together leading businesses and institutions to develop an integrated approach to solving issues affecting the industry.

AIRAH will distribute funding to support a series of projects that demonstrate how renewable energy technology can be optimally integrated with HVAC&R equipment. It will also engage with a range of industry stakeholders to trial renewable energy technologies and illustrate how heating and cooling can be coordinated and controlled to provide demand response.

"The HVAC&R sector is a key focus for decarbonising the built environment. The sector provides a substantial and largely untapped opportunity for enhanced

demand response, load flexibility, renewable energy uptake and integration of various technologies," said ARENA CEO Darren Miller.

i-Hub is open to applications from industry participants who have suitable demonstration projects that require co-funding. It will develop capability for the HVAC&R industry to continue to innovate, beyond the project's three-year lifespan, by considering proposals under one of three activity streams.

Living laboratories

These will be spaces and buildings that facilitate the testing of innovative products and services — both from energy and user-experience perspectives. The 'living laboratories' will enable owners, suppliers, users and researchers to collaborate, create and reflect on alternative solutions for affordable heating and cooling.

Integrated design studios

This initiative aims to involve HVAC&R engineers right from the beginning of the building design process, because early collaboration between architects, HVAC engineers and other stakeholders is more effective in terms of delivering major cost and energy savings. The i-Hub Integrated Design Studios activity is largely focused on:

- increasing innovation at the conceptual design stage
- developing an evidence base of new zero energy buildings concepts
- supporting knowledge development of the next generation of building professionals
- influencing cultural practices across the design industry.

Buildings to grid data clearing house

Properly managing energy use and improving building operations requires access to accurate and detailed building data. However, such access to this data can be limited by a lack of open standards and trusted processes for the sharing of diverse data sets. One of i-Hub's goals is to curate the Australian Smart Buildings Data Clearing House, a single location for accessing a wide range of energy and building data. This will help to increase the quality and value of data sets, as well as empower Australian businesses to develop new data analytics services. The data will be implemented by building owners and property managers to save energy, improve efficiencies and reduce costs. It will also provide evidence to assist in decision-making and inform policy.

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> THE I-HUB PROJECT BRINGS A UNIQUELY CONCERTED EFFORT FROM THE HVAC&R AND PROPERTY INDUSTRIES TO USE THE DESIGN AND OPERATION OF AIR-CONDITIONING SERVICES AS A TOOL FOR SUPPORTING ONSITE AND LOCAL GRID RENEWABLES.

The i-Hub will focus on a series of projects in the area of healthcare, education and data centre sectors that have the potential to deliver hundreds of megawatts of demand response — from the i-Hub project's building owner participants — at a fraction of the cost of other approaches.

"The objective of i-Hub is to support the broader HVAC&R industry with knowledge dissemination, skills development and capacity building. By facilitating a collaborative approach to innovation, i-Hub brings together leading universities, researchers, consultants, building owners and equipment manufacturers to create a connected research and development community in Australia," said AIRAH CEO Tony Gleeson.

"The i-Hub project brings a uniquely concerted effort from the HVAC&R and property industries to use the design and operation of air-conditioning services as a tool for supporting onsite and local grid renewables.

"Through the deferral of HVAC&R loads — during renewable energy supply shortages — and the use of HVAC&R loads as a 'productive source of demand' during periods of excess supply, this project will increase the value of onsite renewable energy production and increase the fraction of building energy that can be economically provided by onsite renewable energy.

"With rising electricity costs putting further pressure on consumers and businesses, the i-Hub vision is to help make a positive impact by supporting Australian innovation. This will deliver superior comfort, better energy efficiency (and therefore lower running costs) and minimise peak demand."

In total, this project will deliver a multidimensional pilot demonstration program and business case evaluation for guiding National Electricity Market (NEM) planners on where to find and how to implement HVAC&R demand response across the National Electricity Market, and unlocking hundreds of megawatts of previously untapped flexible load.

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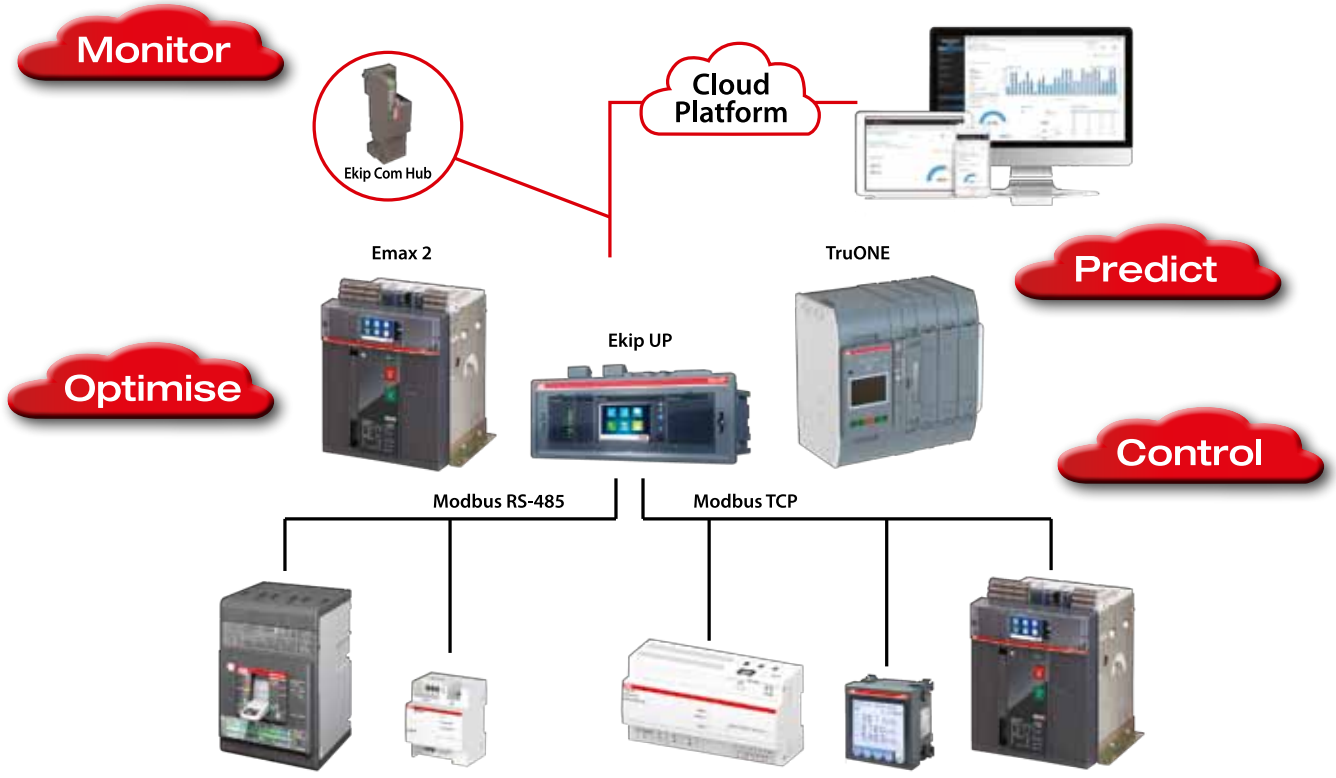

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CASE STUDY

Cool change for air conditioning, refrigeration

ARENA is providing $2 million in funding for Adelaide-based Glaciem Cooling Technologies to demonstrate its refrigeration, thermal energy storage and heat transfer technologies.

Unlike the products commonly available today, Glaciem uses natural refrigerants that are not harmful to the environment. Its system is designed to integrate with solar PV, offering energy efficiency advantages and minimising the need for grid-sourced electricity.

The $4.95 million project will trial the innovative technology at three locations — Ceravolo Orchards at Oakbank in the Adelaide Hills, Pernod Ricard Winemakers in the Barossa Valley and the Reef HQ Aquarium in Townsville.

The sites will employ three different technologies that make up the Glaciem system. These are:

- thermal energy storage and discharge through a heat transfer process;
- use of carbon dioxide as a natural refrigerant for transfer fluid in heat pumps, instead of harmful hydrofluorocarbon;
- an Advanced Control and Forecasting Algorithm (ACFA) control system that reduces costs by forecasting weather;
- electricity prices to make the most of the energy storage available.

Glaciem's saltwater phase change (PCM) material has been developed with the University of South Australia to have a freezing and melting point of -6˚C, which is suitable for cold storage and air conditioning. The system captures renewable energy from solar panels to freeze the PCM solution, which can be thawed to provide a source of cold air for cooling or refrigeration when electricity prices are high.

The system was developed with the support of an ARENA research and development grant announced in 2016.

Ceravolo Orchards and Pernod Ricard Winemakers will pair the system with onsite solar panels to optimise their cold storage systems, while the Reef HQ Aquarium will integrate the technology with an expanded solar system for their air conditioning and water cooling.

The PCM thermal energy storage technology was first demonstrated commercially at Parilla Premium Potatoes in 2014. Findings from that research will be incorporated into the new trials as the technology moves into a demonstration and deployment phase.

