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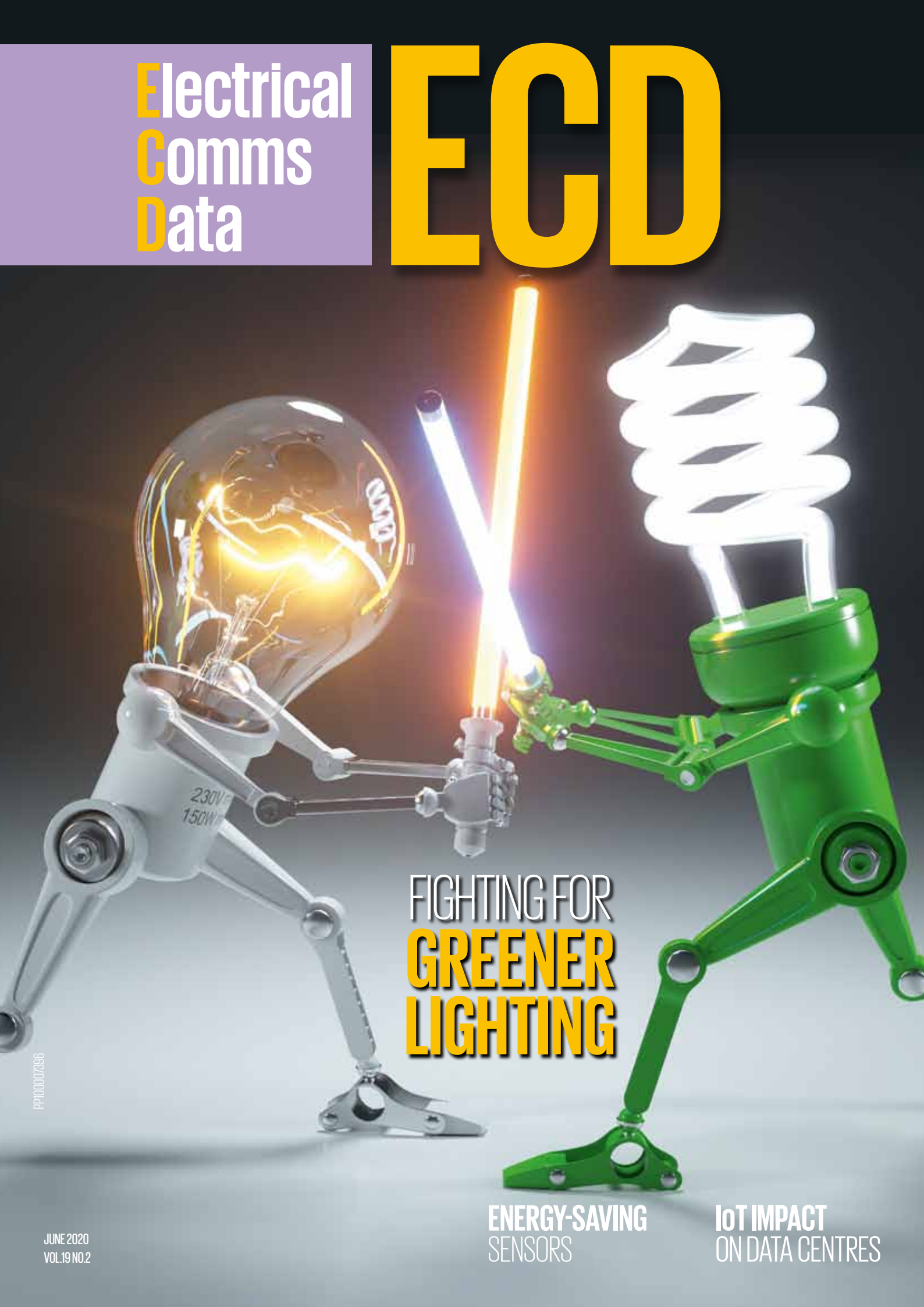

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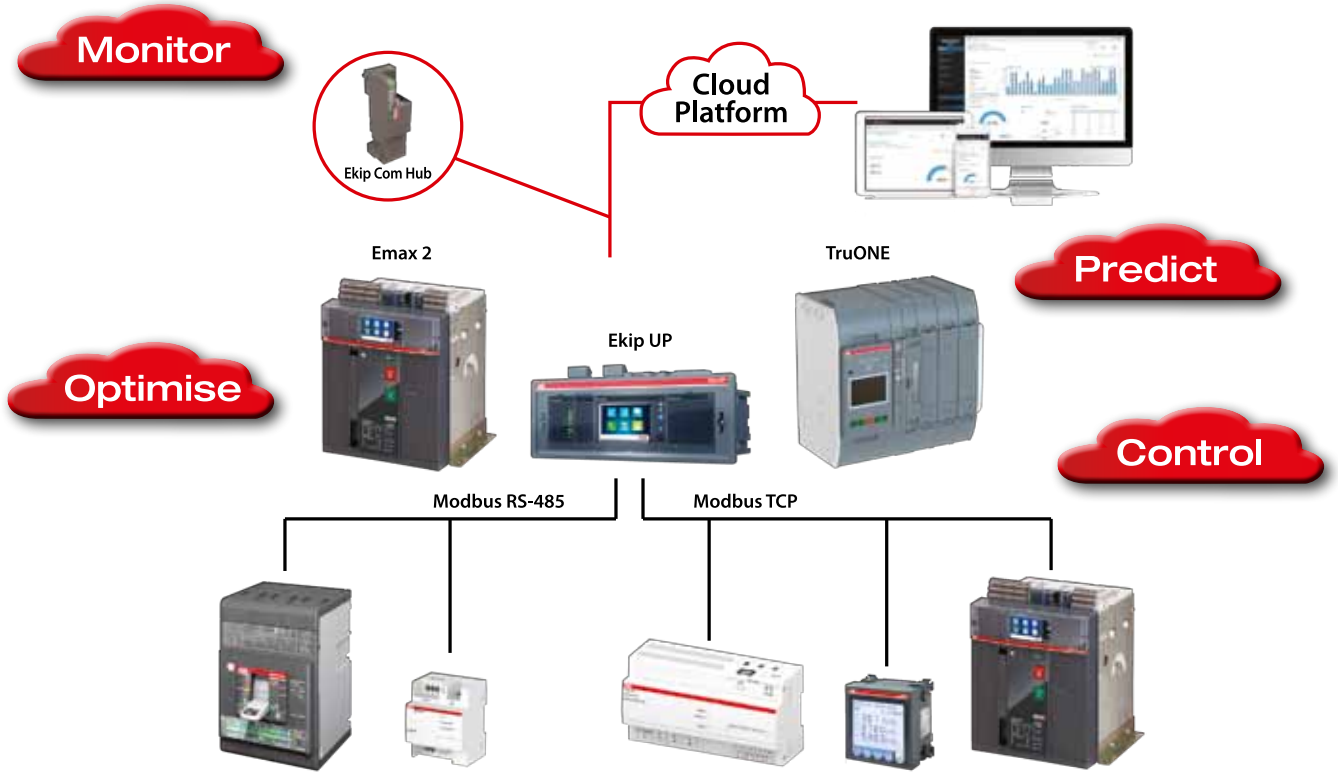

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FROM THE EDITOR

Some of you may be pleased to note that as June rolls around, the year 2020 is already half finished. Given that this has been one of the strangest and most challenging times ever faced by many businesses, it will be interesting to see what the 'new normal' entails as the pandemic eases and we settle into a less restricted lifestyle in the latter half of 2020.

And, as we ponder the concept of a new normal, perhaps we can also look at how other systems and technology can be changed for the better in a post-COVID-19 world.

Sustainable, environmentally friendly lighting systems are becoming evermore important as the world attempts to conserve its natural resources. LED lights that are less disruptive to natural ecosystems can be implemented by industries around the globe — thus cutting energy consumption, minimising light pollution and CO_2 emissions, and helping to protect the environment.

In the same vein, with its capacity for increasing efficiency and cutting energy consumption, the demand for smart building technology continues to rise. Automating building functions through the use of sensors and other smart technology can significantly improve the efficiency of a building and help to reduce the cost of power consumption. In fact, increased government regulation now often means that new buildings are required to be fitted with smarter heating and cooling systems for exactly this purpose.

As society continues to evolve and adapt to its newfound circumstances, we must hope that some of the changes will help to create healthier built and natural environments in the long term.

Amy Steed – Editor
ecd@wfmedia.com.au

SAVING POWER WITH SMART BUILDING SENSORS

Amy Steed

With energy conservation becoming increasingly important to organisations around the world, the demand for smart buildings has risen.

In fact, according to a report from Mordor Intelligence, the smart building market is expected to experience growth of more than 23% during the period 2020–2025.

As sensor technology, control techniques and IoT infrastructure have improved over time, smart buildings have become more efficient — including in terms of power consumption.

Industry 4.0 and the automated building

The building industry has begun to focus on 'Industry 4.0' — also known as the concept of using technologies to connect the physical world with the digital world — in relation to building automation. According to Macquarie University researchers in the article 'Sensing, Controlling, and IoT Infrastructure', Industry 4.0 in the building sector can both increase safety and reduce the energy consumption, without compromising the comfort level within the building.

Applying Industry 4.0 principles to HVACR (heating, ventilation, air conditioning and refrigeration) systems is particularly useful, given that these systems typically account for as much as 30% of energy use and costs in commercial buildings and office spaces. Using smart HVACR technology, such as smart thermites, sensors, control valves, smart actuators, air-conditioning systems and smart room heaters, creates 'greener' buildings that have the capacity to conserve more power. Consequently, around the world, increased government regulation has seen a requirement for many new buildings to be fitted out with smarter heating and cooling systems, which in turn reduces the amount of power that these systems are using.

In the article 'Sensing, Controlling, and IoT Infrastructure', the researchers suggest that an IoT-based building management system (BMS) is the next step for improving energy efficiency in commercial buildings. They state that the BMS can help to manage, monitor and control energy consumption within the building, and "it is also capable of gathering information from building to control the

HVAC, artificial lighting, natural daylighting operation, and utilities in connection with safety devices, fire detection, and protection".

