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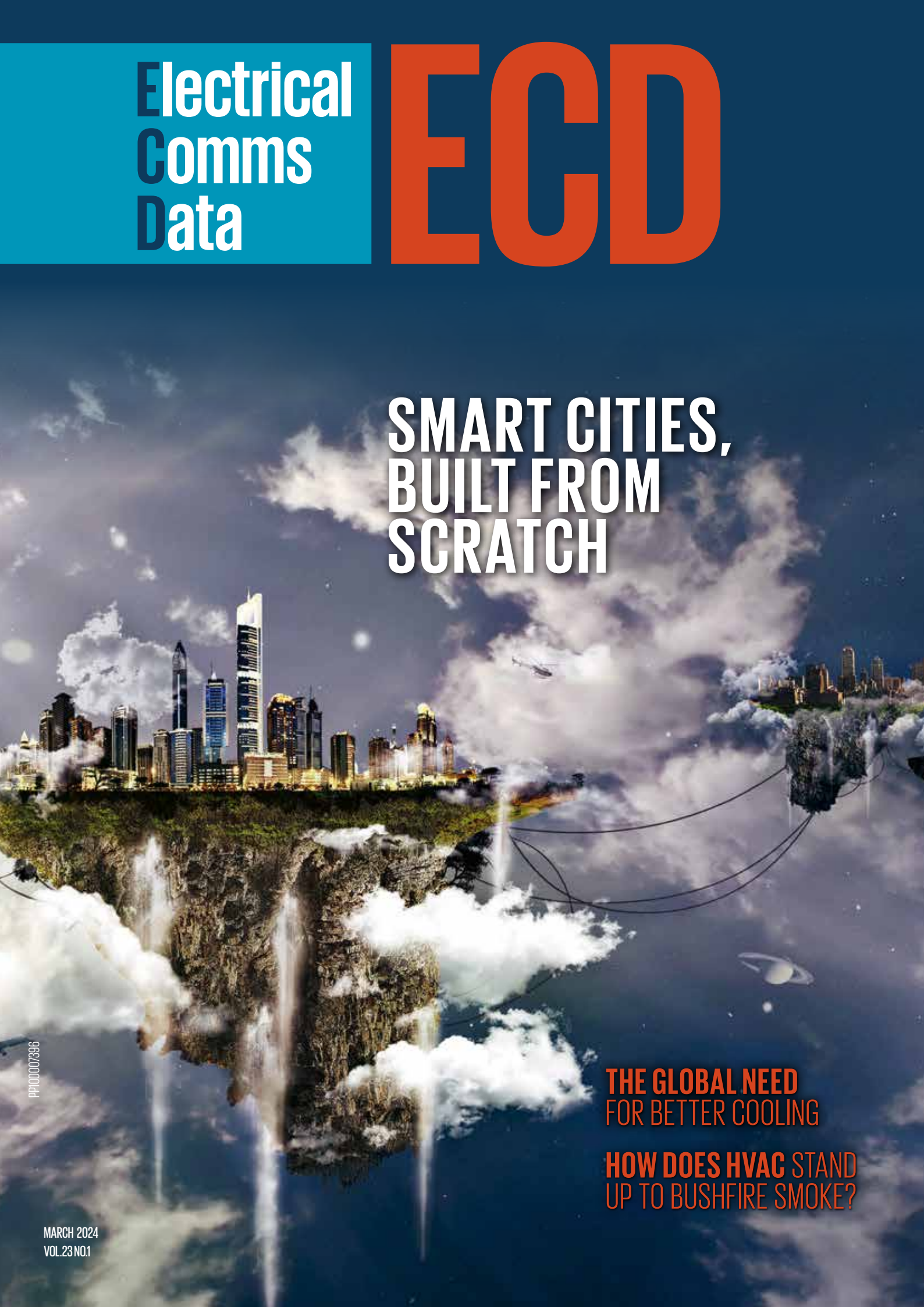
SMART CITIES, BUILT FROM SCRATCH



THE GLOBAL NEED FOR BETTER COOLING

HOW DOES HVAC STAND UP TO BUSHFIRE SMOKE?

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MARCH 2024
VOL.23 NO.1

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FROM THE EDITOR

Welcome to *ECD*'s annual Smart Cities feature, where we take a look at new developments within the enduring smart city movement. Though it's been around since the 1960s, the smart city philosophy only seems to be increasing in relevance, especially with the growing momentum of sustainable technologies and the Internet of Things (IoT). Smart cities are huge right now — and we're not just talking individual examples of smart city technology, but entire cities built from the ground up.

Construction has begun on Nusantara, the proposed new US$36bn capital of Indonesia, with plans for key government buildings to be ready by August this year. Closer to home, Bradfield, a high-tech, sustainable aerotropolis slated for Western Sydney, has recently revealed its draft Master Plan. There's something about these ambitious visions that grips the imagination; they present an exciting opportunity to completely redesign urban life for the benefit of society and the environment — but there's an awful lot at stake.

This edition's feature article explores the idea of the smart city built from scratch — an idea that has produced its share of successes and failures, as well as the current optimistic plans for Bradfield.

On a related note, covered on p 27, the Wireless Broadband Alliance has recently started trialling its **Wi-Fi HaLow for IoT** protocol, with real-world applications including smart homes and cities.

There's also an unofficial HVAC theme running through the magazine, with articles examining how the cooling sector can step up to the challenge of becoming more sustainable against a background of global warming, including in data centres. Another fascinating angle on aircon and climate change is presented in 'How does HVAC stand up to bushfire smoke?'. It's all a reminder of the necessity for sustainable infrastructure — whether in smart cities or otherwise.