Glaciem Managing Director Julian Hudson said the project "will demonstrate that there are real viable alternatives for end users of HVAC&R [heating, ventilation, air conditioning and refrigeration] that drastically reduce operating costs, maximise the economic potential of renewable energy assets and reduce direct and indirect CO_2 emissions".

The project is the latest to receive funding from ARENA under its focus on helping industry reduce emissions. Last month, funding was announced for the Australian Alliance for Energy Productivity to help businesses make the transition to renewables. A potato processor, brewery and food manufacturer will be amongst five projects that progress to undertake feasibility studies.

ARENA CEO Darren Miller said Glaciem's system will help industrial energy users to reduce their emissions and maximise the value of their onsite renewable energy.

"The pilot sites trialling Glaciem's technology will demonstrate that refrigeration equipment, grid supply and onsite renewable energy generation can be reliably integrated across a range of commercial businesses," Darren Miller said.

"Heating and cooling is a huge driver of our electricity consumption including peak demand, which drives higher electricity prices for everyone."

In Australia, heating, ventilation, air conditioning and refrigeration alone consume around 22% of all electricity produced and are responsible for around 50% of peak demand on the electricity grid.

"There are significant opportunities across the heating and cooling sector to reduce energy costs and emissions by combining renewable energy alternatives with innovative storage technologies, and we're proud to support a homegrown start-up like Glaciem do just that," Miller said.

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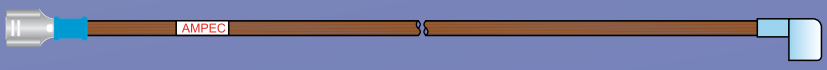
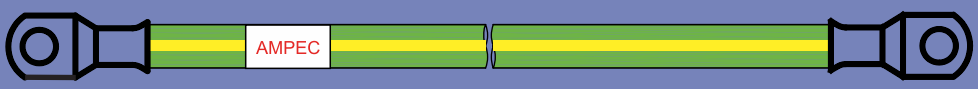
Wiring Harness Solutions





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QUEENSLAND ELECTRICIAN GIVEN FIVE-YEAR LICENCE BAN

Queensland's Electrical Licensing Committee has disqualified an electrical worker from holding an electrical licence for five years after he was found to have been advertising services online to provide unlicensed electrical contracting work.

Audits of 16 properties serviced by the worker found multiple breaches of the Australian/New Zealand wiring rules, causing multiple properties to be electrically unsafe.

His licence was immediately cancelled and he was fined $3200. The disqualification will also apply to the application of external equivalency provisions to any electrical work licence issued by another Australian state or territory or New Zealand.

During November 2019, the committee held disciplinary hearings against six other licence holders, including one against an electrical contractor who had failed to maintain auditing practices of employees to ensure procedures, legislation and Australian Standards were being met.

The committee determined that inadequate training and testing and isolation procedures led to home owners receiving an electric shock and workers being exposed to the risk of one. The contractor's licence was suspended for six months, and the contractor was fined $2500.

Another contractor received a six-month licence suspension and $600 fine for failing to implement safe systems of work and test procedures.

The contractor was also ordered to complete two independent audits to ensure the business has compliant electrical safety systems and procedures in place, and all qualified technical persons (QTPs) working for the business must complete the QTP competency units without recognition of prior learning.

In another instance, an electrical worker was declared to have failed to demonstrate competency in electrical safety, electrical risk and working on electrical installations when he performed electrical work on a large grid connect solar system.

He received a three-month licence suspension, disqualification from being a qualified technical person for six months and a $300 fine.

One contractor was issued 35 penalty points for failing to implement effective safe systems of work, resulting in an electrical worker receiving severe arc flash burns and property damage.

Another received a $200 fine and a caution for performing electrical work with serious defects on the upgrade to a new switchboard on a domestic property.

Finally, an electrical worker was fined $300 for failing to isolate power while conducting electrical work on a main switchboard, resulting in a severe arc flash injury. His licence was suspended for three months and he has been disqualified as a QTP for six months, and he will need to complete competency units before the suspension is lifted.

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PERMIT REMINDER FOR HIGH-VOLTAGE WORKERS

Employers are being reminded to ensure that electrical workers are signed on to an Access or Test permit before high-voltage work commences.

The Queensland Electrical Safety Office said that there have been several high-voltage isolation and access incidents in recent times.

It said it is essential for workers to have a clear understanding of:

- the nature of the work
- isolation points
- the exact areas and equipment covered by the permit.

In addition, all exposed parts must be treated as energised until they have been isolated and proven de-energised. Each high-voltage exposed part must be earthed after being de-energised.

The Electrical Safety Office said any changes to the access coverage of the permit must be communicated to all workers.

All workers who have signed onto the permit must also sign off before surrendering the permit.

ELECTRICIANS URGED TO BECOME PoE PROFICIENT

Electricians who install or service intelligent lighting should familiarise themselves with Power over Ethernet (PoE), according to IDEAL Networks.

In particular, the company said that PoE testers can help electricians to conduct quick, accurate PoE validation, eliminating guesswork and getting the job done faster.

"In just a few short years the use of PoE has migrated from IT devices into building systems like lighting, HVAC and access control," said Tim Widdershoven, Marketing Director for IDEAL Networks.

"However, the growth of PoE presents issues for electricians, who may have never had cause to work on anything other than traditional electrical cable infrastructure.

"PoE offers clear benefits in many applications, not least that installing just one set of cabling infrastructure is less disruptive and generally more cost-effective. So, to stay ahead of clients' demands, it's crucial for electricians to learn the necessary PoE testing and troubleshooting skills now."

In 2018 a new standard, IEEE 802.3bt, was ratified and provides the specifications for PoE equipment to provide up 90 W of power to devices over twisted-pair Ethernet cabling. This amount of power combined with high-efficiency LED light fixtures makes PoE lighting practical. With 60–90 W of power available, multiple luminaires or troffers can be daisy chained from a single port on a PoE Ethernet switch, greatly reducing the total system cost and simplifying the installation.

"Electricians installing or servicing PoE lighting systems need to be familiar with the components of PoE lighting systems to ensure proper operation and easily troubleshoot any problems that arise," Widdershoven said.

"Even when live a PoE system is not always energised, so this means that familiar, standard electrical testing tools cannot be used to test PoE systems."

Instead, there is a range of PoE testers on the market, from simple LED voltage detectors (like a neon electrical outlet checker) to testers which measure voltage and power available to the powered devices (PD) on a circuit. PoE test equipment can also be used to highlight issues with cable quality. For instance, electricians may encounter copper-clad aluminium (CCA) cable which is constructed primarily of aluminium conductors coated with a thin skin of copper. CCA has a much higher resistance than solid copper cable and should not be used in PoE applications, but due to its very low comparative cost, can often be found in intelligent lighting installations.

"The rise of PoE presents electrical contractors with a fantastic opportunity to confidently expand their service offering," Widdershoven said.

"Electricians who are equipped with the right testing tools and a functional knowledge of PoE systems will be able to both ensure that new installations deliver the expected performance and quickly identify faults when troubleshooting."

BUSHFIRES THREATEN NSW POWER GRID

The bushfires raging across NSW have placed huge stress on the state's powerlines and energy transmission.

Following warnings that bushfires could bring down transmission lines and cause blackouts across the state, on 4 January the AEMO called on consumers to limit their energy consumption where possible. It issued a forecast Lack of Reserve 2 (LOR2) market notice, which signals a reduction in predetermined electricity reserve levels.

Residents were asked to:

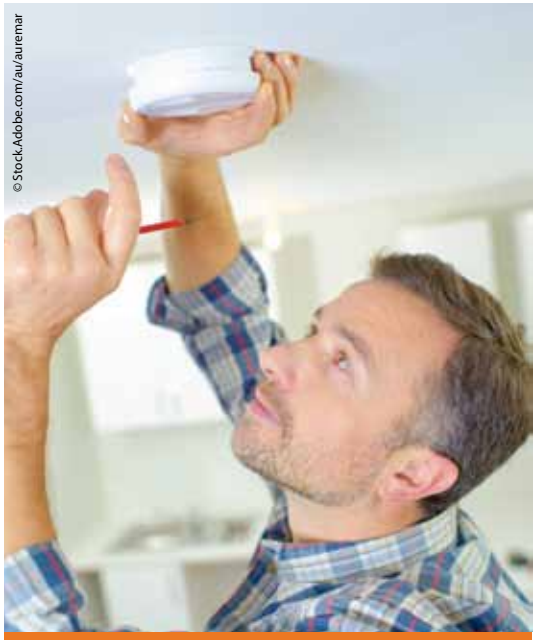
- avoid running multiple appliances at once,
- set air conditioners to 24°, and
- temporarily switch off pool pumps.

However, AEMO stated that energy conservation should only be undertaken if it was safe to do so, with health and wellbeing the primary consideration.

It also said if the situation further worsened and all energy reserves were lost, it may be forced to instruct controlled load shedding in NSW.

AEMO will continue to closely monitor reserve levels to maintain adequate supply.

Electrical Comms Data news



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NEW ELECTRICAL SAFETY GUIDANCE FOR RENTAL PROPERTIES

The Electrical Safety Office in Queensland has released a new guidance for tenants and property owners regarding electrical safety in rental properties.