According to the 'Smart Homes Market — Growth, Trends, and Forecast (2020 - 2025)' report, recent IoT advancements that have led to a drop in price for sensors and processors may also encourage manufacturers to promote automation in the household sector and deliver greater energy savings.

Powering smart sensor networks

A team of researchers at Penne State has been working on technology that can power sensor networks for smart buildings and factories. The everyday electricity used in homes and buildings around the world also creates small magnetic fields while it is in operation — scientists are now trying to harvest this 'waste' electricity for use in sensor networks.

"Just like sunlight is a free source of energy we try to harvest, so are magnetic fields," said Shashank Priya, professor of materials science and engineering and associate vice president for research at Penn State.

"We have this ubiquitous energy present in our homes, office spaces, work spaces and cars. It's everywhere, and we have an opportunity to harvest this background noise and convert it to useable electricity."

The team of scientists developed a device that provides 400% higher power output compared to other state-of-the-art technology when working with low-level magnetic fields, like those found in homes and buildings.

Paper-thin devices of about 1.5 inches long were placed on or near appliances, lights or power cords where the magnetic fields are strongest. According to the researchers, these fields quickly dissipate away from the source of flowing electric current. When placed four inches from a space heater, the device produced enough electricity to power 180 LED arrays. When placed inches away, enough electricity was produced to power a digital alarm clock.

This technology has implications for the design of smart buildings, which require self-powered wireless sensor networks to carry out functions such as the monitoring of energy and operational patterns, as well as remotely controlling systems.

"In buildings, it's known that if you automate a lot of functions, you could actually improve the energy efficiency very significantly," Priya said.

"Buildings are one of the largest consumers of electricity in the United States. So even a few percent drop in energy consumption could represent or translate into megawatts of savings. Sensors are what will make it possible to automate these controls, and this technology is a realistic way to power those sensors."

When carrying out their research, the scientists used a composite structure where they layered two different materials together. One of these materials is magnetostrictive, which converts a magnetic field into stress, and the other is piezoelectric, which converts stress, or vibrations, into an electric field. The combination allows the device to turn a magnetic field into an electric current.

The device has a beam-like structure with one end clamped and the other free to vibrate in response to an applied magnetic field. A magnet mounted at the free end of the beam amplifies the movement and contributes toward a higher production of electricity.

"These results provide significant advancements toward sustainable power for integrated sensors and wireless communication systems," said Min Gyu Kang, an assistant research professor at Penn State and co-lead author on the study.

"The beauty of this research is it uses known materials, but designs the architecture for basically maximizing the conversion of the magnetic field into electricity," Priya said. "This allows for achieving high power density under low amplitude magnetic fields."

The research was published in the journal *Energy and Environmental Science*.

Automation in the future

With energy costs continuing to rise, building managers will face increasing pressure to find ways to save on power within their facilities. This in turn will see a rise in the implementation of IoT communications to foster smart building automation.

In the article 'Sensing, Controlling, and IoT Infrastructure', the researchers suggest that LoRa — a long range, low-power wide-area network protocol — has advantages over other communication protocols. They said that "this protocol has been mostly preferred because of its key features such as low power consumption, bidirectional communication, secure, standardised, high capacity, low cost, and long range". Not only that, but LoRa is deployed with a target — meaning that end-devices have an energy usage limitation placed on them. They have the capacity to connect energy systems with smart devices and sensors, and enable the easy implementation of a more economical, power-saving building management system.

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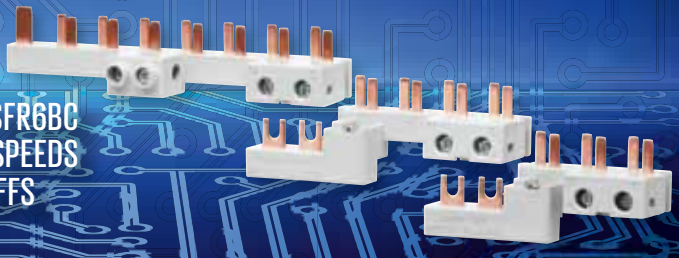

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ENERGY NETWORKS SUPPORT THOSE IN HARDSHIP

A suite of measures has been announced to assist those struggling to pay their power bills.

Energy networks across New South Wales, Victoria and South Australia are working to support customers that are experiencing hardship as a consequence of the COVID-19 pandemic.

The electricity and gas network relief package complements other initiatives across the gas and electricity sector, and took effect on 1 April.

Energy Networks Australia CEO Andrew Dillon said the comprehensive package was aimed at small business and residential customers and would help ensure energy retailers can better assist those facing hardship.

"Networks understand these are extraordinarily tough times for small business, and energy bill relief will really help," Dillon said.

"For small businesses that are mothballed, electricity and gas network charges will not be applied from the start of April to the end of June 2020, if their consumption is less than a quarter what it was in 2019.

"Networks know it is in everyone's interest to support small businesses through what is an extremely challenging period."

The package also includes measures to support households by helping energy retailers provide further assistance to those who fall into hardship as a result of COVID-19.

"Networks will be deferring or rebating electricity and gas network charges for impacted customers," Dillon said.

"This assists impacted customers and helps energy retailers, who administer energy hardship programs.

"Networks and retailers realise it's important the industry pulls together to support the many small businesses and households who will face growing challenges over the months ahead.

"Networks will work with energy retailers to ensure the benefits of this package flow through to customers smoothly."

Governments have already announced various energy support measures for affected customers.

Dillon said energy network crews across the country were continuing to do critical works during this crisis to keep the power on, the gas flowing and the energy system safe and reliable.

The number of planned outages for these critical works would be minimised and they would be as brief as possible.

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WORKER DEATH SPARKS $30K FINE FOR SOLAR COMPANY

A conviction and $30,000 fine has been issued to a solar installer, after a worker fell and was killed at a Bendigo construction site.

Solar 2.0 Pty Ltd pleaded guilty in Bendigo Magistrates' Court to failing to reduce the risk associated with a fall at a workplace, and failing to ensure high-risk construction work was carried out in accordance with a Safe Work Method Statement.

The company was also ordered to pay costs of $14,197.

The court heard a number of Solar 2.0 employees were installing solar panels on the roof of a property in the suburb of Kennington in November 2018 when the worker fell and landed on concrete below.

The 21-year-old man suffered head injuries and later died in hospital.

The court was told there was no fall protection in place onsite and workers had accessed the roof via an extension ladder placed against a veranda with a polycarbonate roof.

Investigators found the ladder had been fitted in a 'gutter guard' at the top and was not fixed at the bottom.

WorkSafe Victoria Executive Director of Health and Safety Julie Nielsen said the death was a tragic reminder of the devastation caused when employers fail to take a safety-first approach.

"Like all workers, this young man deserved to return home safely to his loved ones, who are now left dealing with unimaginable grief," Nielsen said.

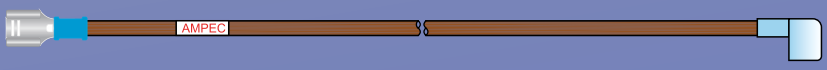
"It's well known that falls are a common cause of serious injuries and deaths in Victorian workplaces, so there is simply no excuse for not having the appropriate measures in place to protect workers."

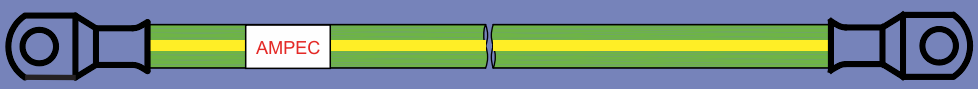
To prevent falls from height, employers should first consider if they can eliminate the risk by doing all or some of the work on the ground or from a solid construction.

If that is not possible, they should use:

- A passive fall prevention device such as scaffolds, perimeter screens, guardrails, safety mesh or elevating work platforms.
- A positioning system, such as a travel-restraint system.
- A fall arrest system, such as a catch platform or safety nets.
- A fixed or portable ladder or implement administrative controls.

Wiring Harness Solutions





ampec TECHNOLOGIES

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Electrical Comms Data news

POWER MAINTENANCE MUST CONTINUE DESPITE COVID-19

Critical maintenance on energy networks will continue throughout the COVID-19 shutdown.

Referred to as a planned outage, this critical preventive maintenance is needed to ensure customers continue to receive a reliable supply of energy. It is also essential to protect lives, prevent damage to properties and keep the power on for the future.

However, it means that the supply of electricity or gas will sometimes be temporarily interrupted so the work can be done safely and efficiently — which may cause issues for the hordes of people currently working from home.

During these unprecedented times of uncertainty, energy networks are assuring customers that they are doing everything they can to keep the power on, gas flowing and the energy system safe and reliable.

Energy Networks Australia CEO Andrew Dillon said networks recognised planned outages caused inconvenience, particularly given the current crisis, but the work that was being undertaken was absolutely essential to ensure a safe and secure energy system.

"We understand many customers are working from home during this unprecedented COVID-19 pandemic; however, to ensure you are able to continue to have power for weeks to come, critical maintenance must continue," Dillon said.

"It is likely that restrictions relating to COVID-19 will continue for several months. Networks are doing everything they can to minimise disruption while these urgent works are undertaken.

"For some critical work, power will be disrupted for a few hours. This is designed to avoid potentially catastrophic faults that could cause long-term outages and put customer safety at risk.

"Please respect the crews performing these works, they are doing so to protect you and your families and ensure the safe and reliable supply of energy."

Dillon said energy networks were taking steps to minimise disruptions and ensure critical infrastructure, such as hospitals, have secure supplies.

"We ask for your patience as networks continue to carry out critical works," he said.

CALLS FOR BETTER JOB PROTECTION DURING COVID-19

The National Electrical and Communications Association (NECA) is calling for governments to take unprecedented measures to protect jobs and businesses in Australia.

In an open letter to the federal Treasurer, Josh Frydenberg, NECA CEO Suresh Manickam has suggested a range of measures that could be implemented.