Katerina Sakkas — Editor
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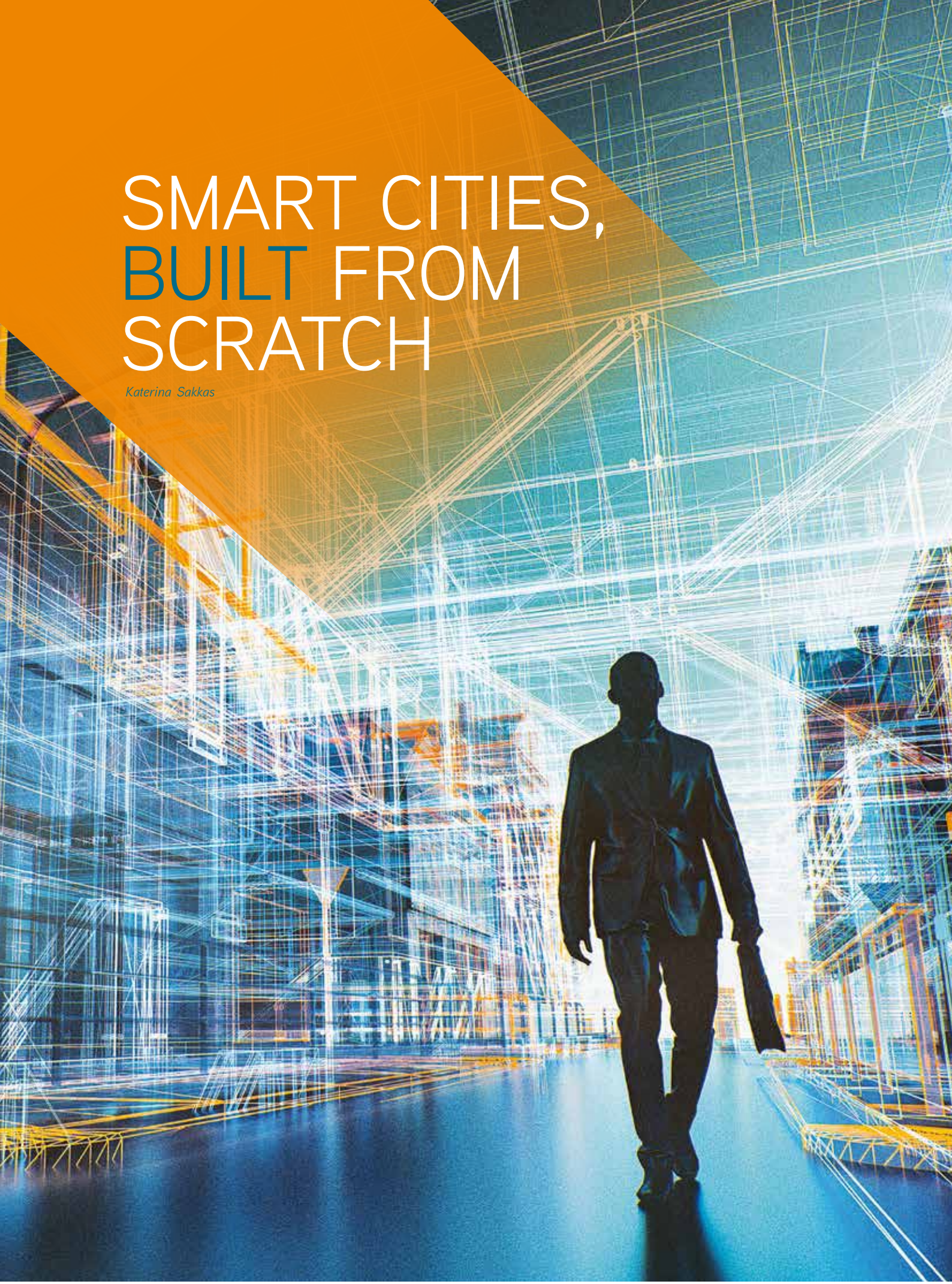
SMART CITIES, BUILT FROM SCRATCH

Katerina Sakkas



There are few things more ambitious than the smart city built from scratch. These futuristic metropolises are founded on the idealistic principle of high-tech, integrated systems working together for the benefit of the community. In a smart city, the Internet of Things (IoT) works smoothly to produce more efficient transport, more sustainable buildings and even, potentially, better health for citizens through sensors that monitor the contents of the fridge or medication cabinet.

With their reliance on interconnected systems, the IoT and sustainable technologies, smart cities present a host of opportunities for the electrical, communications and data industries.

The smart city concept is both old — with origins in the late 1960s — and remarkably current, as witnessed in the imminent plans for Indonesia's new capital Nusantara and Australia's very own Bradfield, an aerotropolis destined for Western Sydney. These days, most cities deploy some form of smart technology, with many identifying as 'smart cities' on the basis of this, but the smart city built from the ground up represents a whole new level of vision and risk.

Given that a few smart cities have been built over the past 20 years or so, while various others have failed before getting off the ground, and yet more are planned for the near future, now seems like an opportune time to assess the effectiveness of the smart city idea in order to avoid mistakes in future.

Getting it right

Two recent studies have examined the opportunities and challenges presented by smart cities through analysis of carefully chosen datasets.

'Smart Cities—A Structured Literature Review'[1], published in July 2023, used Web of Science and Google Scholar to identify relevant research articles on smart cities. It then combed this body of research using a list of 10 questions. These questions related to the definition of a smart city, its advantages and disadvantages, implementation challenges and funding, among other topics. The study also analysed the implementation of smart city solutions in international contexts and proposed strategies to overcome associated challenges.

'What is the impact of smart city development? Empirical evidence from a Smart City Impact Index'[2], published in November 2023, developed a special index to measure the positive and negative impacts of smart city development. Its focus was on cities in South Korea, a country that began to initiate smart city projects in the mid-2000s. This study compared non-smart cities with first-wave smart cities (which focus on transportation and security infrastructure) and second-wave smart cities (which emphasise comprehensive urban management).

Cautionary tales

Both studies identified security and privacy as areas of concern in the modern smart city.

"The integration of technology and data-driven solutions in smart cities has the potential to revolutionize urban living by providing citizens with personalized and accessible services. However, the implementation also presents challenges, including data privacy concerns, unequal access to technology, and the need for collaboration across private, public, and government sectors," wrote the authors of Smart Cities—A Structured Literature Review.[1]

Indeed, this was the main reason Canada's ambitious Sidewalk Toronto project folded in 2020. Proposed by Google subsidiary Sidewalk Labs in response to a callout by Waterfront Toronto in 2017, the ultra-sustainable neighbourhood was going to be built on 12 acres of industrial land along Toronto's waterfront. Critics, however, objected to the minute level of digital scrutiny that residents would seemingly be subjected to, allegedly for their own benefit — something that was made even less appealing given Sidewalk Labs' close relationship to one of the world's data giants.

Some commentators and researchers[3] have similar concerns about Toyota Woven City, a high-tech, ultra-sustainable community that the mobility company started building in 2021 in Tohoku, at the base of Mount Fuji in Japan. Run on hydrogen and billed in Toyota's promotional materials as a "human-centred, living laboratory", the community is designed to eventually be home to 2000 people. In Woven City, sensors will monitor residents' health, track their food use and prompt household robots to keep the fridge stocked. Most of this highly surveilled population will be Toyota employees and their families.

In contrast to Sidewalk Toronto, the Songdo International Business District in Incheon, South Korea, has achieved a degree of success. Built on 1500 acres of land reclaimed from the Yellow Sea and completed in about 2015, the district is by all accounts a marvel of integrated technology, with sensors monitoring energy use and traffic, loads of smart home features and — impressively — pneumatic tubes that pump residents' garbage directly from home to the rubbish facility.

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> THESE DAYS, MOST CITIES DEPLOY SOME FORM OF SMART TECHNOLOGY, BUT THE SMART CITY BUILT FROM THE GROUND UP REPRESENTS A WHOLE NEW LEVEL OF VISION AND RISK.

However, it seems that all the seamless technological integration in the world cannot produce a vibrant community. The district has not as yet attracted the multinational tech companies and skilled international workers that were part of its initial vision, and residents report feelings of alienation and coldness[4], with a lack of opportunities to meet others in the flesh.

Bradfield: "Australia's first 22nd century city"

Named for the chief engineer of the Sydney Harbour Bridge, Bradfield is part of the NSW Government's Greater Sydney Region Plan for a "metropolis of three cities": the Western Parkland City (Bradfield), the Central River City (Parramatta) and the Eastern Harbour City.

Part of what is ultimately planned to be a much larger aerotropolis, Bradfield City Centre will be constructed on 114 hectares in close proximity to the new Western Sydney International Airport at Badgerys Creek. More than 15,000 people are expected to eventually live there in about 10,000 new dwellings, with 20,000 new jobs created. Promotional videos from the Western Parkland City Authority show an artist's impression of a vibrant, walkable city with plenty of landscaped public space where young professionals and families gather. The city's draft Master Plan is currently on public exhibition.

ECD contacted the Western Parkland City Authority (WPCA) for details on how Bradfield City Centre is progressing.