The Electrical safety in rental properties — tenants guide was developed in consultation with Tenants Queensland and is available as a magnetic spiral-bound flip-chart for the fridge.

It offers easily accessible information, as well as simple tips that tenants can follow in order to make using electricity in their home as safe as possible. This includes testing safety switches and smoke alarms, dangers in roof spaces, checking and maintaining electrical appliances, overhead powerlines and the dangers of buying electrical appliances online.

According to the Electrical Safety office, property owners and managers must ensure their property is electrically safe for tenants and people that visit or work on the property. The Electrical safety in rental properties — property owners guide includes information on installing safety switches; smoke alarm laws; what to do if anyone receives tingles or shocks from electrical equipment, taps and other metal fittings; maintaining solar PV systems; and the dangers of DIY electrical work.

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COPPER THIEVES TO BE CAUGHT ON CAMERA

More CCTV cameras have been rolled out by Energex, in an effort to catch those stealing copper from the power network.

Copper started to go missing from South East Queensland's live electricity network earlier this year, prompting the electricity distributor to increase surveillance on its assets.

On top of a number of security measures already in place, Energex has increased live video surveillance within its depots, begun installing covert cameras on its poles and deployed mobile security trailers to its construction worksites.

The amped-up live-monitored CCTV has already paid dividends, with Energex being able to direct police, in real time, to a person attempting to steal from the Beaudesert Depot recently.

Energex said that perpetrators not only risk their own lives, but also those within surrounding homes and businesses by reducing the grid's earth safety capabilities. While some have been caught, others remain at large.

Energex's Head of Corporate Security, Justin Morghem, said the beefed-up security was not just about catching people stealing equipment, it was also about keeping the community safe from thieves destroying vital electrical safety equipment.

"What these people are doing is extremely dangerous. We've significantly increased security measures to protect the community and to ensure those carrying out the theft will now be caught on CCTV camera and the video handed to the police," he said.

Security of the power network was not just about installing CCTV cameras on strategic sections of the power network according to Morghem, who said Energex has also now deployed built-for-purpose security trailers to its construction sites.

"These smart trailers are fully connected to our live monitoring via video around the clock. They also have sirens, floodlights and our staff can even verbally contact the would-be crooks over loudspeakers.

"Furthermore, anyone who attempts to tamper with the trailers will get the surprise of their life by instantly activating all security devices on it."

Acting Minister for Mines and Energy Mark Ryan said the thieves were undertaking a very high-risk activity for very little reward.

"In carrying out these thefts these thieves can very easily kill themselves instantly," he said.

"No second chances — and it's really not worth it. These thieves generally only get scrap metal worth just a few dollars and, little do they know, Energex has close relationships with many metal recyclers who can identify the material and report it when someone tries to sell it to them.

"Ultimately, this entire stepped-up security process is about keeping the community safe from a few mindless crooks."

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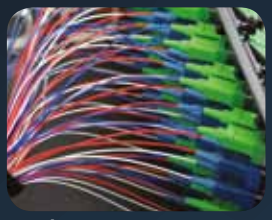
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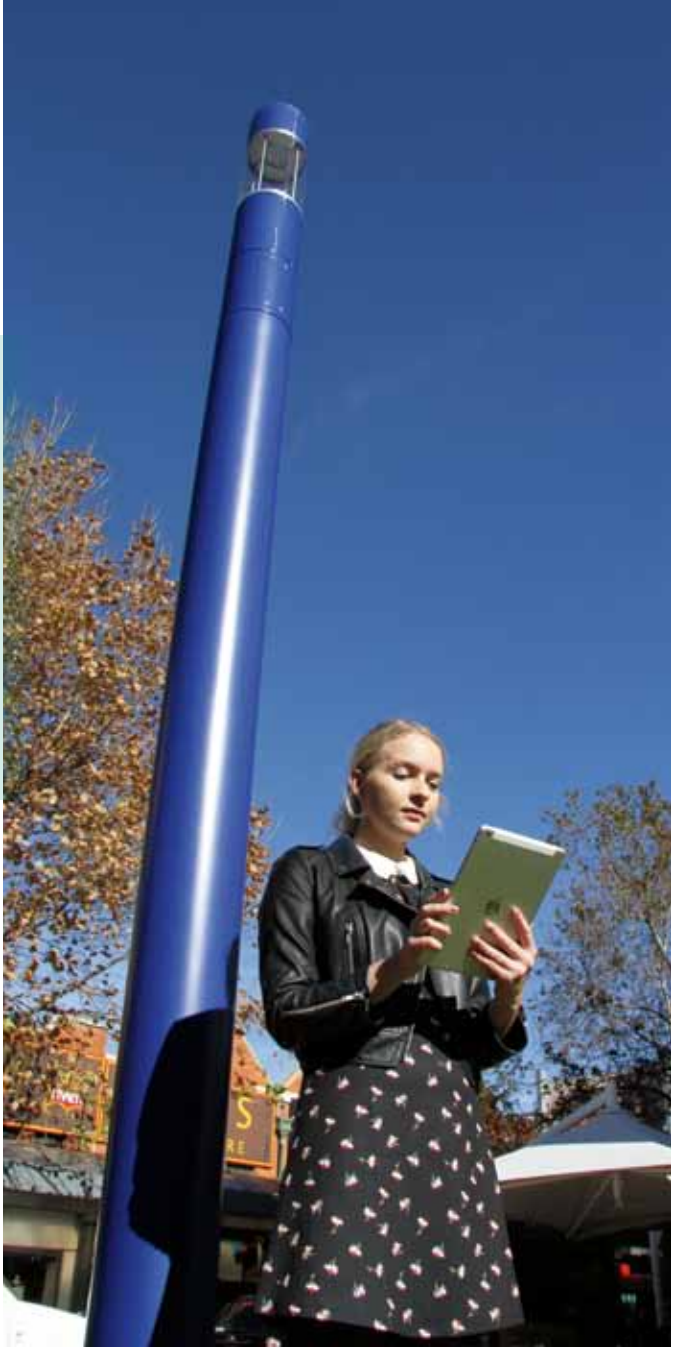

City of Newcastle is going smart, with council rolling out environmentally friendly infrastructure across the region.

Smart street poles and lighting, bin sensors and a five-megawatt solar farm at Summerhill are among the new technologies being deployed.

In addition, an advanced network of sensors spread across the city will help to tackle a range of local environmental issues.

Newcastle's smart street poles are designed to save energy through the use of light-emitting diodes (LEDs), and they are equipped with controls that allow lights to be dimmed when not needed. The council is changing over its existing street lighting to LED, with the ultimate goal of saving energy, money and carbon emissions.

The city's 'Envirosensing' network and Internet of Things (IoT) project was launched in October 2019, after three years of working towards the construction of one of the most advanced smart city infrastructure systems in Australia.

This infrastructure allows for the deployment of smart bin sensors, smart parking sensors and other smart city applications. For instance, by making use of the network, smart bins in public spaces will contain sensors that can detect when they actually need to be emptied. This will save waste crews having to undertake full rounds only to service a large number of empty bins, as well as reducing the number of overflowing bins and saving on driving time.

The Envirosensing system is also designed to measure a range of environmental conditions including temperature, humidity, wind direction, air quality, water usage, soil moisture and solar irradiance.

Custom-designed adaptable sensor housings developed have been integrated into the city's growing smart pole network and can be accessed by the council's research and industry partners to develop new technologies and help solve city challenges.

The council's goal is to use data collected by the sensors to better understand and respond to issues such as urban heat island effect, air pollution, flood management and water sustainability, as well as monitor the performance of urban systems and assets.

"An example of how these sensors can be used is in combatting the phenomenon of higher temperatures in areas with a lot of buildings and pavement, known as the 'urban heat island effect'," said Newcastle Lord Mayor Nuatali Nelmes.

"Studies show that urban heat islands are associated with higher pollution and negative health conditions, especially for the elderly and young children. This technology will be integral to exploring possible actions to mitigate urban warming."

The NSW Government supported the deployment of smart city infrastructure through a $5 million grant via the Restart NSW-funded Hunter Innovation Project. A partnership with the state government will see the City of Newcastle invest an additional $2 million over three years.

Switching on the solar farm

In December 2019, City of Newcastle opened its $8 million five-megawatt solar farm. Covering an area the size of five football fields on a capped landfill that was previously the site of a coalmine, the solar farm's 14,500 photovoltaic cells are now producing 7.5 million kilowatt-hours of renewable electricity each year.

"The solar farm is generating enough energy to power the equivalent of 1300 households, which is a significant environmental gain as well as reducing council's electricity costs by millions of dollars," said Newcastle Deputy Lord Mayor Declan Clausen.

Newcastle moved to 100% renewables in January 2020, following its purchase-power agreement to source electricity from the state's largest wind farm.

"The solar and wind farm combination will mean enough clean energy will be put into the grid to power every sportsground floodlight, local library, park BBQ and every other facility the city operates," said Clausen.

The solar farm was partly funded with a $6.5 million loan from Australia's Clean Energy Finance Corporation.