NECA is urging the government to consider the following:

- Adopt and employ a holistic approach to supporting apprentices. To this end the recently announced wage subsidy of 50% for apprentice and trainee wages that will be made available to small employers should be extended immediately to medium and large employers, including group training organisations.
- Swiftly act to confirm that the construction and maintenance of electrical and communications installations is an 'essential service' at all levels of government.
- Expedite repair and maintenance, or energy efficiency upgrades, especially in government buildings that may be unoccupied, such as universities or schools that are subject to closures. All governments should immediately initiate energy-efficient and solar upgrades to government buildings in time for their reoccupation.
- Task all states and territories to immediately abolish all payroll tax provisions. If the intent of government is to build and boost the economy, any form of payroll tax is both counterintuitive and counterproductive and will only serve to impede growth.
- Task all states and territories to immediately adopt one effective single uniformed approach to security of payments. Moreover, the legislation must clearly ensure that subcontractors are to be paid in a timely manner and are to be no longer treated as de facto financiers.
- Immediately address the detrimental effects of unscrupulous principal contractors who seek to enforce unfair contracts on a 'take it or leave it' basis by shifting risk. Unfair contract provisions need to urgently address the transfer of risk from a principal contractor to a subcontractor, particularly in light of the global health crisis and the viability of businesses.
- Treat Saturdays and Sundays as normal working days, such that shifts can be staggered to allowed for a reduction in the number of people on site at any one time. Further, normal hours in a working day should be expanded between 5 am and 9 pm to allow for two shifts of ordinary hours in a normal working day.
- Postpone the next scheduled rise to the Superannuation Guarantee levy for at least two years in order to assist recovering businesses.
- Invest in infrastructure and construction projects that will keep industry productive and protect jobs.

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Distribution boards

Consistent with the 'DB' family of distribution boards, the newly released DB Essential from APS Industrial is custom designed for the demands of Australian industry and purpose built for compatibility with Siemens circuit breakers.

The DB Essential has been developed as a quality lightweight distribution board for high-end commercial and medium-duty industrial environments. The enclosure by KATKO has a fully welded construction and meets the highest IK rating against external mechanical impacts while maintaining an IP55 ingress rating.

Together these ratings make this range of distribution boards suitable for indoor and outdoor applications.

While the DB Essential does not offer a removable gear tray (as featured in the DB Ultimate), the DB Essential offers flexibility in equipment options due to careful design considerations and a range of features such as a dual quarter-turn locking system, a removable hinged escutcheon and door, and a continuous poured door seal. These features are complemented by a galvanised gear plate, dual earth neutral bars and a removable gland plate at the top.

APS Industrial

www.apsindustrial.com.au

Industrial VPN routers

Ewon Cosy industrial VPN routers are designed to offer easy remote access across the internet to machines and installations on customer sites or in the field. With the Ewon Cosy131, OEMs and system integrators can troubleshoot machines remotely without going on site, reducing support costs.

The Ewon Cosy131 routers are offered with a modern user interface, WAN, Wi-Fi and 3G/4G (WAN fallback) connectivity support. Ewon Cosy131 routers can also send email and SMS notifications that enable the user to understand the details of the issue that occurred within the equipment or process.

Ewon solutions offer an in-depth layered security approach that is certified and continuously monitored to comply with the highest security standards. Now Ewon has advised an upgrade to its Easy Setup functionality. Easy Setup is a set of features that help machine manufacturers to easily prepare, configure and install their routers, no matter where they deploy their machines. This enables users to set the network connectivity of a Cosy131 router with just a PC and either a USB flash drive or an SD card. A wizard guides the user through the most common internet connectivity settings and generates configuration files to be loaded on the device.

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Circuit breaker test system

The Omicron CIBANO 500 is a circuit breaker test system. The lightweight 3-in-1 test system built for medium- and high-voltage circuit breakers is optimised for onsite testing. It combines a micro-ohmmeter, timing analyser, and a coil and motor supply, all in one single device. It is available to rent from TechRentals.

Due to the CIBANO 500's integrated AC/DC power supply there is no longer any need for risky and time-consuming connections to live DC circuits. Additionally, users can operate independently from external power supply units.

The CIBANO 500 features global technology that allows users faster and safer wiring, and speeds up the whole test process. It utilises Omicron's Primary Test Manager (PTM) software tool that provides a well-structured database for managing all circuit breaker-related data.

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OHS OBLIGATIONS IN THE WORKPLACE AMIDST COVID-19

Paul Stathis, Chief Executive Officer, BICSI South Pacific

At the time of writing, the Australian federal and state/territory governments had just eased their social-distancing restrictions, bringing a fresh sense of optimism to our communities.

While the restrictions were relatively minor, these were seen as positive steps to returning to normality, especially in regard to the workplace and our economy, both of which have been severely impacted by COVID-19.

The ICT industry in which BICSI actively participates has likewise been severely impacted by the COVID-19 pandemic — this is despite the fact that ICT is an essential service with millions of people required to work from home and connect via the internet. Many of our members have been called upon to do extraordinary things to ensure their clients and employers can function as close to 'business as usual' as possible. These include establishing thousands of VPNs for remote workers; fast-tracking the deployment of cabling and Wi-Fi networks; urgently remediating faulty and sub-standard ICT networks; and fulfilling inordinately large requests for things like UPSs, wireless access points, cabling, Ethernet switches and records management software. BICSI applauds its fellow ICT workers who have risen to the challenge of helping so many people and businesses stay connected and keep working as close to business as usual as possible.

While no-one can foresee the full extent of the COVID-19 pandemic, many contemplate 2020 as a full year of restrictions, either imposed by government, employers or individually on themselves. Some medical experts warn that returning to 'normal' too soon will cause a second and more dangerous COVID-19 wave, which would claim many more lives and see the economy plunge further still. So BICSI advocates caution in the workplace, even as the current restrictions are eased, and recommends businesses adopt the SafeWork Australia COVID-19 safety guidelines in the workplace for both employers and employees.

Published late April 2020, SafeWork Australia listed a number of guidelines to help employers, managers and business owners understand their responsibilities in operating a 'COVID-19 safe' work environment, along with guidelines for workers to act safely in their workplace while minimising contracting or spreading COVID-19.

Below is an extract from some of the guidelines that can assist all working in the ICT industry to work safely now and into the near future as restrictions are removed. To many, they can seem just 'common sense', but compiled together, they form an excellent framework for being proactive in the workplace to reduce the risks associated with COVID-19 and assist us get back to normal as soon as possible.

Employers

The model Work Health and Safety (WHS) laws require employers to take care of the health, safety and welfare of workers, including staff, contractors and volunteers, and others (clients, customers, visitors) at their workplace. This includes:

- providing and maintaining a work environment that is without risk to health and safety;
- providing adequate and accessible facilities for the welfare of workers to carry out their work; and
- monitoring the health of workers and the conditions of the workplace for the purpose of preventing illness or injury.

Employers' duty to ensure the health and safety of their workers includes eliminating the risk of exposure to COVID-19 where reasonably practicable. If employers aren't able to eliminate that risk, they must minimise the risk, as far as is reasonably practicable, by, for example:

- implementing working-from-home arrangements;
- requiring workers to practise physical distancing;
- requiring workers to practise good hygiene (eg, through workplace policies and ensuring access to adequate and well-stocked hygiene facilities);
- requiring workers to stay home when sick; and
- cleaning the workplace regularly and thoroughly.

Employers must ensure the work of their business or undertaking doesn't put the health and safety of other persons (such as customers, clients and visitors) at risk of contracting COVID-19, by protecting others by, for example:

- requiring them to practise physical distancing, including through contactless deliveries and payments;
- requiring them to practise good hygiene: and
- requiring others to stay away from the workplace, unless essential, eg, family, friends, visitors.

Employers must also maintain their workplace to ensure the work environment doesn't put workers and others at risk of contracting COVID-19 by, for example:

- cleaning the workplace regularly and thoroughly;
- restructuring the layout of the workplace to allow for physical distancing; and
- limiting the number of people in the workplace at any given time.

> THE ICT INDUSTRY IN WHICH BICSI ACTIVELY PARTICIPATES HAS LIKEWISE BEEN SEVERELY IMPACTED BY THE COVID-19 PANDEMIC — THIS IS DESPITE THE FACT THAT ICT IS AN ESSENTIAL SERVICE WITH MILLIONS OF PEOPLE REQUIRED TO WORK FROM HOME AND CONNECT VIA THE INTERNET.

Employers must also provide adequate facilities in their workplace to protect workers from contracting COVID-19 with:

- washroom facilities including adequate supply of soap, water and paper towel, or hand sanitiser where it's not possible for workers to wash their hands;
- staff rooms that are regularly cleaned and allow for physical distancing; and
- regular breaks to use these facilities, particularly to allow workers to wash their hands.

Employers must provide their workers with any information or training that is necessary to protect them from the risk of COVID-19 exposure arising from their work. This may include:

- providing guidance on how to properly wash hands;
- training workers in how to fit and use any necessary personal protective equipment (PPE);
- training workers to exercise adequate cleaning practices throughout the day;
- providing workers with instructions on how to set up a safe home workplace; and
- providing workers with instructions on staying home from work if sick.

Employers must also consult with workers on health and safety matters relating to COVID-19. When consulting, employers must give workers the opportunity to express their views and raise health and safety concerns. Employers must take workers' views into account and advise workers of the outcome of consultation.

Consult with workers:

- when conducting a risk assessment;
- when making decisions on which control measures to use to manage the risk of COVID-19 exposure (eg, when introducing working-from-home arrangements or restricting the workplace to allow for physical distancing);
- when making decisions about the adequacy of the workplace facilities to allow for control measures such as physical distancing and hygiene;
- when proposing other changes that may affect the health and safety of workers; and
- when changing any procedures that have an impact on the health and safety of workers.

Employers must allow workers to express their views and raise health and safety issues that may arise directly or indirectly because of COVID-19. Employers must take the views of workers into account when making decisions and advise workers of decisions. Consultation doesn't require consensus or agreement, but employers must allow workers to be part of the decision-making process. If workers are represented by health and safety representatives (HSRs), they must be included in the consultation process.

Workers

Workers must take reasonable care of themselves and not do anything that would affect the health and safety of others at work (eg, coming to work when unwell). They must follow any reasonable health and safety instructions from their employer.