A WPCA spokesperson said that the city's First Building, housing commercial industry tenants and the Advanced Manufacturing Research Facility (AMRF), is due to open in mid-2024, adding that construction would soon get underway on the Second Building, the two-hectare Central Park, and the roads and services within the city.

Integration is a primary consideration

The WPCA spokesperson said that the first stage of Bradfield City Centre will integrate technology in order to improve day-to-day experiences in the city and allow people to stay connected.

The WPCA is planning a system of innovative multi-function poles capable of accommodating lights, sensors, cameras and telecommunications equipment to ensure Bradfield has the supporting infrastructure in place for smart city technologies, the spokesperson said.

A fibre-optic network throughout the new city will support rapid connection to this digital infrastructure.

At the time of publication, the WPCA was on the point of releasing an expression of interest (EOI) for the market to engage in a number of opportunities to provide digital infrastructure and services supporting smart city functionality in Bradfield City Centre and to improve the visual amenity of places.

Sustainability measures

A key concern in relation to Bradfield has been its location in one of the hottest parts of Sydney, where temperatures during heatwaves can be up to 10 degrees higher than in the coastal suburbs.

The WPCA spokesperson said the draft Master Plan includes controls aimed at curbing the urban heat island effect, including a minimum tree canopy coverage target of 40% and the use of water-sensitive urban design to keep water in the environment to green and cool the city.

"Buildings will feature greenery in the form of extensive landscaping and green roofs, to cool and protect buildings," the spokesperson said. "Planning controls also aim to reduce active heat production from electrical systems and transport in the city."

Additionally, resilience and climate change risk principles are being incorporated into the design of buildings and infrastructure.

The design of the First Commercial Building exemplifies these principles, with the spokesperson saying it "sets the benchmark for Bradfield City Centre as a connected, green and advanced city, while promoting design that is of its place and connected to Country".

The First Building has a timber structure composed of prefabricated modular components that are fixed together. This means that it can be disassembled, expanded and even relocated over time.

Water management is an important consideration, with the building capturing and storing rainwater for landscape irrigation. As might be expected, the First Building roof will also incorporate solar PV to generate power.

Additionally, the roof will be filled with native planting and low-maintenance vegetation to support local biodiversity and improve the microclimate of the building, the WPCA spokesperson said.

Gathering momentum

Once Bradfield's Master Plan is finalised, land will be released for private sector development, building on the momentum created in the lead-up to Western Sydney International Airport opening in 2026 along with the new Western Sydney metro line.

The Western Parkland City Authority intends to create "a thriving 24/7 hub of culture, creativity, and innovation over time". It will be fascinating to see it taking shape.

1. 'Smart Cities—A Structured Literature Review', by Jose Sanchez Gracias, Gregory S. Parnell, Eric Specking, Edward A. Pohl and Randy Buchanan *Smart Cities* 2023, 6(4), 1719-1743; https://doi.org/10.3390/smartcities6040080
2. 'What is the impact of smart city development? Empirical evidence from a Smart City Impact Index', by Yirang Lim, Jurian Edelenbos and Alberto Gianoli *Urban Governance,* https://doi.org/10.1016/j.ugj.2023.11.003
3. See, eg, 'Smart Cities and Data Privacy Concerns in Japan', by Muneo Kaigo & Natalie Pang https://www.kas.de/en/web/politikdialog-asien/digital-asia/detail/-/content/smart-cities-and-data-privacy-concerns-in-japan
4. https://www.bloomberg.com/news/articles/2018-06-22/songdo-south-korea-s-smartest-city-is-lonely


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$206 MILLION IN ENERGY UPGRADES FOR NSW

NSW social housing, apartment and south coast residents are set to benefit from $206 million in energy-saving upgrades as part of a joint initiative of the state and federal governments.

More than 24,000 social housing tenants will receive grants totalling $175 million over four years for upgrades including solar PV, hot water systems, ceiling fans, reverse-cycle air conditioners, insulation and draught proofing.

The NSW Government noted that some social housing properties are among the least energy-efficient homes in the country, often lacking basic insulation and modern appliances. Upgrading an average house from a 1-star to a 3-star rating can reduce energy consumption by 30% and decrease power bills.

"We are delighted that Prime Minister Anthony Albanese and Premier Chris Minns have taken up our policy to provide grants to electrify social housing properties," said Rewiring Australia Executive Director Dan Cass.

"Household electrification is the fastest, most cost-effective way to reduce emissions — and it also decreases the cost of living by significantly reducing energy bills.

"Targeting social homes is necessary to ensure everyone benefits from the bounty of renewable energy regardless of their income."

The Australian Government is also investing $30 million to help fund rooftop solar installations on apartment buildings, or alternatively to give apartment residents the opportunity to purchase a 'plot' in an offsite 'solar garden'. NSW Minister for Climate Change and Energy Penny Sharpe said the Solar Banks program would support over 10,000 apartment dwellers and renters who have traditionally been locked out of owning solar.

"This is important because 21.7% of dwellings in NSW are apartments and people who live there can't simply install a solar system on their roof like people in a separate house," Cass commented.

Finally, $1 million will be invested in community renewable energy projects on the state's far south coast, delivering on a federal government election commitment. The funding will go to local energy projects, with the aim of creating local jobs and delivering renewable energy to local communities.


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MELBOURNE TRIALS AMBITIOUS ENERGY STORAGE PROJECT

The City of Melbourne is launching the first stage of an ambitious energy storage project that aims to accelerate the city's transition to 100% renewable energy by 2030, while simultaneously delivering more affordable renewable energy to residents and businesses.

The pilot stage of Power Melbourne will see three battery energy storage systems — with a combined capacity of 450 kW/1 MWh — installed at Library at the Dock, Boyd Community Hub and a Council House site.

The batteries will charge during the day when there is a higher proportion of renewable energy in the grid. Stored energy from the batteries will then be released back into the grid when it's needed most.

"Storage is the missing piece of the puzzle when it comes to providing residents and businesses with access to affordable renewable energy," said Environment portfolio lead Councillor Rohan Leppert.

The project's pilot phase will test the Power Melbourne model, gaining insights to inform the expansion of the battery network and retail offering in the future.

More than 85% of Melburnians surveyed by the City of Melbourne supported the installation of community batteries in their local area. The majority of residents and businesses also agreed that urgent action is needed on climate change.

Following a rigorous tender process, Origin Energy was selected to partner with the council to install and operate the batteries. This work will be undertaken by the energy company's Origin Zero team, which works with large businesses and councils.

"Partnerships are crucial to the success of innovative projects like this — that's why we've teamed up with Origin Energy to build and operate this flagship battery power network," said Melbourne Lord Mayor Sally Capp.

"Power Melbourne will benefit residents who live or work in apartment buildings and can't install their own solar panels, while driving new investment and creating jobs."

The City of Melbourne is also working with The University of Melbourne, RMIT University and inner-city councils to ensure the Power Melbourne model can be replicated across greater Melbourne and beyond. It will continue to consult with residents and businesses as it tests the initial network.

All three batteries in the Power Melbourne pilot network are expected to be installed by mid-2024.

Electrical Comms Data news

QLD TO AMEND ELECTRICAL SAFETY LAWS

The Queensland Government intends to significantly strengthen the state's electrical safety laws following a 2023 review of Queensland's *Electrical Safety Act 2002*.

The review and subsequent public discussion paper, which involved extensive consultation with industry, registered unions and the community, had a particular focus on the electrical risks posed by emerging technologies.