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SMART CITY SUCCESS LIES IN KEY ICT INFRASTRUCTURE

Paul Stathis, Chief Executive Officer, BICSI South Pacific

Smart cities featured prominently at the 2019 BICSI South Pacific conference recently held in Melbourne, highlighted by the opening and closing keynote presentations.

The opening presentation, entitled 'Digital city services: The new infrastructure for globally competitive communities' was delivered by Adam Beck, Executive Director of Smart Cities Council, and the closing presentation, entitled 'ICT Infrastructure for Highly Connected and Autonomous Transport Systems', was delivered by Professor Majid Sarvi, Professor in Transport for Smart Cities at University of Melbourne.

These two presentations set the tone for the conference by stressing the importance of the infrastructure — the optical fibre, the wireless networks, the copper comms cabling, the power reticulation, the enclosures — that actually enable cities to be made 'smart'.

Emphasising this point, Professor Sarvi cited the significant global shift in thinking amongst proponents of autonomous vehicles. He stated that car manufacturers initially focused on vehicle-to-vehicle communications for safe and efficient movement. But in their trials, they quickly realised this wasn't enough — vehicles needed to be connected to their entire environment with information being shared with a plethora of stationary devices and systems. So the current global focus is on vehicle-to-infrastructure communications, a view that the university had long advocated.

The remainder of this article will convey just some of the compelling initiatives, statistics and vision presented by these two speakers at the BICSI conference on where smart cities are going and how essential infrastructure is to their successful adoption.

'Digital city services: The new infrastructure for globally competitive communities' presentation

The Smart City Council defines a smart city as "one that uses technology and data to accelerate liveability, workability and sustainability". It becomes an accelerator of productivity, wellbeing, opportunity, and economic and societal change.

Consider just some examples of the remarkable uptake of digital technologies that demonstrate the potential improvements:

E-commerce

2.2 billion parcels ordered online are expected to be shipped annually in Australia by 2022, with over one million parcels being sent per business day in Melbourne and Sydney alone. That's a 15% growth for Australia projected in just three years. And how are parcels collected/delivered? 7% off street parking, 3% in driveways, 13% in metered parking, 10% parked in loading zones and a whopping 33% double parked. Think of the impact that this has on traffic alone! Demand is projected to soar as online procurement matures to become the norm for many domestic and commercial transactions. Central to this is reliable internet access in both fixed and mobile environments, afforded only by infrastructure commensurate with the burgeoning demands.

Transportation

While Uber changed the taxi industry forever, the concept also massively transformed our food industry with food deliveries. Over 500 restaurants and cafes in Australia have created 'virtual restaurants' on the Uber Eats platform, and they have seen an average 30% growth while using existing facilities.

One digital phenomenon that has taken the world by surprise is the Micro-mobility trip scheme. In the US alone, the number of micro-mobile devices rose from 35 million in 2017 to more than 84 million in 2018, made up of 38.5 million shared e-scooters, nine million dockless share-bikes and 36.5 million docked share-bikes.

Economic and societal change

Adam Beck cited the 'On Dijon' program in France as an excellent example of an entire city committed to a digital transformation. Its vision

is to create the metropolis of the future — intelligent and connected. Its objectives are to optimise and consolidate urban equipment (eg, traffic signals, street lighting, surveillance cameras, environmental sensors, etc) to facilitate the management of public space.

Among the major factors of economic and societal change, digital is undoubtedly the most powerful. Dijon Metropole and the City of Dijon conceived and imagined the city of the future through a resolutely innovative and structuring project for the future of the region.

On Dijon relies on an innovative investment-leveraging effect: modernising public services and equipment, especially installing 100% LED lighting, to generate savings, which in turn allow new digital services to be funded. Connectivity is also a vital element, with plans for extensive deployment of micro-datacentres connected wirelessly and via optical fibre for reliable, low-latency integration of services that had until now been largely disparate and therefore inefficient.

'ICT Infrastructure for Highly Connected and Autonomous Transport Systems' presentation

Professor Sarvi started his presentation by stressing the significant benefits autonomous vehicles will bring to the community as part of a truly smart city in comparing machine-controlled vehicles to human-controlled vehicles. In addition to being able to communicate with other vehicles and infrastructure continuously and more efficiently than humans, machines also react quicker than humans; don't get tired, distracted or drunk; and can 'see' more than humans, thereby contributing to safer mobility.

But all of that requires constant and reliable connectivity. In the vehicle-to-vehicle space, vehicles will typically share their location, vector and intention using DSRC (dedicated short-range communications) short-range to medium-range wireless communication channels in the 5.9 GHz band specifically designed for automotive use and a corresponding set of protocols and standards.

At the same time, vehicles will communicate with fixed 'road-side' infrastructure over DSRC and cellular (4/5G) sharing information such as road and weather conditions, traffic incidents, etc. Some of the technologies that will be deployed to facilitate this communication on a large scale include radar and stereo cameras for 3D vision; LiDAR — light detection and ranging; object and sign recognition; and telematics — location, GPS mapping, connected car.

Professor Sarvi concluded that the future of transport will be personalised, automated, connected and electric. But he cautioned that, to address the migration from human-controlled to machine-controlled vehicles, the industry should focus on the transport problems and what customers want and not what technology can provide. If truly ►

> IF TRULY AUTONOMOUS VEHICLES ARE TO BE A POSSIBILITY IN THE NEAR FUTURE, THEY WOULD NEED TO COPE WITH TODAY'S CARS AND INFRASTRUCTURE THROUGH AN EXTENSIVE TRANSITIONARY PERIOD.

autonomous vehicles are to be a possibility in the near future, they would need to cope with today's cars and infrastructure through an extensive transitionary period.

At a higher level, governments and infrastructure operators would need to transform their mindset from 'building roads' to 'providing mobility'.

In exploring this migration, the University of Melbourne developed the Australian Integrated Multimodal Ecosystem (AIMES) — a multimodal urban testing ecosystem for implementing and testing of emerging connected transport technologies at large scale and in complex urban environments. AIMES covers more than 100 km of road network over an area of 6 km^2 and is densely instrumented with over 250 intelligent sensors to provide data to AIMES.

The AIMES test-bed has as its goals the development of a common vision and roadmap for deployment; the development of system-wide pilots; and to facilitate collaboration between government, industry and academia. Ultimately, intelligent transport systems will make urban transport safer, cleaner, efficient, sustainable and integrated; provide better strategies and policy-making for automated vehicle and smart infrastructure; and support and facilitate emerging technologies and quantify what the connected transport network of the future will be.

As aspirational and transformative as these and other smart city initiatives are, the inescapable fact remains — dependable ICT infrastructure is critical to their success.

This message was stressed throughout the BICSI conference, emphasising the need for the industry to be skilled in its deployment of current technologies and to build their knowledge about future applications and technologies — something that all BICSI conferences facilitate for its members and the ICT industry.

BICSI South Pacific
www.bicsi.com.au

Heat alarm

An addition to the PSA LIFESAVER range is the LIFESAVER heat alarm model HA240. A heat alarm detects the thermal temperature of its environment and activates when the temperature exceeds 57°C. Heat alarms are designed for areas where smoke alarms may not be suitable, such as in kitchens, basements, garages and workshops.

The LIFESAVER HA240 heat alarm operates on mains power 240 VAC with a 9 V battery backup and can be interconnected to the PSA range of smoke alarms and accessories. The device features power and status LED, a single test and hush button and battery hush mode to silence low battery beeping. It complies to the latest standard AS1603.3:2018 and comes with a 5-year warranty.

PSA Products
www.psaproducts.com.au

Remote monitoring, alarming and logging solution

DeltaBlack is an easy-to-use cellular 4G/3G/2G remote monitoring, alarming and logging solution which is suitable for use in a range of industrial applications.

The Industrial IoT edge device is designed to work in the cloud with SCADA systems or via simple user-friendly SMS commands.

With multiple I/O channels, wide operating supply voltage, DIN-rail mount and integrated RE232 modem, the device includes various sensor types including temperature and humidity, level, flow, pressure, pulse meters — electrical, water and gas — and CT current transducers.

Other features include: integrated 7-channel data logger including one relay output; customised SMS alerts; and LED indication for cellular signal quality and communication status.

The unit weighs 250 g and comes with a pre-provision SIM card. Users can remotely manage the device and access measured data anywhere by connecting the sensors and logging into ETM'S IoT Cloud Dashboard (EWO).

Suitable applications include: pump, fan, generator and motor; refrigeration and freezer systems; metering, HVAC and indoor climate; tank measurements; fire panels and intruder alarms; data centre monitoring; and agriculture.

ETM Pacific Pty Ltd
www.etmiot.com.au

Optical time-domain reflectometer

The Fluke Optifiber Pro Quad is an optical time-domain reflectometer (OTDR) designed for testing, troubleshooting and certifying multi- and single-mode fibre-optic networks. It is available to rent from TechRentals.

With its powerful feature set, the OTDR is designed to increase the availability of data centre and storage area networks. It is an all-in-one fibre-testing tool complete with planning, inspection, certification and reporting — eliminating the need to invest in a second ODTR to troubleshoot LAN and campus networks.