To prevent the spread of COVID-19, it's important that workers:

- work safely and observe any new requirements for physical distancing (even if it means performing tasks in a different way to what they're used to);
- follow instructions (eg, about how to wash hands thoroughly);
- ask if not sure how to safely perform the work;
- use PPE in the way they were trained and instructed to use it; and
- report unsafe or unhealthy situations (eg, lack of soap in the bathroom) to supervisor or to a HSR.

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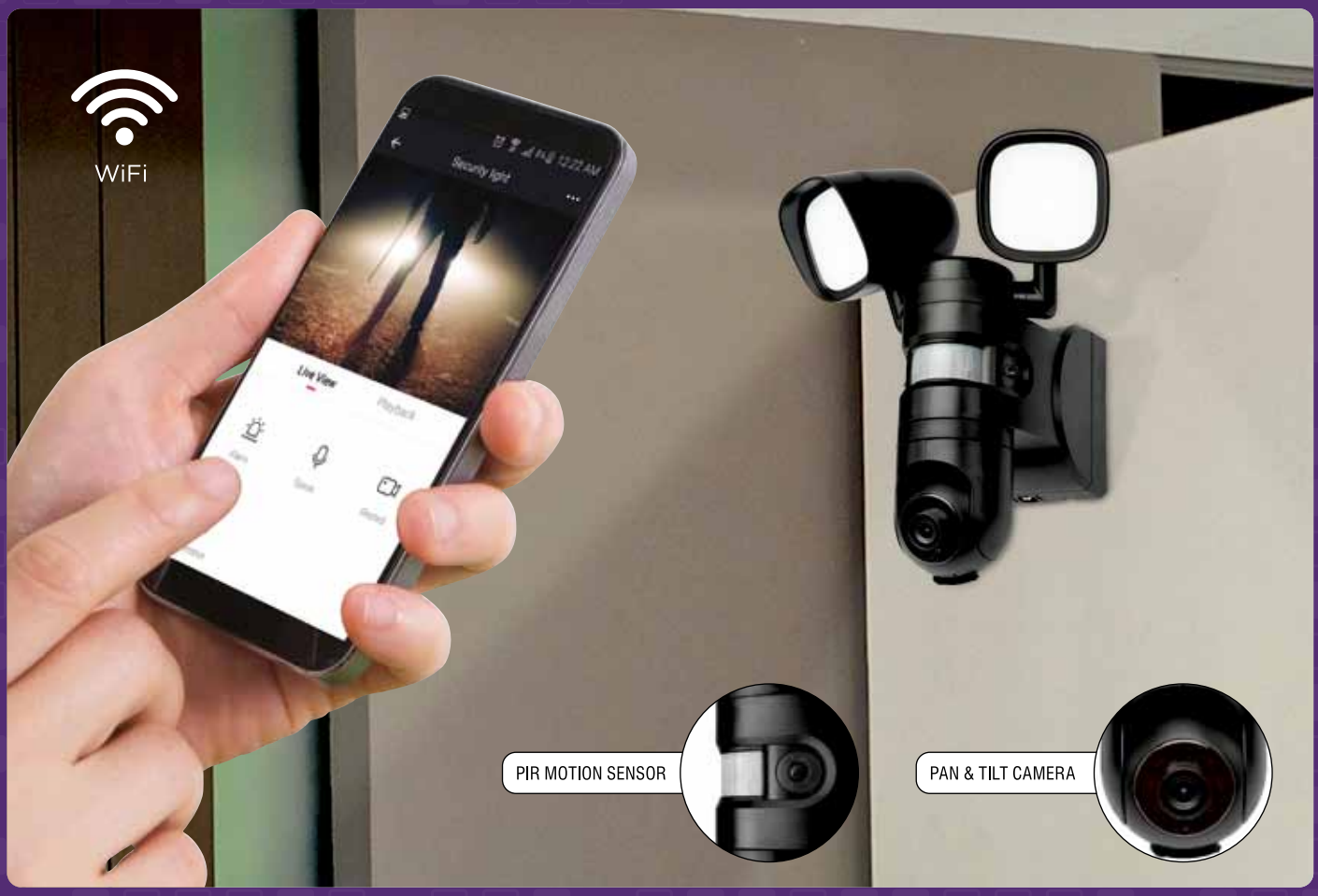

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CHOOSING THE RIGHT ENCLOSURE FOR HARSH ENVIRONMENTS

An electrical enclosure's ability to protect the controls contained within is impacted by environmental conditions.

Particularly in harsh environments such as mining and transportation, there is the risk of production downtime, injury and increased maintenance costs where an enclosure fails to do its job.

In the majority of cases, there will be a specific material that is better suited for long-term reliability and overall cost reduction. Enclosure material selection should be carefully selected, taking into consideration factors such as environmental characteristics and heating and cooling mechanisms. Environments can be either indoors or outdoors and, depending on location, there can be environmental factors such as moisture, ultraviolet or solar radiation, dust, temperature, and other chemical and physical conditions at the site of permanent installation.

An overspecified enclosure will work effectively in a natural environment — but in an underspecified enclosure, the internal equipment could be damaged, causing long-term consequences. Therefore, environmental factors override other considerations in materials selection. The most common corrosive element is water, which is usually present in enclosure applications. Additionally, adjacent processing operations or other intermittent activities such as industrial cleaning, salty atmospheres and the general plant environment may expose an enclosure to a variety of corrosive agents and temperatures.

The level of corrosion typically increases with moisture content, including rain, dew and condensation. While rain can have a beneficial effect as it washes away contaminants from exposed surfaces, if left to collect in pockets or crevices it will supply a source of continued moisture. When relative humidity exceeds 70%, a thin moisture film forms on a metal surface, providing an electrolyte. This dew or condensation can become very corrosive if it is saturated with a contaminant like sea salt or acid compounds from industrial sources.

Therefore, when choosing an enclosure material, start by identifying the environmental requirements of the application, and then narrow down the options to material types that fit the necessary requirements, size and ratings. Typical materials available include powder-coated steel, stainless, thermoplastic and aluminium. Evaluate the thermal considerations the material will need to withstand, and the reactions of each material to such conditions.

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TIME WARP TECH CUTS POWER OUTAGE TIME

New 'time reversal' technology enables faster fault-finding within power networks, as well as reducing power outage durations.

The technology, which was developed by researchers at Monash University, would enable technicians to locate faults in power networks within just tens of seconds. It can also complement existing technology to help ease community impact in bushfire-prone areas.

An international research team involving Dr Reza Razzaghi from Monash University's Department of Electrical and Computer Systems Engineering has successfully tested their fault location technology in Switzerland, with further trials to continue on Australian powerlines.

A patent for the latest innovation in this technology has been filed by Monash University, and Australian industry has expressed interest in upscaling it for further tests on rural powerline networks.

In contrast to current methods, this technology requires only a single measurement point installed at a substation which can identify a precise fault in the power line, to within 10 metres, in a few seconds to minutes.

Victoria currently adopts rapid earth fault current limiters (REFCLs) across its high-risk rural power networks, which limits the energy supply when a fault occurs to mitigate any bushfire risks.

However, REFCLs cannot precisely determine where a fault is located, meaning restoration crews can spend hours patrolling hundreds of kilometres of powerlines in order to find the problem before they can fix it.

Thousands of people can be without power for several hours in extreme heatwave conditions as a result of this time lag. Local communities can suffer heat stress casualties due to the long power outages that are sometimes required to prevent fires.

"This innovation aims to ease the community impact of current technology that helps to prevent fires. The problem we have is when a network fault is detected, the REFCL activates to prevent the fire but it can't find the fault," said Dr Tony Marxsen, Research Associate in Monash University's Department of Electrical and Computer Systems Engineering.

"So what ends up happening is that a large number of people are without power for upwards of five hours on a 45-degree day.

"This technology offers the hope that faults can be pinpointed quickly, reliably and safely, to, above all, reduce the impact on customers in very high-stress conditions."

The time reversal technology comprises three steps: the fault signals are measured; the fault locations are then defined and the time-reversed signals are injected to a computer model of the network; and finally, the fault current at a guessed location is evaluated to identify the most probable location of the fault.

"Imagine a swimming pool with sensors around its perimeter. If a stone was dropped into the water, the ripples would hit the sensors, and these sensors would record the waves generated by this stone drop. The time reversal technology can find the location of the dropped stone by (in a computer model of the pool) reversing the direction of the waves measured by the sensors," Razzaghi said.

The technology will allow distribution network operators to locate faults in powerlines quickly and allow the fault to be found and repaired faster.

Faults in electrical distribution networks are one of the primary sources of major bushfires in Australia. On Black Saturday, five of Victoria's 11 major bushfires were started by powerline faults. Media reports blamed a power network fault for a 2019 fire in South Australia that burned more than 20,000 hectares, destroying many houses and local businesses.

"Rather than bypassing REFCLs and re-energising faulty networks and risking a fire, this technology can help to pinpoint the fault location after the operation of REFCLs," Razzaghi said.

"This radical new technology has the potential to save lives and ensure Australia is best prepared to prevent and tackle any catastrophic incidents that might arise as our country continues to get warmer and drier," Marxsen said.

Further research in currently being undertaken to adapt this technology to Australian power networks.

Electrically powered wire rope and cable cutters

Enerpac's electrically powered EWCE wire rope and cable cutters are designed to reduce hazards and increase efficiency when cutting heavy-duty material. The 25 kg guillotine-style cutters offer 380 kN (42.7 tonnes) force to slice through rope up to 42 mm in diameter and cable up to 55 mm in diameter. The product provides an alternative to cutting material with angle grinders, gas saws or by holding it in place, amidst a shower of sparks or broken blades.

The cutters can handle materials up to HR48 hardness and are suitable for rigorous use on sites such as mining, electrical, construction and infrastructure. The 230 V tools complement the company's range of hydraulic cutter heads, including WHC, WMC, WHR and STC types in capacities from 3–20 tonnes and cutting capacities of 13–101 mm.

The cutters offer increased safety and portability, facilitated by the tool's opening head. The cutters also enable easy and secure set-up and operation, with wire rope or cable held in place by the blades during the cutting process, offering greater safety than cut-off wheels. A controlled cutting process increases productivity and offers quick set-up, with double-acting cylinder and directional control to improve handling and reduce jamming. The blades are also durable, designed to outlast grinder or saw blades and avoid hazards from disintegrating rotating equipment.