"Queensland's Electrical Safety Act was introduced in 2002 and the way we use and interact with electricity has changed dramatically since then," said Minister for Industrial Relations Grace Grace.

"The amendments we are proposing will ensure the Act stays ahead of rapidly evolving electrical technology, keeping safety front and centre so we can enjoy the benefits it brings."

The government intends to legislate to expand the definition of "electrical equipment" to include some high-risk extra-low-voltage items; consultation identified items such as solar PV modules and some lithium-ion batteries as being of particular risk.

It is also seeking to update the definition of "electrical installation" to ensure it covers modern energy generation systems, as well as new and emerging technologies such as battery energy storage systems.

Additionally, a working group will be established to ensure the legislative definition of "electrical work" is clear, fit for purpose and adaptable to ongoing technological advancements.

Separate to the review, a roundtable chaired by the Commissioner for Electrical Safety has been convened to consider safety improvements for those who work on electric vehicles, with outcomes to be referred for national consideration later this year.

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SA Power Networks is installing animal guards to reduce power outages caused by animals.

BAT-RELATED OUTAGES STILL A PROBLEM IN SA

Adelaide's rapidly growing grey-headed flying fox colony continues to present a challenge for SA Power Networks, especially at this time of year. From late January to early April, a new brood of young get on the move, causing a large number of bat-related outages.

Customers can experience either extended outages when an animal gets caught on powerlines, or short 'momentary' outages, as equipment reconnects power after an animal temporarily contacts overhead powerlines.

These outages tend to occur in the early hours of the morning when the young tire while foraging for food and land on electricity pole tops for a rest.

SA Power Networks said it had been consulting with animal and environmental experts on potential options to minimise the number of outages while also protecting the flying foxes.

"In 2023, we had more than 55 instances of 'sustained' bat-related outages, impacting about 72,000 customers, with numerous additional momentary outages," said Head of Corporate Affairs Paul Roberts.

"Given the rapid growth of the colony now totalling about 46,000 animals, we expect the number of outages to increase in early 2024 as juvenile bats become more active and forage for food. This is a significant issue for us and our customers, though thankfully most outages occur in the early hours of the morning while most of us are sleeping."

Bat-related outages occur randomly across the metropolitan area and in the state's south-east, where a second colony has formed.

In response, SA Power Networks crews are continuing to install animal guards on high-voltage (HV) powerline pole tops at locations where bat-related outages have occurred, as well as whenever other work is being undertaken on poles.

"Installation of the animal guards is now business as usual when undertaking pole-top work. We also have a program underway to install additional switch points on powerlines, which has helped reduce the number of customers impacted when these bat-related outages occur," Roberts said.

"We will do everything we can to minimise the impact, but given the colonies are growing and we have hundreds of thousands of poles, we have a lot of work to do over the next decade installing animal guards and covering more of our powerlines to be able to significantly reduce what tend to be randomly located bat-related outages."

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THE GLOBAL NEED FOR BETTER COOLING

Unless drastic action is taken, the cooling sector presents an alarming threat to our rapidly warming planet. This was the overriding message of 'Keeping it Chill: How to meet cooling demands while cutting emissions', a report published during the COP28 climate talks in Dubai.

Initiated by the UN Environment Programme (UNEP)'s Cool Coalition, the report found that cooling equipment currently represents 20% of total electricity consumption, with this figure expected to more than double by 2050 based on current growth trends.

Greenhouse gas emissions from the industry's power consumption will increase, alongside leakage of refrigerant gases, most of which have a much higher global warming potential than carbon dioxide. Under a business-as-usual scenario, emissions from cooling are predicted to account for more than 10% of global emissions in 2050.

It's not all doom and gloom, however. The report states that if key measures are taken to reduce the power consumption of cooling equipment, this would cut at least 60% off predicted 2050 sectoral emissions, provide universal access to life-saving cooling, take the pressure off energy grids and save trillions of dollars by 2050.

The report was released in support of the Global Cooling Pledge, a joint initiative between the United Arab Emirates as host of COP28 and the Cool Coalition. Over 60 countries have signed up to the Pledge with commitments to reduce the climate impact of the cooling sector.

"The cooling sector must grow to protect everyone from rising temperatures, maintain food quality and safety, keep vaccines stable and economies productive," said Inger Andersen, Executive Director of UNEP.

"But this growth must not come at the cost of the energy transition and more intense climate impacts. Countries and the cooling sector must act now to ensure low-carbon cooling growth. Fortunately, the solutions are available today. Getting energy-efficient, sustainable cooling right offers an opportunity to cut global warming, improve the lives of hundreds of millions of people and realise huge financial savings."

Climate change, population and income growth, and urbanisation are all contributing to an increased demand for cooling. Around 1.2 billion people in Africa and Asia lack access to cooling services, putting lives at risk from extreme heat, reducing farmers' incomes, driving food loss and waste, and hindering universal vaccine access.

Rising demand for often inefficient equipment, including air conditioners and refrigerators, will require large investments in electricity generation and distribution infrastructure. Inefficient equipment will also result in high electricity bills for end users, particularly in Africa and South Asia, where the fastest growth is predicted.

"The private sector has a huge role to play in financing and driving innovation to advance sustainable cooling, which can help fulfil vital local development needs and support global carbon reduction targets. We are pleased to contribute to the Global Cooling Stocktake Report and to support the Global Cooling Pledge," said Makhtar Diop, Managing Director, International Finance Corporation.

What steps can be taken?

The report lays out sustainable cooling measures in three areas: passive cooling, higher energy efficiency standards and a faster phase-down of climate-warming refrigerants. Following the measures outlined in these areas would deliver the previously mentioned 60% in cuts; adding in rapid power grid decarbonisation would reduce sectoral emissions by 96%.

Passive cooling measures

Passive cooling measures — such as insulation, natural shading, ventilation and reflective surfaces — can dramatically reduce cooling loads. These can be provided, in part, by the development and enforcement of building energy codes that incorporate passive cooling, as well as through urban design.

Such strategies can curb the growth in demand for cooling capacity in 2050 by 24%, result in capital cost savings of up to US$3 trillion in avoidance of new cooling equipment and reduce emissions by 1.3 billion tons of CO2e.

Higher efficiency standards

Higher efficiency standards and better labelling of all cooling equipment would triple the

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global average efficiency of cooling equipment in 2050 from today's levels, delivering 30% of modelled energy savings, lowering energy bills and improving the resilience and financial viability of cold chains.

Critical implementing policies include regularly updated Minimum Energy Performance Standards (MEPS), financial instruments to encourage demand for higher efficiency products and regulations to avoid the dumping of low efficiency cooling equipment into developing countries.

Kigali Amendment

The world has committed to phasing down HFCs through the Kigali Amendment to the Montreal Protocol — a global deal designed to protect the ozone layer and slow climate change.

Faster action is possible and can achieve a halving of HFC emissions in 2050 — compared to the Kigali phase-down timetable — through rapid uptake of better technologies in new equipment, better refrigerant management and stronger national enforcement.

Finance is critical

According to the report, the sustainable cooling transition will be made affordable through total life cycle cost savings of $22 trillion ($17 trillion in power cost savings plus $5 trillion in power generation investments). Existing business models need to be scaled to use these savings to reduce upfront costs and make the transition affordable for all.