The OTDR accelerates fibre certification with trace times as short as 2 s in Quick Test mode. Featuring a smartphone user interface, it is designed for all skill levels and should enable users to perform expert fibre troubleshooting and certification. Operator efficiency is maximised with task-focused usability, fast trace times and one-button set-ups. Users can select, scroll and magnify on screen using their fingertips (via the smartphone user interface) with a capacitive touch screen rather than a legacy touch screen, eliminating recalibration.

The OTDR is supplied with LinkWare software, which enables users to download recorded data and generate detailed and standard-compliant reports. It also features EventMap, where information is automatically interpreted to create a detailed and graphical map of events that includes connectors, splices and anomalies.

TechRentals

www.techrentals.com.au

Copper and fibre testing

The Fluke DSX-8000QOi contains the DSX-8000 copper analyser, CertiFiber Pro OLTS quad wavelength, Optifiber Pro OTDR quad wavelength and a USB fibre inspection probe. It is available to rent from TechRentals.

The DSX-8000 copper analyser enables testing and certification of twisted pair cabling for up to 40 Gigabit Ethernet deployments and will handle any cabling system such as Cat 5e, 6, 6A, 8 or Class FA and I/II. It makes tasks easier to manage and achieves system acceptance faster.

CertiFiber Pro Optical Loss Test Set offers efficient fibre optics certification. Featuring a simple user interface, the CertiFiber Pro eliminates errors and speeds troubleshooting. It performs Tier 1 (basic) fibre certification in 3 s and complies with all applicable cabling standards, which call out the Encircled Flux launch condition requirements for optical sources.

The Optifiber Pro OTDR offers SmartLoop technology that tests two fibres in a single test, eliminating the need to travel to the far end of the connection to perform tests. It performs Tier 2 (extended) fibre certification and displays a graphical EventMap for easy trace interpretation.

The Fibre Inspection probe allows users to inspect and certify fibre-optic connector end-faces in one second.

TechRentals

www.techrentals.com.au

Presence detector

The mySmart MY-P120-RR presence detector has a range of up to 20 m.

The sensor has a lens design of 360° 'no dead spot' detection, providing a diameter range of up to 20 m and an adjustable lens shield, which minimises or blocks the detecting field. The sensor design makes it suitable for car parks.

Available in white, these IP44-rated sensors are designed to minimise energy use and cost without compromising user experience for commercial offices and corridors.

The sensor has two independent relay channels that can be connected to separate electrical phases for individual control of lighting, air conditioning or stepped shutdown.

Further enhancing user experience, the sensor has two optional accessories — a surface mount collar (MY-SMC1) and a user programming handset for intuitive and quick settings. Designed for flexibility and adaptability, the sensor's design provides cable strain relief and a clear back cover for easy inspection, and utilises spring clamps for quick and easy installation.

mySmart

mySmart.com.au

kWh energy meters

Energy metering solutions designed by Hager allow tracking of a building's energy consumption to allow detection of network anomalies, remote monitoring of equipment and prediction of energy consumption.

Hager's new single- and three-phase energy meters are bidirectional for consumed and generated power.

The meters come with a range of features including: pulse and Modbus communication; direct measurement up to 125 A without the need of a converter; bidirectional for consumed and supplied mains power; and data recovery of voltage, current, frequency, power factor, active energy and power.

A compact 3 x 80 A single-phase metering device is also available.

Hager Electro Pty Ltd

www.hagerelectro.com.au

IMPROVING OPERATIONAL PERFORMANCE BY BRINGING PEOPLE BACK INTO DATA CENTRES

*Matt Gurr**

With human error being one of the biggest culprits for data centre downtime, new approaches are needed, and focus should be shifted from removing humans via automation to welcoming humans back into the data centre by designing an environment that supports them.

Human error is one of the biggest challenges in keeping data centres functioning and ensuring the provision of fast, reliable, safe services that consumers rely on, and which are critical for the competitiveness of companies using these facilities.

From adjusting the temperature to pulling power cords, the results can be catastrophic, often making headlines around the world. When people have access to a data centre, it increases the chances of cables being knocked loose, power cords being damaged, systems being left in manual modes and other occurrences. These can be a nightmare for IT administrators and cause immense frustration for end users, that is, the community that relies on information and services provided by data centres.

Over the past decade, the industry's response to human error has been to reduce the number of humans working in these facilities, or in some cases, to remove them completely. 'Dark' or 'lights-out' data centres, which have sophisticated automation processes, are isolated and limit environmental fluctuations and human access.

In removing humans, it was hoped to mitigate, or eliminate, the possibility of human error, plus achieve additional benefits around energy savings and improved cooling efficiency and safety.

Hitting the limits of 'lights out' data centres

However, a 2016 report by the Ponemon Institute revealed that the proportion of failures attributed to human error remained unchanged since 2013, sitting stable at around 22% of all incidents. While it's difficult to draw concrete conclusions, it does suggest little progress has been made to improve what should be an avoidable cause of disruption.

With automation becoming more prevalent across data centres, why are we not seeing a reduction in outages where humans are the root cause?

Improving data centre environments

With 'lights out' data centres not having the impact the industry had hoped for, we must look in a different place for improvement. Rather than trying to engineer people out of the data centre, we should be trying to design an environment that supports them and makes them more productive and efficient.

While people are one cause of outages in data centres, they are also critical to the successful and safe operation of them. These people perform maintenance, they fulfil requests and respond to incidents — often against tight deadlines and under immense pressure.

We need to help these people have a better, less problematic experience. We need to make the space less hostile and one in which people want to work.

WHILE IT'S VERY EARLY DAYS FOR HUMAN-CENTRED DESIGN IN DATA CENTRES AND FOCUSING ON PEOPLE MIGHT NOT INITIALLY SEEM LIKE A NATURAL FIT, AGAINST THE BACKDROP OF THE INDUSTRY'S DESIRE TO AUTOMATE AND ENGINEER HUMANS OUT, AND THE FACT THAT HUMAN ERROR INCIDENTS ARE NOT REDUCING, IT'S AN APPROACH WORTH TAKING.

Human-centred design and reducing human error

Human-centred design is not a natural bedfellow for data centres; however, applying the approach in a non-traditional way could change the data centre landscape for the better.

Learning from the commercial building market, there is substantial research and evidence that a well-designed space, built for people, can significantly increase the cognitive capability (by 26.4%) of end users.

Studies also indicate that in human-centred spaces, people's ability to deal with crisis response situations is increased significantly, which for a mission-critical environment such as a data centre is vital.

Optimising data centres for people's performance

Traditionally, data centres have been technically heavy, focused on reliability, maintaining efficiency and driving down power consumption. This typical engineering-led design approach is still important; however, when considering the people within data centres, a human-centric design methodology is more appropriate and, when combined with robust technical design, will yield broader, more effective results for people and for the overall operation of the data centre.

When optimising the facility for people's performance, the quality of the indoor environment is critical. When there is daylight, views, thermal comfort, good lighting, increased outdoor air rates, good acoustics, direct exhaust of emissions produced by equipment, as well as plants and natural materials, such as timber, which minimise pollutant build-up, we create a better indoor environment.

But human-centred design starts long before people actually enter the data centre. Thinking about the experience of the humans travelling to and working in data centres, there are many more fundamental aspects to consider:

- What are the different roles within the data centre?
- What are people's pain points?
- How do they arrive?
- Where do they park?
- How far do they have to walk?
- How smooth is the security process?
- Based on their experience leading up to their arrival into the building, do they have time to review their procedures?
- How are they feeling when they work through their procedures — are they fresh or tired, stressed and hurried?
- While doing their work do they feel they have time or do they feel pressured and anxious?

The answers to these questions ultimately impact on how people perform. They also identify what can be fixed and inform a design which could improve their experience through elements such as better parking facilities, improved entry to the data centre, seamless security process and better workspaces.

To improve the human experience, it is not necessary to make changes to the critical MEP systems or the technical functioning of the facility. Many solutions are not expensive, don't affect the critical infrastructure and are not going to cause an outage, but they might help to reduce the error rate from human involvement.

While it's very early days for human-centred design in data centres and focusing on people might not initially seem like a natural fit, against the backdrop of the industry's desire to automate and engineer humans out, and the fact that human error incidents are not reducing, it's an approach worth taking.

Improving the suitability of the data centre environment for the technicians, engineers and workers, and taking a human-centred design approach could be the answer the industry has been seeking.

Let's give people the best chance to perform optimally. Let's welcome them back into the data centre and make their space somewhere they can be, they can work and somewhere they can do their job well.

**Matt Gurr is Aurecon's Design Leader and Mission Critical Data Centre Specialist. This article has been reproduced with their permission.*

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With two relay channels and a switch input, the MY-P120-RR is the best option for long range motion detection. Superior PIR sensitivity means no false triggers due to insects or other small animals. The MY-P120-RR is ideal for car parks, warehouses, offices and factories which require long range.

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- IP 44
- 0°C - +45°C
- Spring Clamps
- Dual load for lighting & HVAC control
- Manual control via button
- User friendly settings
- Optional handset (MY-R11)

MY-P109-RR PRESENCE DETECTOR

This versatile sensor has two independent relay channels that can be connected to separate electrical phases for individual control of lighting, air conditioning or stepped shutdown.