The EWCE electric wire rope and cable cutters complement the company's comprehensive ranges of lifting cylinders, pumps, pullers, presses, control technologies and professional bolting technologies widely used throughout Australia, New Zealand and Papua New Guinea.

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Singlemode optical fibre

The Prysmian BendBrightXS bend insensitive singlemode optical fibre has a 180 μm outer diameter. The fibre enables cable miniaturisation and supports high-density optical networks.

The dimensional reduction of 180 μm fibre corresponds to half of the cross-section area of legacy 250 μm singlemode fibre, while preserving a 125 μm glass diameter. The fibre is fully compliant with G.652 and G.657.A2 global standards, and it can be spliced with any legacy standard singlemode fibre.

With its ColorLock-XS coating system, the fibre is designed to offer good bending performance and mechanical reliability.

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DESIGNING ENVIRONMENTALLY FRIENDLY LIGHTING SYSTEMS

Greater emphasis is now being placed on ecological aspects when planning and installing lighting systems for industrial plants.

Sustainable, energy-efficient and environmentally friendly lighting solutions for indoors and outdoors are in more demand than ever before, as the world aims to conserve its natural resources. This includes measures to reduce light emissions and modifications to lighting technology to protect particularly sensitive ecosystems.

LED technology is a superior alternative to conventional lighting solutions in almost any area, for almost any application. Converting around 35% of their energy consumption into light, they are around twice as efficient as gas discharge lamps and fluorescent tubes. Thanks to their reduced energy consumption, the light-emitting diodes contribute to lowering CO_2 emissions and protecting the environment. LED light fittings also outdo conventional lighting technology when it comes to their service life, which is multiple times longer. With a service life lasting up to 100,000 operating hours, they have proven to be particularly sustainable and require far less maintenance or replacement. Unlike lamps that contain mercury, LED lights are also free from toxic substances, in particular mercury, and can therefore be disposed of much more easily and in an environmentally friendly manner.

Systematically combating light pollution

As well as efficient, energy-saving lighting and light fitting technology, a sustainable lighting concept also requires professional lighting design that guarantees standard-compliant lighting at business premises that is as environmentally friendly as possible. Industrial light, alongside street lighting, illuminated advertisements and floodlight systems, is one of the main sources of irritating light pollution that creates significant 'light domes' and lights up the night sky over urban areas. Light pollution — the emission of artificial light into the atmosphere and subsequent reflection of this light by fine particles — does not just affect human biorhythms. It also has detrimental effects on animals and plants. For instance, artificially brightened surroundings affect plants' growth cycles. Light emissions with a high proportion of blue light, which is characteristic of cold white LED lighting, can disrupt nocturnal insects' and migratory birds' sense of direction, as well as affecting the breeding and feeding behaviour of a range of species.

Optimised lighting

Up to now, there are still no binding regulations limiting light emissions from industrial plants; as a result, it is down to lighting manufacturers and lighting designers to make their customers aware of this important issue. Unfavourable light distribution caused by improper planning, installation errors or outdated lighting not only has a negative effect on plants and animals — it also wastes

> LIGHT POLLUTION — THE EMISSION OF ARTIFICIAL LIGHT INTO THE ATMOSPHERE AND SUBSEQUENT REFLECTION OF THIS LIGHT BY FINE PARTICLES — DOES NOT JUST AFFECT HUMAN BIORHYTHMS. IT ALSO HAS DETRIMENTAL EFFECTS ON ANIMALS AND PLANTS.

energy, thereby driving operating costs higher and higher. From a design perspective, therefore, the aim is to provide optimum lighting that illuminates all required areas evenly and with as few shadows as possible, without losing scattered light. Using software-based planning tools such as ezyLum from R. STAHL, every inch of an industrial site can be mapped precisely in 3D, including area calculations, standard objects and shadows. The number and position of light fittings and the required luminous flux of the lighting can be accurately determined for defined mounting surfaces. The radiation angle can be adjusted in all three axes, which enables the light to be directed almost entirely towards the area to be illuminated — this reduces and can even eliminate disruptive light emission.

Modified lighting technology

Compared to conventional lighting, which emits light across a wide angle, light-emitting diodes can be aligned for use as a superior half-room spotlight. The special light design prevents unwanted light emission into the upper half of the room caused by reflection within the light itself. For this purpose, R. STAHL manufactures special versions of its tubular light fittings and linear luminaires with a minimised upward light factor. The light distribution curves are modified using a method suitable for the specific characteristics of the light-emitting diodes in use — either refractively using lenses or using reflectors — to eliminate upward light. Additionally, semiconductor technology makes it possible to modify the LEDs' emission spectrum and eliminate unwanted colour components. Depending on the semiconductor material and conversion used, the wavelength of the light emission can be deliberately limited to certain spectral ranges. Compared to conventional solutions such as filtered fluorescent lamps, this more than doubles the efficiency of the lighting. R. STAHL manufactures light fittings with a converted colour spectrum for a range of uses, including the pharmaceutical industry, photo development or signalling safety equipment such as emergency showers. This equipment is also used for onshore and offshore projects in areas with a sensitive ecosystem; in these environments, unmodified artificial light could have a significant negative effect on the natural behaviour of endangered species.

Illuminating species conservation

R. STAHL collaborates with relevant environmental organisations to develop environmentally sustainable lighting for industrial plants and delivery platforms in protected conservation zones. The geography of the area is used as a basis to determine whether endangered species are found in the area to be lit and, if so, how sensitive these species are to light emissions in a certain colour spectrum. Artificial light with a predominantly blue component is particularly attractive to many animals. It stimulates their mesopic vision, which confuses the animals into thinking that it is dawn or dusk and, as a result, triggers their hunting, flying or defence instincts. For example, the natural behaviour of endangered sea turtles is affected by this type of light. To protect these animals, R. STAHL has developed a 'turtle-friendly' lighting version with a light spectrum that has been shifted towards yellow. This solution is specifically intended for use as external lighting on oil rigs and plants close to the coast. The use of particularly warm white light ensures that newly hatched animals are not drawn away from their path to the sea and does not disrupt the biological rhythms of the adult members of the species.

Protecting the environment from harmful light emissions is becoming more and more important in the lighting industry. Industrial sites in ecologically sensitive regions and increasing light pollution in urban centres require light manufacturers and lighting designers to rise to the challenge of developing sustainable, environmentally friendly solutions.

R. STAHL Australia Pty Ltd
www.stahl.com.au

INDOOR LIGHTS COULD SOON POWER SMART DEVICES

A new type of indoor solar cell is being developed for use in smart connected devices.

According to researchers from Uppsala University, these dye-sensitised solar cells are able to harvest light from indoor lamps, removing the need for wires and batteries.

It is estimated that by 2025, many facets of our lives will be mediated through Internet of Things (IoT) devices, a majority of which will be located indoors. Broad installation of such IoT devices requires the devices to become autonomous, meaning that they should no longer need batteries or a grid connection to operate. To achieve this, it is crucial to identify a local low-maintenance energy source that can provide local power to IoT devices, especially in ambient conditions.

Working towards this goal, a research team led by Marina Freitag, assistant professor at the Department of Chemistry, Uppsala University, has developed new indoor photovoltaic cells that can convert up to 34% of visible light into electricity to power a wide range of IoT sensors. The team has designed novel dye-sensitised photovoltaic cells based on a copper-complex electrolyte, which makes them suitable for harvesting indoor light from fluorescent lamps and LEDs. The latest promising results establish dye-sensitised solar cells as leaders in power conversion efficiency for ambient lighting conditions, outperforming conventional silicon and solar cells made from exotic materials.

The research could revolutionise indoor digital sensing for smart greenhouses, offices, shelves, packages and many other smart everyday objects for the Internet of Things.

"Knowing the spectra of these light sources makes it possible to tune special dyes to absorb indoor light. While generating large amounts of energy, these indoor photovoltaics also maintain a high voltage under low light, which is important to power IoT devices," Freitag said.

In cooperation with the Technical University of Munich, the researchers have further designed an adaptive 'power management' system for solar-powered IoT sensors. In contrast to their battery-limited counterparts, the light-driven devices intelligently feed from the amount of light available. Computational workloads are executed according to the level of illumination, minimising energy losses during storage and thus using all light energy to the maximum of its availability. Combining artificial intelligence and automated learning, the solar cell system can thus reduce energy consumption and battery waste, and help to improve general living conditions.

In the future, scientists expect that billions of IoT devices self-powered by indoor solar cells will provide everything from environmental information to human-machine and machine-machine communications. Such advanced sensors can further enhance the next wave of robotics and autonomous systems currently in development.

"Ambient light harvesters provide a new generation of self-powered and smart IoT devices powered by an energy source that is largely untapped. The combination of high efficiency and low cost with non-toxic materials for indoor photovoltaics is of paramount importance to IoT sustainability," Freitag said.

The research was published in *Chemical Science*.

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The ENSA SSL-B Series comprises professional solar battery power systems with integrated LED lighting that are suitable for wherever main power access is not possible or is inconvenient.

Preconfigured and ready for implementation, the SSL-B Series is available in 56, 80, 120 and 180 W panel sizes, with options for 12 or 24 V power output.

Each model features high conversion monocrystalline solar panel technology with a high capacity lithium iron phosphate (LiFePO4) battery to extend the system's operating time for multiple days of use, even in poor solar conditions.

The solar battery power station also features a 180 lm/W LED area light with customisable microwave motion detection system to conserve power usage. The LED light can be turned on from dusk to dawn or when motion is detected. Includes remote for setting control.

Users can customise their own solar battery power station for off-grid, completely standalone outdoor lighting, security, CCTV, Wi-Fi boosting, remote TX/RX and more.

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Temperature sensor

With typical temperature-reading accuracy of 0.25°C and low operating and standby current, the STMicroelectronics STTS22H is designed to enhance temperature and heat-flow monitoring in asset trackers, shipping-container loggers, HVAC systems, air humidifiers, refrigerators, building-automation systems and smart consumer devices.

The device is I²C and SMBus 3.0 compliant, and supports flexible operating modes including configurable output data rate (ODR) down to 1 Hz, a power-saving one-shot mode and an interrupt pin that supports SMBus Alert Response Address (ARA). This allows the sensor, as an SMBus slave, to signal the application if a user-programmed upper or lower temperature threshold is exceeded. Programmable I²C/SMBus slave addresses allow up to two sensors to share the same bus.