Financial tools include on-bill financing (when a utility pays for an upgrade and recovers the cost through monthly power bills), risk-sharing facilities, public and private investments, green mortgages and seed financing for cold chains. For many developing countries, dedicated concessional finance will be needed as well as incorporating sustainable cooling criteria into banks' lending practices.

"As temperatures rise, it is critical that we work together to improve energy efficiency and reduce emissions from the cooling sector while increasing access to sustainable cooling," said Dr Sultan Al Jaber, COP28 President.

"This access is especially important for the most vulnerable communities, who have often contributed the least to climate change but are the most exposed to its impacts."

Optical time-domain reflectometer

NBN- & Telstra-approved with local calibration, support and training, the TTS FX150+ optical time-domain reflectometer (OTDR) provides analysis for both point-to-point links and PON networks with up to 2 PON splitters. It has a filtered port option for live fibre testing, a 5″ touchscreen and built-in rechargeable Li-Poly battery (9 h, 1 kg).

The device has 256,000 sampling points and 3 cm resolution with the shortest dead zone, as well as an onboard power meter, laser source and USB/WiFi/Bluetooth connectivity.

The built-in VNC server offers full remote management over LAN/WiFi/Cloud (perpetual), with the OTDR able to be controlled remotely through mobile apps (perpetual). PC software is provided for OTDR trace analysis and report generation (perpetual), while link mapping is offered via multiple, automatic test acquisitions.

Users can generate bi-directional analysis reports and batch processing using reference trace. They can also gain full remote control of the unit using the free Fiberizer and EZRemote services from VeEX. Additionally, they have access to lifetime cloud Fiberizer for online analysis, storage and reporting, as well as easy-to-install lifetime firmware updates.

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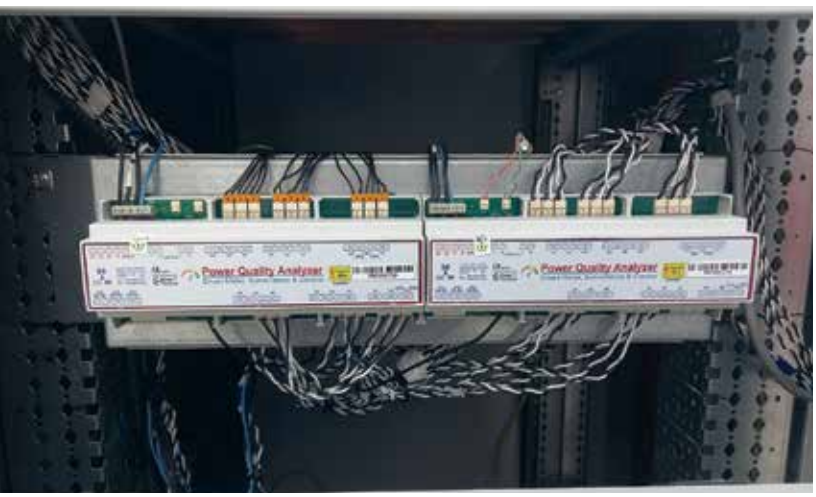

Energy management system

Designed for facility and plant managers aiming to streamline their energy consumption, the EnerIT EMS uses a network of IoT devices and sensors to provide real-time monitoring capabilities. Integrated into a 9- or 21-channel device, the IoT network meticulously collects and processes data from various energy sources.

The EMS's powerful API software visualises complex data in an accessible way, making it easier for users to understand and manage energy usage. Tailored to cater to the needs of industrial plants, commercial and residential buildings, and other facilities, the EnerIT solution helps identify inefficiencies and potential savings, as well as enabling more sustainable practices.

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EXPLORING THE IMPACT OF BRIGHT LIGHTING ON WILDLIFE

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Aotearoa New Zealand scientists have looked into the effects on flora and fauna of an increasingly lit-up nocturnal world.

Dr Ellen Cieraad and Dr Bridgette Farnworth from Nelson Marlborough Institute of Technology (NMIT) Te Pūkenga used satellite data to study the spread of artificial light at night (ALAN) in Aotearoa. They also summarised all the published literature on the impacts of ALAN on species and communities that have been described in the country to date, placing this information within the context of impacts observed globally.

They found that although most of New Zealand (95.2%) has no direct artificial light, its lit surface area increased by 37.4% (from 3.0% to 4.2%) between 2012 and 2021. Too much light at night can disrupt the daily routines and behaviour patterns of animals such as bats, wētā and seabirds, and affect the growth and seasonal cycles of trees.

"The rate at which New Zealand is brightening is faster than the global average," Cieraad said.

In their paper, published in the *New Zealand Journal of Ecology*, the researchers single out LEDs as a potential area of concern. LEDs are characterised by a broad wavelength spectrum with a strong peak in the blue part of the spectrum. While representing a move towards greater sustainability, the global transition from high-pressure sodium (HPS) lights to LEDs nonetheless has the potential to substantially increase the magnitude of effects on species that are sensitive to specific wavelengths.

However, transitioning from HPS to LED lighting has also enabled the dimming of Auckland's public streetlights for much of the night — something the researchers note may have contributed to fewer reported environmental impacts compared with cities experiencing similar transitions elsewhere.

Fortunately, light pollution is relatively easy to address if there is enough will to do so.

"We have the technology to reduce the impact of the light we emit into the environment, including shielding the light, using motion sensors, dimmers and different colours of light. But the first question should always be: Do we really need light here, in the first place?" Cieraad said.

In addition to technological measures, the researchers called for greater regulation of guidelines and standards across Aotearoa New Zealand; these are currently adopted on a voluntary basis by commercial fishing vessels, the cruise industry and the lighting industry.

Cieraad and Farnworth intend their study to provide a foundation to support the development of future research directions and relevant mitigation measures for artificial light at night in New Zealand.

"We found that artificial light at night is a highly understudied pollutant for New Zealand. More than 30% of the existing research here was based on simple observations of how light alters animal behaviour rather than proper, experimental trials. So clearly, this indicates we need additional research," Farnworth said.

This is not about banishing light. It's an opportunity for us, as a nation, to think about how we can convert ourselves to be 'shadow architects' and build ecofriendly places that include darkness as part of the habitat," she concluded.

PTP grandmaster clock

The Protempis Thunderbolt GM330 PTP grandmaster clock is designed for networks that require timing and phase synchronisation, including applications in public and private wireless, data centres, industrial networks and more. It provides continuous availability of UTC traceable time for phase synchronisation, a critical need for LTE Advanced/5G networks and services.

The GM330 performs well with the latest requirements and reduces the cost of deployment by integrating three functions: high accuracy GNSS timing with dual frequency and holdover; PTP distribution including support for a broad range of PTP profiles and a high number of clients; and a 40G line-rate integrated switch and 1G/10G SFP+ (can be optical or copper) ports for integration to a networked environment.

Some of the key PTP profiles supported include: IEEE-1588 v2.1, ITU-T G.8265.1, ITU-T G.8275.1, ITU-T G.8275.2, PRTC-B, Telecom-2019 IEEE 802.1AS, enterprise power profile (C37.238 2011) and broadcast profile (SMPTE ST-2059-2). The GM330 is useful to many market segments, including small cell, LTE advanced/5G synchronisation, private 5G and industrial data networks, ORAN 5G, oil & gas and enterprise, power & utility, broadcast and financial.