- 9mtr
- IP 44
- MY-R11
- -20°C - +45°C

MY-PA08 SERIES

MY-PA08 series sensors are entry level, one relay channel, non-programmable sensors with manual adjustments. Available as surface mount (MY-PA08-R-SUR) and flush mount (MY-PA08-R), these sensors are ideal for laundries, garages or store rooms.

- 8mtr
- IP 40
- -10°C - +50°C

MY-HF114-RR PRESENCE DETECTOR

The MY-HF114-RR microwave sensor has been designed with two relay channels and greater sensitivity to provide solutions for environments such as bathrooms, toilets and classrooms.

- 14mtr
- IP 54
- MY-R11H
- -20°C - +50°C

DC/DC converters

Distributed in Australia and New Zealand by DLPC, MORNSUN has released the PV150-29Bxx converter series for 150 W 250–1500 VDC applications.

The series features 4 kVAC isolation with a wide-input 250–1500 VDC voltage range, with efficiencies of up to 84% @ 800 VDC input. It offers output voltages of 12, 15, 24 and 48 V, plus an industrial operating temperature range of -40 to +70°C (note the derating of output power is lower than 65% with temperatures of 55 to 70°C). It is suitable for applications with altitudes up to 5000 m with no derating ≤2000 m, making the series useful for high-altitude, low-oxygen applications with wide temperature variations during the day and night.

Other features include a long service life MTBF over 300,000 h; high efficiency; low ripple and noise; long lifespan; input undervoltage protection; reverse input voltage protection; and output short circuit, overcurrent and overvoltage protection. The series meets CSA-C22.2 No.107.1, EN62109 standards and is widely used for photovoltaic applications in inverter systems and tracking systems.

DLPC Pty Ltd

www.dlpc.com.au

Wireless IP camera system

The HiLook wireless IP camera system from PSA is simple to install, offering a four-channel network video recorder (NVR) complete with a 1 TB hard drive for event recording. Set-up is easy, with plug-and-play installation. Wirelessly connect up to four IP bullet cameras to be viewed on a monitor or on a smartphone app. Each camera provides high definition 1080P resolution with a wireless range up to 50 m. The cameras are rated for outdoor application with an IP66 rating and come with infra-red LED for night vision up to a range of 30 m.

The system is suitable for difficult cable installations in both commercial and domestic applications. The HiLook wireless IP system is available as a ready-to-install kit complete with a four-channel NVR, four cameras and power supplies.

PSA Products

www.psaproducts.com.au

Wireless infrastructure management

Emerson has added two IIoT solutions to its Plantweb Insight data analytics platform that the company says will enable industrial facilities to transform the way they manage their enterprise-level wireless network infrastructure.

As digitalisation and wireless technology adoption continue to rapidly expand in industrial facilities throughout the world, the need for greater visibility of network infrastructure performance is key. The Plantweb Insight applications provide a quick-to-implement, scalable IIoT solution that helps users advance their digital transformation strategies and achieve greater operational efficiencies.

The Plantweb Insight Network Management application provides continuous, centralised monitoring of WirelessHART networks. This application provides a singular, consolidated view of the status of all wireless networks in a facility, with embedded expertise and guidance for advanced network management.

A key feature is a configurable mesh network diagram, providing visualisation of network design and connections along with device-specific information. It also provides an exportable record of syslog alerts, network details outlining conformance to network best practices and more.

The Plantweb Insight Power Module Management application drills down to the device level, allowing facilities to keep their wireless devices appropriately powered so they can continuously transmit key monitoring data. By aggregating power module statuses, users can evolve traditional maintenance planning and implement more efficient and cost-effective practices.

Emerson Automation Solutions

www.emerson.com/au/automation

ENERGY SECTOR GENERATES BUSHFIRE DISASTER SUPPORT

The energy industry is stepping up in the face of the current bushfire disaster, putting a range of measures in place to support affected communities.

It has also been working to maintain the safety and security of the power network and its assets, which have incurred extensive damage during the fires.

At the federal government's Electricity Sector Bushfire Response and Recovery Roundtable, energy generators, retailers and networks have detailed what steps can be taken to support people who are currently experiencing loss and hardship.

Australian Energy Council Chief Executive Sarah McNamara and Energy Networks Australia CEO Andrew Dillon said the energy industry's focus is on supporting those communities to ensure they can get back on their feet as quickly as possible.

"Safety is always our top priority. Energy companies have undertaken a range of measures to prepare for the bushfire season and ensure its workforce, assets and electricity supply are protected," McNamara said.

Dillon said energy companies had hundreds of support personnel on the ground in fire affected areas, in many cases rebuilding large sections of network from the ground up.

"More than 5000 power poles have been destroyed and are being replaced. Networks have restored power to thousands of people and have deployed generators to as many homes and businesses as possible where power reconnection has been delayed," he said.

Energy retailers and networks also confirmed a range of support measures to assist affected customers, including the temporary suspension of collection activities in bushfire impacted areas, until the emergency situation has been resolved.

This is in addition to retailers' existing hardship programs. Customers are encouraged to contact their retailer or distributor directly and find out what assistance is available. Many retailers are also offering financial assistance to registered volunteer firefighters.

Likewise, networks in bushfire affected areas will either waive the network access charge for customers who have been without power for more than seven consecutive days, or are backdating network charges to the last meter read for destroyed homes. This will be done by working through electricity retailers who have committed to pass this benefit on to customers.

Many Australians working in the energy sector have also been fighting the bushfires as volunteer members of fire services or assisting communities as part of the Army Reserve.

The Australian Energy Council and Energy Networks Australia outlined to the government a range of measures being undertaken by the sector. These include:

- The suspension of collection activities for affected customers while emergency warnings are in place.
- Retailers will provide advice to affected customers on the assistance available to them — customers will also be encouraged to have an early conversation with their retailer, if they need assistance.
- Waiving of outstanding debts, meter replacement charges and reconnection fees for homes or small businesses lost as a result of this natural disaster.
- When natural disasters occur specific assistance will be made available for volunteer and emergency services workers — customers are encouraged to contact their retailer and find out what assistance is available.

ENHANCING ENERGY STORAGE

A newly developed class of ionic liquids may store more energy than conventional electrolytes, with less risk of catching fire.

Supercapacitors are electrical devices that store and release energy, requiring a layer of electrolyte to conduct electricity. This electrolyte layer can be solid, liquid or something in between. A collaborative group of researchers from MIT and other institutions has developed a novel class of liquids that may improve the efficiency and stability of supercapacitors, reducing flammability at the same time. The team's results are published in the journal *Nature Materials*.

A novel ionic liquid

As a result of their investigations, the team of researchers has added a compound to the class of materials known as ionic liquids. The new compound, called SAIL (surface-active ionic liquid), is similar to a surfactant, like those used to disperse oil spills. Lead author and MIT postdoc Xianwen Mao explained that, with the addition of this material, ionic liquids have new and strange properties, such as becoming highly viscous.

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"It's hard to imagine that this viscous liquid could be used for energy storage, but what we find is that once we raise the temperature, it can store more energy, and more than many other electrolytes," Mao said.

Mao explained that with other ionic liquids, as temperature increases, viscosity decreases and energy-storage capacity increases. However with SAIL, although viscosity remains higher than in other known electrolytes, capacity increases very quickly with increasing temperature. This means that the novel compound can store a higher density of energy than many conventional electrolytes, and with greater stability and safety.

According to Mao, the new class of materials could have a variety of applications for high-temperature energy storage such as in hot environments, including oil drilling facilities or chemical plants.

"Our electrolyte is very safe at high temperatures, and even performs better," he said. In contrast, some electrolytes used in lithium-ion batteries are quite flammable.

> THE KEY TO THE LIQUID'S EFFECTIVENESS IS THE AUTOMATIC ASSEMBLY OF ITS MOLECULES, WHICH LINE UP TO FORM A LAYERED CONFIGURATION ON THE METAL ELECTRODE SURFACE.

Automatic molecule assembly

The key to the liquid's effectiveness is the automatic assembly of its molecules, which line up to form a layered configuration on the metal electrode surface. In this self-assembled nanostructure the molecules line up with their heads facing outward toward the electrode or away from it, and the tail ends cluster in the middle.

"It forms a very interesting, sandwich-like, double-layer structure," said T Alan Hatton, senior author and MIT Professor of Chemical Engineering.

This highly ordered structure helps to prevent overscreening — which can occur with other ionic liquids — in which the first layer of ions that collect on an electrode surface contains more ions than there are corresponding charges on the surface. This can cause a scattered distribution of ions or a thicker ion multilayer, thus a loss of efficiency in energy storage. Hatton said, "Whereas with our case, because of the way everything is structured, charges are concentrated within the surface layer."

SAIL applications

Mao said that the material could help to improve the performance of supercapacitors. Such devices can be used to store electrical charge and are sometimes used to supplement battery systems in electric vehicles to provide an extra boost of power. Using SAIL instead of a conventional electrolyte in a supercapacitor could increase its energy density by a factor of four or five, Mao said. He also commented that future supercapacitors may be able to store more energy than batteries, potentially even replacing batteries in applications such as electric vehicles, personal electronics or grid-level energy storage facilities.