Power consumption is low, drawing just 2 μA at 1 Hz ODR and 1.75 μA during periodic one-shot measurements, helping extend the running time of battery-powered devices. In standby mode with the serial port inactive, the device draws 0.5 μA (typical). The 1.5–3.6 V operating-voltage range allows use with various power sources such as a small lithium cell.

The sensor is fast-acting, with conversion time of 5 ms, and provides 16-bit temperature data. The package features a metal slug that minimises thermal resistance to ensure fast settling at the ambient temperature. Devices come factory-calibrated and maintain the 0.25°C typical accuracy from -10 to +60°C, eliminating any need for user calibration.

The product comes in a compact (2 x 2 x 0.5 mm), low-profile, 6-lead UDFN package.

STMicroelectronics Pty Ltd
www.st.com

Uninterruptible power supply

The Delta Amplon RT 1–20 kVA UPS range is a power solution for mission-critical ICT environments. It offers operations- and energy-saving features such as a high output power factor of 0.9, said to provide more real power to critical loads.

It also features an operation temperature tolerance up to 50°C; up to 94% AC-AC efficiency and 97% efficiency in ECO mode; and intelligent battery management to sustain battery life and performance.

According to the company, this model has a much smaller footprint than other models, which can save up to 67% of space, and has good local communications through a rotatable LCD display.

The UPS range also offers optional Li-ion battery technology allowing hot-swappable battery strings, replaceable from the front of the rack and enabling continuous operation. This feature addresses critical issues such as maintenance costs, space, manageability and total cost of ownership.

Delta Electronics Industrial Automation
www.deltaww.com./ia

NEXT-GEN SOLAR
DESIGNED TO TAKE THE HEAT

A next-generation solar cell that can maintain efficiency in the heat has been developed by engineers at Iowa State University.

This solar cell takes advantage of the electro-optical properties of perovskite materials, and the materials are much more stable at high temperatures.

One problem with the current generation of silicon solar cells is their relatively low efficiency at converting solar energy into electricity, according to Vikram Dalal, the Director of Iowa State's Microelectronics Research Center.

The best silicon solar cells in the laboratory are about 26% efficient while commercial cells are about 15%. That means bigger systems are necessary to produce a given amount of electricity, and bigger systems mean higher costs.

That has researchers looking for new ways to raise efficiency and decrease costs. One idea that could boost efficiency by as much as 50% is a tandem structure that stacks two kinds of cells on top of each other, each using different, complementary parts of the solar spectrum to produce power.

The potential of perovskite

Researchers have recently started looking at hybrid organic-inorganic perovskite materials as a good tandem partner for silicon cells. Perovskite calls have efficiency rates nearing 25%, have a complementary bandgap, can be very thin (just a millionth of metre) and can easily be deposited on silicon.

However, Dalal said researchers have learned those hybrid perovskite solar cells break down when exposed to high temperatures.

This causes problems when solar arrays are placed where the sunshine is — usually hot, dry deserts in places such as the American southwest, Australia, the Middle East and India. Ambient temperatures in such places can hit 48–54˚C and solar cell temperatures can hit 93˚C.

Iowa State University engineers, in a project partially supported by the National Science Foundation, have found a way to take advantage of perovskite's useful properties while stabilising the cells at high temperatures. They describe their discovery in a paper recently published online by the scientific journal *American Chemical Society Applied Energy Materials*.

"These are promising results in pursuit of the commercialisation of perovskite solar cell materials and a cleaner, greener future," said Harshavardhan Gaonkar, the paper's first author, who is working in Boise, Idaho, as an engineer for ON Semiconductor.

Tweaking the material

Dalal, the corresponding author of the paper, said there are two key developments in the new solar cell technology.

Firstly, engineers made some tweaks to the make-up of the perovskite material. They removed organic components in the material — particularly cations, materials with extra protons and a positive charge — and substituted inorganic materials such as cesium. That made the material stable at higher temperatures.

Secondly, they developed a fabrication technique that builds the perovskite material one thin layer — just a few billionths of a metre — at a time. This vapour deposition technique is consistent, leaves no contaminants and is already used in other industries so it can be scaled up for commercial production.

The result of those changes?

"Our perovskite solar cells show no thermal degradation even at 200˚C for over three days, temperatures far more than what the solar cell would have to endure in real-world environments," Gaonkar said.

"That's far better than the organic-inorganic perovskite cells, which would have decomposed totally at this temperature. So this is a major advance in the field," Dalal said.

The paper reports the new inorganic perovskite solar cells have a photo-conversion efficiency of 11.8%.

"We are now trying to optimise this cell — we want to make it more efficient at converting solar energy into electricity," Dalal said.

"We still have a lot of research to do, but we think we can get there by using new combinations of materials."

Enclosures

MFB's SoHo 210 range of enclosures offers a useful solution for removing desk clutter. The simple enclosures provide a vertical storage solution for equipment that could otherwise take up unnecessary desk space. Simply drop one under a desk to house modems, switches, routers and other peripheral devices.

The enclosures can be supplied unassembled or assembled with common MFB accessories including shelving and power distribution boards. They are available in a range of heights and depths and a range of powder coat colour finishes.

MFB Products Pty Ltd
www.mfb.com.au

Cable assemblies

TE Connectivity has introduced M8/M12 cable assemblies to complement its existing sensor/actuator cable assembly solutions.

The A- and B-coded M8/M12 cable assemblies comply with Profibus, DeviceNet and CC-link protocols, offering multiple options for a variety of needs. They have 360° shielding against EMI for complete protection for signal and data transmission, and are rated IP67 for resistance to dust and water.

The assemblies are overmoulded in either PVC or halogen-free polyurethane (PUR) cables, suitable for drag chain applications or torsional stress, depending on user performance requirements. They come with various standard cable length options from 0.5 to 15.0 m.

The assemblies can be produced in many user-specific plug-and-play configurations to enable design flexibility and quick installation in most industrial environments.

Applications for the assemblies include process control systems, robotics and automation, production equipment, machine tools and material handling.

TE Connectivity
www.te.com

Explosion-protected lighting systems

R. STAHL has now released modern explosion-protected lighting systems with DALI interfaces. The EXLUX luminaire variants correspond to the DALI standard according to IEC 62386, and are specifically designed for consistent lighting management for general and emergency lighting, even up to Zone 1 explosion protection. As well as safety and emergency lighting, the range includes durable, energy-efficient linear luminaires that can be installed as ceiling, pendant or pole-mounted light fittings.

These luminaires, from the EXLUX 6002/4, 6402/4, 6009/4 and 6409/4 ranges, are designed to function for over 100,000 operating hours at a maximum ambient temperature of +60°C and achieve light output values up to 145 lm/W. Thanks to the use of bidirectional DALI communication, around 200 programmable commands can be configured, allowing operators to set different intensity values and dimming behaviour for individual light fittings or luminaire groups.

In addition, status and functional data can be transmitted to the bus master. The DALI standard makes it easier to integrate external sensors for presence or daylight control and offers additional functions for continuous data storage (NVM), device identification, light value detection and error diagnosis. The automatic retrieval of switching states, error messages and brightness values supports forward-looking maintenance concepts. For location-independent remote monitoring, data can be managed using a web browser or smartphone app. The safety and emergency lighting monitoring function encompasses both the light fittings and the battery status. This means that the DALI function is automatically switched off in a situation requiring emergency lighting. R. STAHL supplies its DALI light fitting variants as devices suitable for hard-wired networking using the DALI 24 V DC bus. Ex d protected empty enclosures are available for installing a DALI master in a hazardous area.

R. STAHL Australia Pty Ltd
www.stahl.com.au

Test and diagnostics system for medium-voltage cables

Megger's VLF Sine 62 kV with integrated tan delta is a compact, robust and portable high-performance test and diagnostics system for the testing and condition analysis of medium-voltage cables. The smart VLF system automatically adjusts the test frequency to the cable length, making even tests on 35 kV rated cables (up to 25 km) easy to carry out.

The product is a multifunctional tool. Not only can it perform VLF and DC testing, it can also perform sheath testing and sheath fault pinpointing. Moreover, the optional internal tan delta expands the system to assess both cable integrity and condition.

The device offers easy field operation, with no need for external computer. It is also small and light, with automatic result interpretation as per latest IEEE 400.2 standard.

Megger Limited

www.megger.com

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12 kV thumper and TDR power cable fault locator

The Megger EZ-Thump is a compact and lightweight portable cable fault location system that is also suitable for cable testing. It is designed for quick and safe fault-locating operations to reduce customer outage time. It is available to rent from TechRentals.

The unit incorporates a 12 kV hipot tester, time-domain reflectometer (TDR) and surge generator. It can be powered from an AC supply or internal batteries (3 h recharge time provides 30 m of thumping). The surge generator produces a 500 J, 0–12 kV @ 12 mA pulse. The kit includes the Digiphone Plus pin pointer with surge wave receiver to locate faults while thumping.

The device is suitable for both a 'satellite' fault-locating concept, designed for remote areas with less frequent faults, and for hard-to-access inner-city locations.

TechRentals

www.techrentals.com.au

Edge networking gateway

The FlexEdge Intelligent Edge Automation Platform from Red Lion is said to bring greater versatility to edge computing. The DA50D and DA70D models feature a modular design and intuitive software to enable quick customisation and deployment in a range of applications. The robust, industrial-grade networking gateway is deployable as a wired or cellular solution to securely connect different networks through flexible networking functionality.

FlexEdge offers a wide variety of wireless and wired communication options for connection to any industrial communication requirement, regardless of protocol or manufacturer, and offers a form factor and platform that adapts as quickly as application needs change. It is available with advanced networking functionality or advanced automation features, including protocol conversion, an advanced web server, data logging and cloud connectivity.

Both the DA50D and DA70D feature wide operating temperatures from -40 to +75°C while remaining flexible for data-driven applications with real-time system alarms and LED diagnostic indicators. With multiple isolated serial ports, Ethernet, optional Wi-Fi and cellular communication sleds, optional field-installable I/O and a certified, robust enclosure, FlexEdge is designed to be suitable for almost any industrial environment with demanding requirements.