TelecomTest Solutions

www.telecomtest.com.au

Waterproof outdoor lighting connectors

Lighting and outdoor electrical installations require high levels of protection against the elements, especially in Australia's harsh and unpredictable climates.

As an authorised local distributor, LAPP Australia is bringing the compact and powerful range of Wieland Electric RST waterproof connectors to Australia, with local stock to provide efficient delivery.

The waterproof RST series provides IP66/68/69 protection and is consistently pluggable, even in tight spaces. The design also matches seamlessly with existing installations for a visually appealing effect.

In addition to lighting, the tight seal and high mechanical strength of the RST series is suited to applications such as solar systems, greenhouses, illuminated advertising, shipbuilding, HVAC and building installations, machinery and plant manufacturing, wind power, elevators and escalators, conveyors and combustion technology.

The RST connectors come pre-wired and colour-coded, so they can be connected swiftly and safely according to the plug-and-play principle. Where maintenance is required or installations have changed needs over time, disassembly is equally efficient, enabling quick and safe uncoupling with minimal downtime.

LAPP Australia Pty Ltd

lappaustralia.com.au

IT cooling system

Mitsubishi Electric Australia has launched an energy-efficient cooling system for IT environments.

The split cooling package consists of the s-MEXT air conditioner indoor unit connected to a Mr Slim R32 inverter outdoor unit.

The s-MEXT air-conditioning unit has been designed with data centres in mind and is equipped to control temperature and relative humidity. Its modest size means it can easily integrate into small IT rooms, data centres and distribution rooms without sacrificing space.

Increased power densities in IT environments have led to growing temperatures (up to 23°C) of intake airflows directed to the IT equipment. The s-MEXT and Mr Slim cooling package has been designed to manage return air temperatures up to 35°C, matching the requirements of the most critical data centres.

S-MEXT is available in over (top air supply) and under (bottom air supply) variants for a wider range of applications.

Mitsubishi Electric Australia

www.mitsubishielectric.com.au

CEE connectors

PCE CEE cable connectors are designed for demanding applications that require a durable connection. The term "CEE" generally refers to industrial plugs and sockets that comply with the IEC 60309 standard.

LAPP Australia is an authorised distributor of PCE products, including CEE cable connectors, which are commonly used for temporary power feeds such as power tools, and power distribution for outdoor events.

The durability of PCE CEE industrial plugs and sockets makes them suitable for more heavy-duty applications too, including mining, tunnels, power plants, marine and heavy industry.

LAPP Australia provides a dynamic array of these PCE connectors, ranging from 16–125 A, with 3- to 7-pole options available in both IP44 and IP67 versions. Their robust design makes them suitable for harsh environments and they are quick and easy to assemble.

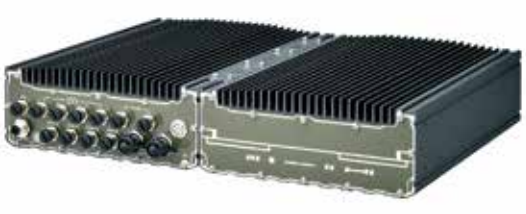
LAPP Australia Pty Ltd
lappaustralia.com.au

Waterproof computer

The Neousys SEMIL-2000GC is a 19″ rackmount, IP69K waterproof computer designed for industrial and edge AI applications. It is built for fanless operation across a temperature range of -40 to 70°C, making it suitable for harsh environments.

The computer features 2x M12 10GbE, 1x GbE and 4x M12 PoE+ ports for high-speed networking, and 2x USB3.2 Gen1 Type-C ports with DisplayPort alternative mode. Its durable construction utilises corrosion-proof stainless steel and aluminium, making it resistant to moisture and salinity. The SEMIL-2000GC also has MIL-STD-810H compliance, 8–48 V wide-range DC input with reverse polarity protection and built-in ignition power control.

Backplane Systems Technology Pty Ltd
www.backplane.com.au



CAT6 and CAT6A bulk LAN cables

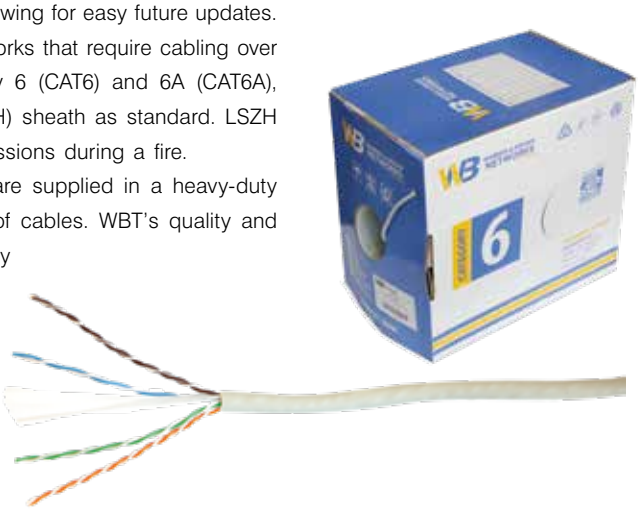
High-quality structured cabling remains the backbone of every high-performing ICT network. Maintaining consistent and reliable performance can be limited without having the proper supporting infrastructure.

Warren & Brown Technologies (WBT) LAN cables are ACMA compliant as well as meeting all Australian and international standards including ISO/IEC 11801. As a leading network connectivity infrastructure manufacturer, WBT is committed to providing quality products that enhance network performance as well as allowing for easy future updates.

WBT's range of bulk LAN cables provides good value for networks that require cabling over long distances or flexible cabling lengths. Available in Category 6 (CAT6) and 6A (CAT6A), all WBT cables are provided with low smoke zero halogen (LSZH) sheath as standard. LSZH considerably reduces the amount of toxic and corrosive gas emissions during a fire.

The range includes a variety of colours and the bulk packs are supplied in a heavy-duty speed reel box designed for easy unspooling and deployment of cables. WBT's quality and inspection procedures aim to ensure only high-quality, individually inspected and approved cables are supplied.

WBT offers fast manufacturing and delivery times, local stock availability, secure online shopping and dedicated technical and customer support teams.



Warren & Brown Technologies
www.wbnetworks.com.au

Electronic circuit protection device

The Siemens SENTRON ECPD (electronic circuit protection device) electronically switches off circuit faults if errors occur and, if necessary, trips the mechanical isolating contact downstream. Up to now, this sort of disconnection has been handled purely through electro-mechanical elements.

With SENTRON ECPD, multiple product functions are combined in the one device. New functions can be activated on the ECPD via the SENTRON powerconfig app without having to purchase a new device and functionally adapt it into the circuit.

The ECPD can be adjusted as required and adapts to the requirements of each application, eg, with regard to rated current, tripping limits or behaviour. This means circuits can be designed based on the rated current of loads instead of the significantly higher inrush current peaks that occur briefly with certain load types, such as LED lights.

SENTRON ECPD offers full transparency on energy consumption in the final circuit through radio-based communication with the SENTRON Powercenter 1000 and 3000 gateways. Remote diagnostics and remote switching can be carried out during normal operation as well as in the event of a fault.

Siemens Ltd
www.siemens.com.au

Probe microscope

VIAVI has expanded its fibre-optic test solutions portfolio with the addition of the INX 760 probe microscope. The fully automated microscope delivers fast inspection and analysis of single, duplex and multi-fibre connectors in applications including hyperscale data centres, metro core construction, telco distribution and more.