According to Mao, the material could also be useful for a variety of emerging separation processes, such as chemical processing and refining applications, carbon dioxide capture and resource recovery from waste streams.

The material developed by the team is just an example of a variety of possible SAIL compounds. The team will continue to work on different variations and on optimisng its parameters for particular uses.

"It is a very exciting result that surface-active ionic liquids with amphiphilic structures can self-assemble on electrode surfaces and enhance charge storage performance at electrified surfaces," said Stanford Professor of Materials Science and Engineering Yi Cui.

"The authors have studied and understood the mechanism. The work here might have a great impact on the design of high-energy-density supercapacitors and could also help improve battery performance," he said.

WHAT IF TEXTILES COULD GENERATE PV ENERGY...

Researchers from the Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) have developed pliable, textile-based solar cells that could add a new dimension to photovoltaic energy generation. Instead of glass or silicon, the substrate for the solar cells is a woven fabric.

In addition to rooftop solar systems, other surfaces could be used to generate power. For example, truck or semitrailer tarps could produce the electricity needed to power cooling systems or other onboard equipment. Conventional building facades could be covered with photovoltaic textiles in place of concrete render; blinds used to provide shade in buildings with glass facades could be used to create hundreds of square metres of additional surface for producing power. This would enable a plethora of ways to harness solar energy.

Glass-fibre fabric as a solar-cell substrate

"There are a number of processes that enable solar cells to be incorporated in coatings applied to textiles," explained Dr Lars Rebenklau, group manager for system integration and electronic packaging at Fraunhofer IKTS.

"That might sound easy, but the machines in the textile industry are designed to handle huge rolls of fabric — five or six metres wide and up to 1000 metres in length," added Dr Jonas Sundqvist, group manager for thin-film technology at Fraunhofer IKTS.

Dr Rebenklau continued: "During the coating process, the textiles have to withstand temperatures of around 200°C. Other factors play a key role too: the fabric must meet fire regulations, have a high tensile strength and be cheap to produce. The consortium therefore opted for a glass-fibre fabric, which fulfils all of these specifications."

An emphasis on standard processes

The research team faced the challenge of how to apply the wafer-thin layers that make up a solar cell — the bottom electrode, the photovoltaic layer and the top electrode — to the fabric. These layers are between one and 10 microns in thickness. By comparison, the surface of the fabric is like a mountain range.

The solution was to first apply a layer that levels out the peaks and troughs on the surface of the fabric. For this purpose, the researchers opted for a standard process used in the textile industry: transfer printing, which is also used to rubberise fabrics.

All other processes were adapted to be easily incorporated in standard production methods used in the textile industry. For example, the two electrodes — made from electrically conductive polyester — and the photovoltaic layer are applied by means of the common roll-to-roll method. The solar cells are then laminated with an additional protective layer to make them more robust.

Preparing fabric-based solar cells for market launch

The research team has already produced an initial prototype of the fabric-based solar cells.

"This has demonstrated the basic functionality of our textile-based solar cells," Dr Rebenklau said. "Right now, they have an efficiency of between 0.1 and 0.3%."

In a follow-up project, he and the team are seeking to push this over the 5% mark, at which point the textile-based solar cells would become commercially viable.

Silicon-based solar cells are significantly more efficient (10–20%). However, this new form of solar cell is not intended to replace the conventional type, merely offer an alternative for specific applications. In the coming months, the team will be investigating ways of enhancing the service life of the fabric-based solar cells.

If all goes according to plan, the first textile-based solar cells could be ready for commercialisation in around five years. This would fulfil the original goal of the PhotoTex project: to provide new stimulus for Germany's textile industry and improve its competitiveness.

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DEWESoft KRYPTON ONE high-voltage and high-isolation DAQ instruments are rugged, small and fully distributable 1-channel data acquisition modules.

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The latest modules made for high-voltage and thermocouple temperature measurements with high isolation are KRYPTONi-1xHV and KRYPTONi-1xTH-HV. Both provide safety at high voltages with an overvoltage category CATII 1000 V.

The KRYPTONi-1xHV module is designed for high-voltage measurements with a single input range of ±1000 V. The acquisition is based on 24-bit SAR ADC with a sampling rate of up to 40 kS/s and an additional anti-aliasing filter. The input connector is a 4 mm safety banana jack.

The KRYPTONi-1xTH-HV module is an isolated single thermocouple module designed for temperature measurements at high voltages. It supports K-type thermocouple. Temperature is acquired by using a 24-bit delta-sigma ADC with the sampling rate up to 100 S/s. Cold junction compensation is provided by a Pt1000 sensing element. The input connector, LEMO Redel 2P series, is designed in plastic to enable sufficient isolation and clearances.

The product brings data acquisition systems closer to the sensor, which reduces the cost of the sensor cabling and chances of wiring errors, and substantially improves the signal quality.

Metromatics Pty Ltd
www.metromatics.com.au

Web-based PV design tool

SolarEdge has introduced an extended feature set on its Designer tool that specifically supports commercial PV systems.

To make commercial solar design faster and easier for large PV systems, a variety of features have been added to this web-based PV design tool.

In order to maximise self-consumption in commercial projects, users can now select the most suitable consumption profile from a list of different commercial load profiles that represent typical energy consumption patterns, such as in factories, retail stores and office buildings. Modelling has also been made easier with features including multi-selection of objects, copy pasting and improved edge alignment.

For the electrical design of commercial PV systems, the design tool provides an auto-string layout feature that, at a click of a button, quickly and automatically follows flexible design rules. Users can also duplicate wired blocks of modules by stringing them together and using the duplication feature to easily and quickly expand system size.

The tool offers accurate energy simulations and reports by providing insight into expected energy production of the PV system being planned and designed. Included in the simulations are shading analysis as part of the energy simulation calculation and additional system losses. The advanced options for system losses include soiling and snow, thermal loss, light induced degradation (LID), incidence angle modifier and system unavailability. Detailed irradiance analysis is also included in order to optimise PV design.

SolarEdge Technologies Inc.
www.solaredge.com

Fibre-optic breakout trays

Warren and Brown slide-out fibre-optic breakout trays (FOBOTs) are optic fibre enclosures that provide a safe and stable place for fibres to be spliced or terminated. The FOBOTS are sturdy, cost-effective and provide easy access to the cables enclosed. The range supports 1RU and 2RU with splice and patch or patch-only options.

Other features include a rackmount, sliding enclosure FOBOT; 19″ mounting brackets for rear or front mounting; adaptor plates with pre-installed fibre-optic through adaptors; a labelling kit with optional front management tray; Velcro wrap and other accessories.

Warren & Brown Technologies
www.wbnetworks.com.au

DESIGNING AUSTRALIA'S FUTURE ENERGY GRID

The Australian Energy Market Commission (AEMC) has urged that action be taken to create an energy grid that can accommodate rooftop solar expansion and a national electric vehicle network.

The AEMC has published a report — 'Integrating distributed energy resources for the grid of the future: Economic regulatory framework review 2019' — calling on distribution network companies to kickstart major grid reforms to accommodate renewable energy and avoid the need for significant new network investment.

The commission highlights that rooftop solar penetration has reached a point where a choice needs to be made between distribution networks spending billions on new substations, poles and wires to cope, or start delivering the grid of the future so consumers aren't landed with unnecessary costs.

Releasing the report, AEMC Chairman John Pierce said networks are increasingly cutting solar PV flows off from the grid because of the power system's inability to connect new technologies.

"We need electricity networks to become trading platforms where consumers are the drivers of change," Pierce said.

"We are already seeing more take-up of distributed energy resources like batteries, electric vehicles and smart appliances. They can smooth peak demand on the grid and help stabilise the power system — making the most of all the energy in the system, wherever it's produced or stored.

"A grid-enabled trading platform will open up a whole new world of opportunities for households and businesses — providing payments for services like frequency control and network support to make the power system stronger and enable higher levels of domestic demand response.

"But escalating penetration of rooftop solar, industry-wide failure to comprehensively introduce cost-reflective customer reward pricing, lack of network visibility of low-voltage network constraints, and inadequate technical network standards and compliance are combining to reduce system security and efficiency," he said.

The AEMC distributed energy resources blueprint identifies initiatives that can be implemented immediately and sharpens focus on reforms already underway that need to pick up speed. Several key actions are needed to deliver distribution networks that will work for the future through an integrated program with all the market bodies and the Energy Security Board.

"There are serious choices to be made," Pierce said. "To keep building traditional infrastructure and passing on those costs to consumers, or get on with the job of implementing reforms to increase access to the network for new solar connections,

to improve reliability and security while that happens, and to avoid gold-plating," he continued.

"Consumers are already doing their part and investing in their own rooftop energy generation, but distribution networks are not moving quickly enough to realise the value of those investments.

"Where new rules are required to accelerate change, we will push ahead with proposals for new distribution network pricing, access and connection arrangements if proponents don't start that process themselves by early next year. We won't stand by and allow the current situation to continue.