The platform carries certifications that make it suitable for oil and gas, water, wastewater, maritime, hazardous areas and factory automation applications.

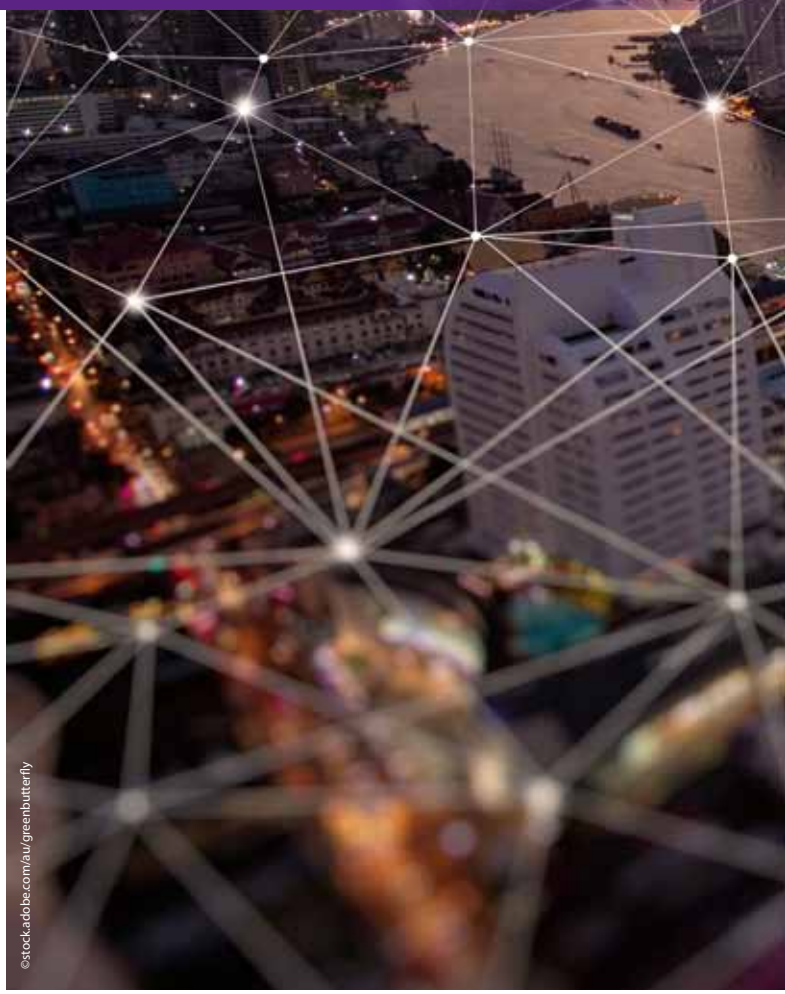
Control Logic Pty Ltd

www.controllogic.com.au

HOW IoT IS RESHAPING NETWORK DESIGN

James Young, Director, CommScope Enterprise Data Center division

Back in 2014, a Gartner report said that the Internet of Things (IoT) will pose seven challenges in the data centre: sheer volume of data, server technologies, data security, the data centre network, consumer privacy, need for higher availability and increased data processing requirements.



Now the impacts of IoT are coming into sharper focus, in the data centre and across the network. Some of Gartner's predictions hold true, but we have a better idea as to how they might play out.

Latency and reliability

In a world of always-on ubiquitous connectivity, latency and reliability loom over everything, whether you're talking about self-driving cars or Industry 4.0. These two challenges are driving much of the change that we'll see in network design over the next few years.

If the industry is to realise the promised benefits of IoT, we must increase the ability to support more machine-to-machine communications in near-real time. In applications like autonomous vehicles, latency requirements are on the order of a couple of milliseconds. GSMA, the international association for mobile technology, has specified that 5G's latency should be 1 ms, which is 50 times better than 4G's current 50 ms.

Satisfying these requirements involves a radical rethink about how and where we deploy assets throughout the network. For example, routing and backing up data using a traditional star-type network design will become increasingly unfeasible. The vast amount of traffic and the latency demands would easily overwhelm a north–south data flow. So topologies are being redesigned to provide more east–west connectivity.

Link reliability will be every bit as critical as latency. This will involve multiple failovers wherever that data is being transported. For vehicle guidance, for example, the job of collecting, processing and storing the information may be shared among an assortment of curbside micro data centres and smart-city-enabled street fixtures.

Compute/storage capacity moves to the edge

Traditionally, when we needed to go faster we increased bandwidth. Eventually you get to the point where you run out of bandwidth, even on optical glass. Given the amount of data we're talking about with IoT, that time will be sooner rather than later. One of the few tools left is the ability to decrease the distance the data has to travel.

So IoT data is increasingly being processed at the device via the SoC (system on a chip) and stored at the network edge. Alternatively, the device may send the raw data directly to compute/storage assets at the network edge for processing and storage. In either case, this allows network operators to increase the link capacity between the device and the compute/storage location.

Supporting all these edge nodes means deploying more mesh-type designs that can meet the required failover reliability and latency requirements. Each node will need multiple service delivery points and parallel peer-to-peer connectivity, meaning a lot more fibre. On the other hand, a side benefit of this design will be reduced traffic on the backhaul network, since only data that is needed will have to be backhauled to the data centre.

Standardisations to drive and scale development

M2M communications requires a high degree of automated service delivery and resource allocation, creating challenges for network security, API security and identity management. Organisations such as IEEE and the OpenFog Consortium are working towards standards for automatically authenticating each node on the network without human intervention. To be effective in a vendor-agnostic network,

these solutions must be integrated into all the sensors, devices and other IoT hardware. That will require buy-in from the OEMs.

The need for standardisation is also driving changes in infrastructure. A near-future goal of 5G, for example, is to enable virtual network slicing. Dividing the infrastructure into independent virtual networks enables operators to create an independent standardised layer above the control plane, from which they can deliver proprietary value-added services. A major challenge is prioritising and routing the traffic to ensure that any operator-specific service would operate within the same SLAs on every other provider network.

The challenge isn't just bandwidth — using techniques such as wavelength-division multiplexing (WDM) or coherent transmission, enough bandwidth can be created — but it would also require standardising parts of the providers' infrastructure to support the virtual network slicing. It's an issue of cooperative design. This type of standardisation would eventually lead to the development of off-the-shelf modular network components that could be used to dramatically reduce the time and cost of maintaining the network and reduce mean time to repair.

More clarity and even more questions

It will most likely be a few years before we see the kind of broadscale IoT deployments that will warrant the changes mentioned here. But as the pieces start to fall in place, the rate of change will accelerate. As far as timing, industrial applications are already beginning to emerge and more will gradually be introduced based on their ability to demonstrate ROI.

Service providers may be a bit ahead of the curve, thanks to their experience with more edge-based processing, storage and delivery systems. While much of their investment in the access network is in optimising their radio networks (xRAN), it's unclear how much of that knowledge can be transferred to support the IoT ecosystem. Who will be at the new 'beach front' first and what will they need when they get there? For all the clarity we've gained since 2014, there are still lots of questions.

CommScope Solutions Singapore Pte Ltd
www.commscope.com

Sonic imager

The Fluke ii900 ultrasonic industrial imager is able to detect and locate compressed air, steam, gas and vacuum leaks by utilising sonic technology. It is available to rent from TechRentals.

The ii900 is designed to save time and money by identifying even the smallest of air leaks by using an array of microphones. With the SoundSight and SoundMap technology it is easy to identify the location and magnitude of the leak with a coloured visual display.

There is no need for any downtime or switching lines, as the ii900 is tuned to work in noisy industrial facilities. The Fluke ii900 ultrasonic imager can identify leaks from a distance up to 50 m and is capable of scanning a large area quickly. The device is easy to use, with simple pinpoint and shoot features.

TechRentals

www.techrentals.com.au

Emergency lighting monitoring system

The ABB NaveoPro emergency lighting monitoring system allows users to set up, maintain and fully control their entire emergency lighting installation with a mobile app.

This provides a real-time overview of all systems, saving time, enabling better maintenance planning and enhancing building safety.

The system offers a transparent and proactive way to install, monitor and maintain emergency lighting systems from a mobile device.

Part of the ABB Ability platform of connected devices, this system offers cybersecurity and allows secure integration of data that enables key benefits for all users of the system.

Using the app, self-contained emergency luminaires can be easily installed and programmed into a building in a fast and intuitive way. The system provides a digital overview via the cloud, giving instant information to assist resource planning and enhance building safety, which can be processed directly from a smart device.

With emergency luminaire data stored in the cloud, the mobile app provides a 24/7 overview of all smart monitored buildings via Google maps. Building maps can be uploaded and overlaid onto Google maps, showing its current status and providing a clear and precise location of the emergency lighting luminaire.

Testing, inspection and maintenance planning can be scheduled to ensure all emergency luminaires are working properly. In addition, functional and duration tests can easily be programmed via the app. Faults are automatically detected and reported directly to a mobile device. In addition, multiple users can access the data held on the emergency lighting system, which can be emailed, shared and stored to provide a permanent record of the health of an emergency lighting system.

To further enhance building safety, the system sends maintenance alerts so components can be replaced before a malfunction occurs.

ABB Australia Pty Ltd

www.abbaustralia.com.au

DPT DIN rail disconnect terminal blocks

Dinkle DPT DIN rail disconnect terminal blocks are designed to provide efficient, safe disconnect and testing of current transformer (CT) and voltage transformer (VT) circuits.

These DPT DIN rail series terminal blocks offer easier access in CT circuits, DIN rail mounting with no tools required and push-in design to help ensure secure wiring connection while reducing time and tools required for termination.

The DPTD6 model block also provides direct-testing technology, enabling a user to test the circuit current without undoing any wired connections. To perform direct-test for a single- or three-phase circuit, the user switches a lever on the terminal block to disconnect a de-energised circuit. The user then places a current-measuring device across the block at its test points using either 4 mm test probes or securely fastened 2.3 mm test plugs. The DPTL6 model version is similar to the DPTD6 but without a disconnect lever for testing.