The INX 760 automates every step of the inspection process, from test set-up and tip configuration to image focus, analysis and data storage. Interchangeable AutoID tips automatically configure the probe for inspection of different fibre connector types. In addition, the internal panoptic imaging engine delivers edge-to-edge field of view without compromising magnification or image resolution.

The INX 760 delivers a user-friendly solution for field teams to certify connectors to IEC-61300-3-35 and help ensure fibre network performance.

VIAVI Solutions Inc
www.viavisolutions.com.au

Flexible outdoor lighting control

Designed for outdoor facilities, Theben's theLuxa P300 KNX can be mounted either on a wall or ceiling thanks to its swivelling sensor head. Available in white or black, the motion detector has an integrated, sensitive brightness sensor that can be used as a twilight switch. It also has an integrated temperature sensor.

Four motion detector channels respond to temperature and/or brightness and can be time-linked for various lighting applications such as orientation lighting. In the Orientation light setting, a basic illumination of 40% provides orientation in the morning and evening twilight hours. Depending on movement, the brightness switches to 100%.

Three separate motion sensors detect the areas to the left, front and right of the motion detector. One or more of these sensors can be individually assigned to each of the four motion channels. This means that when movements are detected on one side of the building, only the lights on that side will be switched on, while a movement from the front could then switch on the lighting on both sides.

Integrated into a KNX system with a 300° detection range of up to 16 m and anti-creep protection, theLuxa P300 KNX's brightness thresholds, duty cycle and sensitivity can be individually adjusted via the KNX parameters.

Theben AG
www.theben.de

TOLL FETs

Transphorm has introduced three SuperGaN FETs in TOLL packages to its robust GaN power semiconductor range. The new FETs have on-resistances of 35, 50 and 72 milliohms.

Transphorm's TOLL package configuration is industry standard, meaning the SuperGaN TOLL FETs can be used as drop-in replacements for any e-mode TOLL solution. The new devices also offer high voltage dynamic (switching) on-resistance reliability.

The three surface mount devices (SMDs) support higher power applications operating within an average range of 1 to 3 kW. These power systems are typically found in high-performance segments such as computing (AI, server, telecom, data centre); energy and industrial (PV inverters, servo motors); and other broad industrial markets. The FETs are also suited for rapidly expanding AI systems that rely on GPUs requiring 10 to 15 times the power of traditional CPUs.

Transphorm
www.transphormusa.com/en/

Rugged smartphone

The Aspera R10 rugged smartphone has IP68-rated protection against water and dust ingress, 4G dual sim cards and a robust design providing a level of protection from heavy knocks and drops.

The R10 comes with NFC, enabling contactless payments, a 6.5″ HD+ display, dual 4G SIM cards, Android 13 OS and a 2 GHz Octa-core MediaTek processor coupled with 4 GB RAM and 128 GB ROM. It is powered by a 5100 mAh battery.

The R10's rear camera is 13 MP and its front-facing camera is 8 MP, enabling HD resolution video recording as well as facial recognition for unlocking the phone.

Aspera

www.asperasoft.com

Solar attachment solution

The S-5! MLPE Mount provides a universal method for attaching module level power electronics (MLPE) directly to solar PV module frames. It is designed for solar developers, installers and end users who want a flexible, easy-to-install MLPE mounting device for PV module frames, without having to rely on attachment to rails.

Designed for use with most solar modules, the MLPE Mount secures optimisers and microinverters along the underside of the module frame at desired locations so wire management is simplified. This provides the versatility needed to better handle module-to-module wire management and electrically bonds the equipment together to comply with grounding requirements.

The MLPE Mount is suitable for use with all S-5!'s solar attachments and can be used in rail-based installations or paired with the PVKIT rail-less solar mounting solution for direct attachment to metal roofs. A tab feature makes installation quick and easy, and lessens the likelihood of rotation during installation — one hand can position the MLPE device on the frame while the other hand tightens the bolt to secure it.

S5!

www.s-5.com/

IoT switch

The ICP DAS iNS-316 is a 16-port IoT switch that supports both IEEE802.3af and 802.3at PoE specifications, making it compatible with a wide range of devices. The switch offers up to 30 W per port at 48–57 VDC power input.

For management and configuration, the switch has a user-friendly web-based GUI, allowing for remote control and monitoring of the power supply status of connected PoE devices. Additionally, the iNS-316 supports SNMP v2c and Modbus, providing flexibility in network management and device integration.

A power scheduling function enables the switch to automatically turn off power to connected devices during non-essential periods, leading to energy savings and a reduced carbon footprint.

Each port on the iNS-316 is equipped with independent PoE status LED indicators, allowing network administrators to identify abnormalities in the power supply.

ICP Electronics Australia Pty Ltd

www.icp-australia.com.au

Bocube series of enclosures by BOPLA

Even though the standardisation of electrotechnical equipment and installations has been advancing steadily, it is impossible to avoid less typical elements or completely customised solutions in any production plant or machinery park. In some cases, they actually contribute to process modernisation, and in other cases they arise from the need to combine incompatible systems, optimisation, production scaling, etc.

The Bocube series of enclosures comprises solutions designed with such situations in mind. They can also be used **to manufacture short batches of devices, create prototypes or implement one-off projects**.

Graphite

Grey

Transparent cover

Aluminium

Design and closing system

The front panel closing system is the most characteristic feature of the Bocube product range. The front cover is pressed down with two levers that are located on opposite sides (horizontally or vertically). The panel can be tilted (as if it were hinged) or detached from the two press-down elements and removed. It does not require any special tools, as standard side holders come with a small gap into which a prying element (a screwdriver blade, knife, etc.) can be inserted. Simultaneously, full closure ensures the nominal body tightness. As a result, depending on the model, the IP66 (full dust- and water-tightness) degree of protection is ensured as a standard; however, it can reach even IP69 (protection against immersion and high-pressure water jet).

Wall-mounting holes are positioned inside the enclosure, but outside the main compartment, so that the installation process does not compromise wall integrity, and screws and holes remain protected from the external factors. There are **factory-made bushings inside each model, designed to seat rails or a mounting plate** in order to minimise any processing needs before use. Note also that the Bocube series includes enclosures of multiple sizes, i.e. from small designs accommodating a single electronic circuit (**80 x 89 x 47 mm**) to panel boxes, which are large enough to install two DIN rails (**364 x 284 x 120 mm**).

Design materials

New BOPLA products are divided into two series: Bocube and Bocube Alu. The former series includes products made of plastics, e.g. ABS or polycarbonate, whose properties allow for outdoor operation of products and their exposure to weather conditions. The entire body and front is always made of a single raw material, which streamlines recycling (polyurethane seals are the only exception from this rule). Moreover, the bodies made from polycarbonate demonstrate the IK07 mechanical strength class and comply with international fire safety standards (UL 94 V-0 class, i.e. resistance to flames, self-extinguishing capability).

Bocube Alu

Bocube Alu made from aluminium enclosures exhibit not only a higher impact protection class (IK08), but also offer the degree of protection up to IP69 (with silicone seals). Due to the materials used in their design, they offer protection against electromagnetic interferences (shielding) and dissipate the heat emitted by electronic components to the body exterior. Their surfaces are powder-coated (except for the mechanical components, i.e. hinges). The parameters of Bocube Alu solutions make them perfectly suited for (rail, sea, etc.) transport applications, heavy machinery, etc.