"Failure to act now would mean either fewer people are able to export solar to the grid, or all consumers will pay more to build new substations and poles and wires that are rarely needed."

Via a Grid of the Future program, the AEMC has identified implementation pathways for futureproofing distribution networks:

Rewards for solar PV customers

Distribution networks and the Australian Energy Regulator (AER) can implement cost-reflective network tariffs that reward customers who have invested in solar PV for using and storing electricity in ways that help the grid work efficiently.

The need for costly augmentation of the grid is reduced by ensuring price incentives encourage consumers to export excess energy back to the grid when it is most valuable.

Load and voltage visibility

It is recommended that distribution networks improve the visibility of loads and voltages on low-voltage distribution networks (between homes and substations) so existing and future constraints can be identified and addressed. The AEMC has found that distribution networks have very limited information on real-time loads and voltages downstream of the zone substations, making it difficult to determine where local constraints exist or where they are likely to develop in the future. This in turn makes it hard for network businesses to find optimal solutions for alleviating these constraints.

Rule change requests

The report suggests that distribution networks or relevant stakeholders request rule changes in relation to possible improvements in managing network operational information and system security supports. The AEMC is collaborating with St Vincent de Paul Society Victoria and the Distributed Energy Integration Program (DEIP) access and pricing working group to reform network charging arrangements in light of the changing relationship between consumers and the power system. Instead of paying only for energy consumed, customers would pay for access to the services they need through the network and be rewarded where they can provide services back to the grid. The total revenue networks can earn would continue to be regulated, with lower total network costs.

Technical standards development

With the Australian Renewable Energy Agency (ARENA), market bodies — AEMC, Australian Energy Market Operator (AEMO) and AER — consumer groups or Standards Australia can accelerate the development of technical standards and provision of information to support the integration of solar and other distributed energy in the grid. This includes:

- Developing new AER guidelines for the evaluation of revenue proposals from distribution businesses for projects to better integrate distributed energy resources
- Monitoring the rollout of smart meters, including a review of competition in metering arrangements.
- Identifying distribution businesses' future data requirements, including additional meter data that should be collected
- Developing a standard 'value of customer export' methodology to help identify where building more network capacity will provide greater overall benefits for consumers.
- Improving understanding of the information customers need about their distributed energy resources.
- Coordinating work across industry on the technical aspects of integrating distributed energy resources
- Jurisdictional governments and safety regulators to develop mechanisms to improve distributed energy resources' compliance with technical standards.

"It is very costly to invest in generation and network infrastructure when it is only used for a few hours each year to service peak demand," Pierce explained. "By more efficiently using the energy produced by distributed energy resources, and by encouraging consumption and storage of energy when it is cheapest, both power bills and demand on the electricity network can be reduced.

"That's why the ability for customers to choose to reduce demand in a manner that is suitable to them is such an effective part of the energy market's toolkit."

The AEMC will monitor progress on the recommendations as part of its annual review of electricity networks economic regulatory frameworks.

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SMART ENERGY ON SHOW IN 2020

The Smart Energy Council's Smart Energy Conference and Exhibition will be celebrating its 58th anniversary in 2020.

Held Tuesday, 7 and Wednesday, 8 April 2020, the event will be located at the International Convention Centre Sydney.

As the first major industry conference and exhibition for the year, the event is a great opportunity for the smart energy community to learn about the latest technologies, to see and source the latest solutions and to gather, to network and to build relationships.

The conference program and 9000 m^2 exhibition area are guaranteed to provide inspiration and deliver innovation. This free-to-attend event brings together:

- 5000+ visitors over two days
- 120+ exhibitors and partners
- 130+ speakers
- 30+ hours of premium content
- 18+ hours of networking
- Multi-stream conference program
- 3000+ organisations represented

From senior executives and managers to small business owners, consultants and installers, this event is designed to update and connect industry. The exhibition includes leading products from Alpha ESS, 1 Stop Warehouse, Longi Solar, Growatt, Pylontech, Huawei, Delta, Enphase, Fronius and AC Solar Warehouse. Meanwhile, the conference program covers smart energy solutions, applied energy solutions and installer professional development, and delegates can also attend the co-located Hydrogen 2020 Conference. Program content (subject to change) features leading experts such as: Minister Shane Rattenbury, Energy Minister, ACT; Vincent Dwyer, Energy Estate Oliver Yates, Bronze Boar Investments; Kobad Bhavnagri, Bloomberg New Energy Finance; Mark Williamson, Clean Energy Regulator; David Leitch, ITK Services; Tristan Edis, Green Energy Markets; Ian Learmonth, CEFC; Tim Washington, Jet Charge Simon Holmes à Court, Melbourne University, Energy Transition Hub; Stephanie Moroz, Davanz; Claire Johnson, Hydrolytics; Craig Knight, Horizon Fuel Cell Technologies Keshia Noronho, Fronius and Alex Hewitt, CWPR.

Delegates can expect to meet with visitors from across Australia and overseas including suppliers, financiers with projects, entrepreneurs, media, government and academics from the solar, storage, energy management, hydrogen, wind and zero emission vehicles sectors.

Smart Energy Conference and Exhibition 2020
7-8 April 2020
International Convention Centre Sydney
Register for free: www.smartenergy.org.au.

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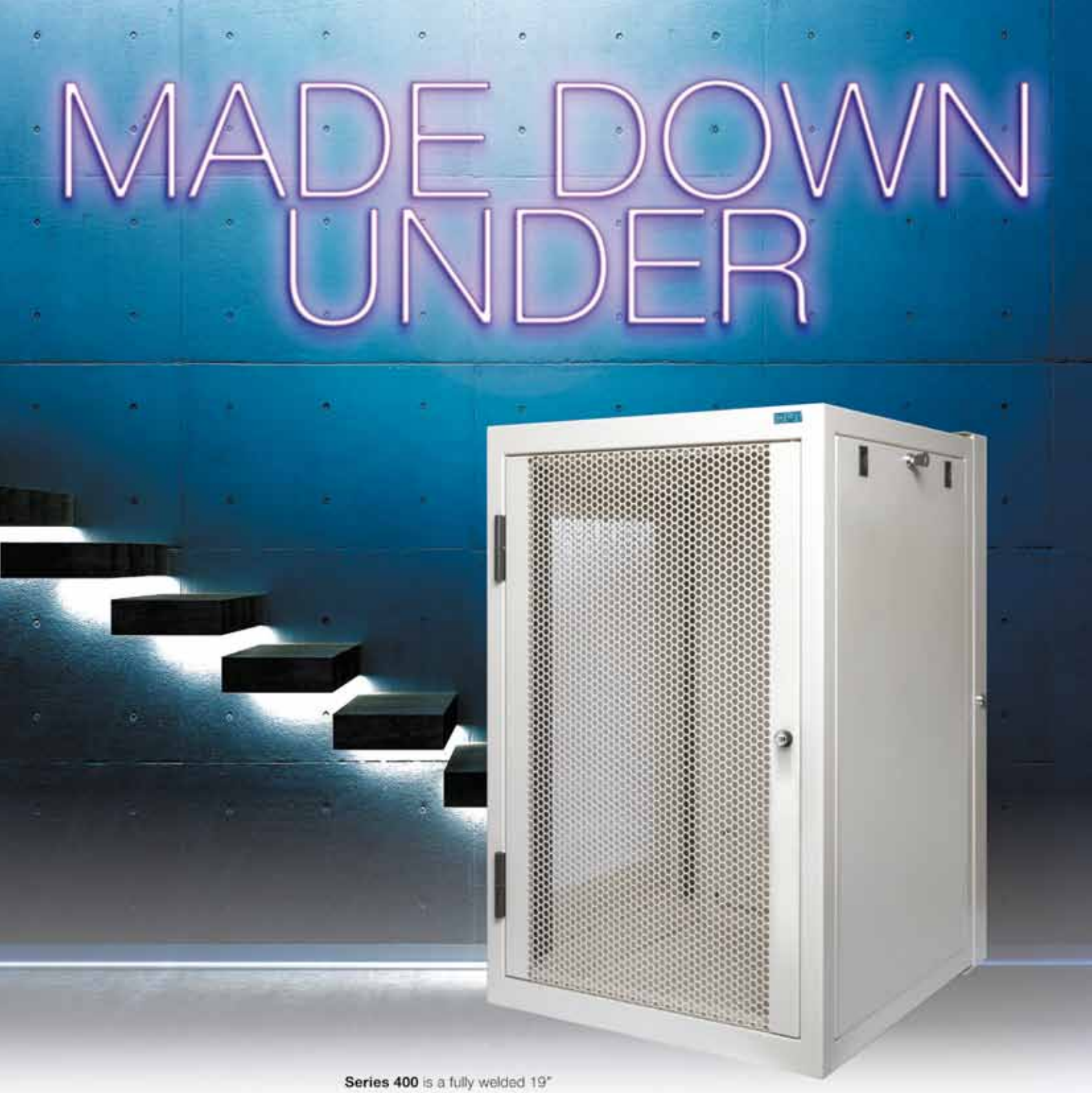

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