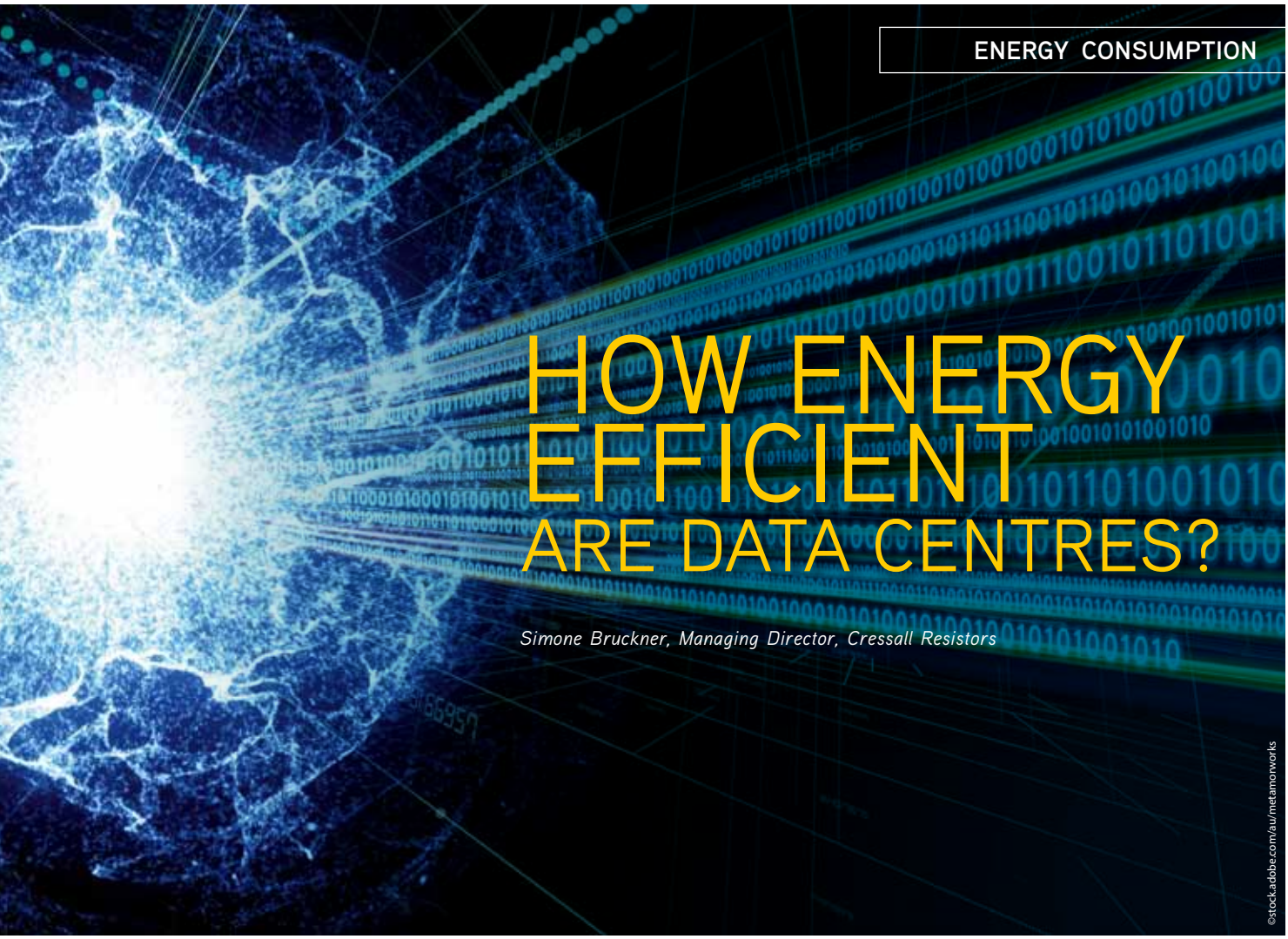
Both blocks are UL rated up to 30 A at 600 VAC. The blocks are DIN rail mountable and measure 8 mm in width by 103.2 mm in height by 50–57.5 mm in depth (depending on DIN rail depth), allowing for easier installation and space saving compared with traditional barrier-type terminal blocks.

These push-in style blocks accommodate wire sizes from AWG20 to AWG8, and also feature plug-in slots for bridges (jumpers), providing continuity between any combination of blocks on the same DIN rail. They are touch-safe — back of hand and finger protection — and operate at temperatures from -40 to 120°C.

Users can employ these DPT series blocks to safely disconnect secondary circuits between measuring instruments and safety equipment in CT shorting and other applications. A safe disconnect can be achieved by placing the block in front of the measurement instrument.

Dinkle International

www.dinkle.com/en/home



HOW ENERGY EFFICIENT ARE DATA CENTRES?

Simone Bruckner, Managing Director, Cressall Resistors

Data technology is usually perceived as positive for the environment — think smart meters, predictive analytics and autonomous vehicles. In fact, even the notion of 'The Cloud' invites thoughts of crispness and clean air. However, the reality is that data centres consume a lot of energy.

For example, in 2018, Chinese data centres produced 99 million tonnes of carbon dioxide (CO_2) — generating the equivalent environmental footprint of around 21 million cars. With global data traffic more than doubling every four years, it's no surprise that the environmental impact of data centres is coming under scrutiny.

As the uptake of cloud computing continues to increase at a rapid pace, more companies are relying on dedicated facilities to collect, store, process and distribute data. If data is going to continue to act as the powerhouse of the information revolution, evaluating its inefficiencies is crucial.

China's data centre sector makes up 8% of the global market and is the second largest in the world. There are data centres everywhere, whirring away unseen across the globe. The biggest, covering over a million square feet, can consume as much power as a city of as many people.

The energy required to run a data centre can be broken down broadly into the power consumed by computing resources and that of supporting infrastructure, such as cooling systems. Typically, server rooms in data centres are cooled using classic ambient air-cooling with cold water-recirculation coolers. For high power applications, water-cooled racks are also used.

Businesses are working to address the efficiency issue. In fact, there are a number of companies jostling for the title of greenest technology company. Both Apple and Google claim to run on 100% renewable energy, while Microsoft announced that it is ahead of schedule to hit its target of 60% renewable energy in its data centres by 2020. Renewables of choice for data centres include rooftop solar, wind, geothermal and waste heat reclamation.

The technology to improve data centre efficiency already exists. The world has been harnessing the benefits of renewable technologies in a number of industries for decades, so there is no reason why data centres cannot benefit from the likes of solar power. However, the sheer mass of energy that a data centre requires means that ensuring the efficiency and continuity of renewable energy is crucial — data simply doesn't have time for a cloudy day or broken panel.

When installing renewable energy systems onto data centres, operators will also need to put technology to avert potential inefficiencies into place. For example, when connecting new solar panels or disconnecting existing installations from the grid for maintenance, the panels continue generating electricity. This excess energy could damage equipment, so it must be safely dispersed.

To achieve this, load banks or dummy loads should be added onto the solar panels to dissipate excess energy to help safely increase and maintain the renewable energy sources installed on a data centre. Load banks also help test a data centre's air-conditioning system — which is vital for keeping servers cool and functioning — to make sure it is working properly before the data centre is put into action.

While it cannot be denied that the rise of big data presents a big energy challenge, data centres are the engines of the digital economy, and it would be almost impossible for modern businesses to function without them.

The vast amount of energy that data centres require doesn't mean that the cloud must return back to Earth with a bump. By making sure that renewable resources have the technology in place to provide more sustainable energy generation, people can continue to benefit from the wealth of data they create while minimising its impact on the environment.

COULD ULTRAVIOLET LEDS HELP FIGHT COVID-19?

Ultraviolet LEDs that can decontaminate surfaces from COVID-19 infection are currently being developed by researchers.

According to researchers at UC Santa Barbara's Solid State Lighting & Energy Electronics Center (SSLEEC), these LEDs could also potentially decontaminate air and water that have come into contact with the SARS-CoV-2 virus.

"One major application is in medical situations — the disinfection of personal protective equipment, surfaces, floors, within the HVAC systems, etc," said materials doctoral researcher Christian Zollner, whose work centres on advancing deep ultraviolet light LED technology for sanitation and purification purposes.

Indeed, much attention of late has turned to the power of ultraviolet light to inactivate the novel coronavirus. As a technology, ultraviolet light disinfection has been around for some time. While practical, large-scale efficacy against the spread of SARS-CoV-2 has yet to be shown, UV light shows a lot of promise. SSLEEC member company Seoul Semiconductor in early April reported a "99.9% sterilisation of coronavirus (COVID-19) in 30 seconds" with its UV LED products. Its technology currently is being adopted for automotive use, in UV LED lamps that sterilise the interior of unoccupied vehicles.

Not all UV wavelengths are alike — UV-A and UV-B have important uses, but the rare UV-C is the ultraviolet light of choice for purifying air and water and for inactivating microbes. These can be generated only via human-made processes.

"UV-C light in the 260–285 nm range most relevant for current disinfection technologies is also harmful to human skin, so for now it is mostly used in applications where no-one is present at the time of disinfection," Zollner said.

In fact, the World Health Organization warns against using ultraviolet disinfection lamps to sanitise hands or other areas of the skin — even brief exposure to UV-C light can cause burns and eye damage.

Portable, fast-acting water disinfection was among the primary applications the researchers had in mind as they were developing their UV-C LED technology; the diodes' durability, reliability and small form factor would be a game changer in less developed areas of the world where clean water is not available.

The emergence of the COVID-19 pandemic has added another dimension. As the world races to find vaccines, therapies and cures for the disease, disinfection, decontamination and isolation are the few weapons we have to defend ourselves, and the solutions will need to be deployed worldwide. In addition to UV-C for water sanitation purposes, UV-C light could be integrated into systems that turn on when no-one is present, Zollner said.

"This would provide a low-cost, chemical-free and convenient way to sanitise public, retail, personal and medical spaces," he said.

For the moment, however, Zollner and colleagues are waiting out the pandemic, as research at UC Santa Barbara has slowed to minimise person-to-person contact.

"Our next steps, once research activities resume at UCSB, is to continue our work on improving our AlGaN/SiC platform to hopefully produce the world's most efficient UV-C light emitters," he said.

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