Applications

Thanks to their high degree of protection and possibility of being installed outdoors, small enclosure models are perfectly suited to the needs of **remote IoT sensor installations**, such as battery-powered circuits that require periodic energy cell replacement. They can also be successfully customised to operate as **distribution points for power, signalling, alarm and even communication systems**.

The Bocube series provided by BOPLA offers **extremely diverse, but also very simple to implement, customisation capabilities at minimum expenditure, which eliminates almost all compromises** that universal enclosure users must face.

TME® Electronic Components

Transfer Multisort Elektronik Sp. z o.o.
www.tme.com/au/en

CASE STUDY

How remote monitoring is protecting NSW harbours

Port Kembla

Cathodic protection (CP) is an electrochemical technique used to control the corrosion of metal. CP systems are commonly used to protect structures such as pipelines, storage tanks, steel piles, offshore oil platforms and reinforcing steel in concrete.

NSW Ports has existing cathodic protection systems at five of its berths in Port Kembla, but these impressed current CP systems vary in age, with some installed as far back as the 1980s. In order to enhance surveillance and provide more accurate energy monitoring, NSW Ports enlisted cathodic protection and remote monitoring company Omniflex to install remote monitoring at each CP system.

The available space to mount remote monitoring equipment inside each CP system enclosure was different, so Omniflex designed custom configurations for each monitoring system. Further complicating the monitoring requirements was the fact that CP systems on both concrete and steel structures needed to be monitored, with different numbers of transformer/rectifiers (T/R), anodes and reference electrodes.

The measurement data is sent via the 4G mobile phone network to the NSW Ports Data2Desktop web portal, which integrates the CP systems at Port Kembla into NSW Ports' existing remote berth-monitoring. This portal provides a convenient single point for the monitoring of cathodic protection performance and energy consumption across all of NSW Ports' CP assets.

"Monitoring of CP systems involves measuring T/R output voltages as high as 60 volts, individual anode currents using existing current shunts which are only millivolts and reference electrodes which require very high input impedances," explained David Celine, Managing Director of Omniflex. "Our PowerView iRef8 monitoring unit, with its individual channel isolation, high input impedance and multiple measurement ranges, is purpose-designed for these CP monitoring applications.

Ominflex's PowerView iRef8 monitoring unit.

"Traditionally, checking cathodic protection functionality is done by inspection once every six or 12 months," Celine added. "Corrosion is silent and any failures such as disconnected anodes or failed power supplies could go unnoticed for up to a year, leaving structural steel unprotected against corrosion."

Tracking the electricity usage of CP systems has other benefits, such as allowing energy consumption to be quantified for cost allocation purposes, especially if third parties are operating the berths. Further, with businesses increasingly needing to measure their carbon footprint accurately in order to meet sustainability goals, monitoring energy usage of CP systems is key.

Omniflex (Australia) Pty Ltd
www.omniflex.com.au

Industrial IoT security sensor

Nozomi Guardian Air is a wireless spectrum sensor purpose-built for OT and IoT environments worldwide.

Guardian Air provides visibility into wirelessly enabled devices, monitoring several prominent wireless frequencies, not just Bluetooth and Wi-Fi, to provide security teams with visibility of connected sensors, devices, laptops and mobile phones. With the addition of Guardian Air, users can have a comprehensive network solution all in one integrated platform.

With Guardian Air, IT security professionals and OT operators can continuously monitor prominent wireless frequency technologies used in OT and IoT environments including Bluetooth, Wi-Fi, cellular, LoRaWAN, Zigbee, GPS, drone RF protocols, WirelessHART and more. They can also detect wirelessly connected assets and gain asset information to quickly address unauthorised installations, detect wireless-specific threats, including brute force attacks, spoofing, and bluejacking — with the added ability to determine the location of the devices performing the attacks and seamlessly integrate wireless data into a single OT & IoT security platform that unifies asset visibility from the endpoint and across wired and wireless networks.

Nozomi Networks Inc

www.nozominetworks.com/

Smart security system

Uniden's App Cam SOLO Pano Kit is an intelligent security system offering a range of AI features designed for Australian conditions.

The weatherproof device has a 440 lumens spotlight, a 170-degree-wide field of view and a 3K lens resolution to capture high-quality footage when most needed. With this detection technology, the App Cam SOLO Pano Kit alerts users through instant-push notifications via the Uniden SOLO app, thus reducing the number of false alarms.

Uniden offers free seven-day cloud storage, which rolls over for the life of the product. This cloud-based storage saves motion-triggered recordings, so users receive relevant footage without the clutter, making it simpler to find and review key events.

The system's wire-free over Wi-Fi capability is designed so that both homeowners and renters can easily install it without worrying about ongoing subscription costs.

Uniden Australia

www.uniden.com.au

CASE STUDY

How a utility saved money through smart design

With a network spanning 737,000 km and covering approximately 95% of New South Wales, Essential Energy distributes electricity services to more than 870,000 homes and businesses in 1500 regional, rural and remote communities.

Despite its large coverage area, the utility has a small customer density of 1.7 customers per square kilometre, resulting in a significantly higher operational cost-to-customer ratio than many other distribution network service providers. With a minimal customer base to finance the maintenance and support of over 184,000 km of powerlines held up by 1.4 million poles, and pressure to lower operating costs, Essential Energy needed to assess its capital works projects to find a low-cost, low-resource solution.

"How do we lower energy costs but unlock value across our complete portfolio of works?" asked Matthew Turvey, Senior Electrical Engineer with the substation design team at Essential Energy.

As a company that embraces going digital, Essential Energy wanted to solve the problem through an intelligent digital design system (IDDS). However, while intelligent digital design has been available for several years, it has mainly been used on large-scale projects with capital budgets exceeding AU$100 million.

Fewer than 15 people make up Essential Energy's substation design team — a team responsible for managing the design of all capital investments related to the refurbishment, replacement and construction of substation assets. This team wanted to bridge the gap between large-budget projects and small capital works by applying the same end-to-end benefits of IDDS to both. "There are tens of thousands of design teams like ours working with state or private utilities that need a low-cost, low-resource solution so they can also take the next step to unlock value that an intelligent digital design system can offer," Turvey said.

Digital reality model of the Brewarrina substation. Image courtesy of Essential Energy.

Investigating substation design processes

Committed to improving design performance and digital efficiency across its portfolio of works, Essential Energy and its substation design team selected the Brewarrina Substation to investigate the substation design process and the feasibility of using digital technologies to replace time-consuming manual tasks.

The town of Brewarrina in the far north of NSW.

iStock.com/JohnCarnemolla

A 22- to 66-kilovolt rural site with total capacity of approximately 5 megavolt amperes, the area is prone to severe weather events, including flooding, lightning, strong winds and dust storms. These site conditions presented data acquisition challenges, making traditional onsite surveys dangerous and inefficient in terms of time and accuracy. Several options, including ground scanning and LiDAR (light detection and radar), were trialled, and the captured images were converted to 3D models and used as the basis of new designs.

Streamlining digital workflows

Already familiar with Bentley applications, Essential Energy initiated the IDDS workflow for Brewarrina by creating digital reality models of the site using Bentley Systems' ContextCapture. "The digital reality model is then copied into ProjectWise and forms the foundation to create both primary and secondary drawings for the project using Bentley's OpenUtilities Substation," said Jess Hammond, Senior Drawing Officer at Essential Energy.

All reality models, CAD drawings and related documents were stored and shared via ProjectWise, using links instead of manually sharing drawing files, which led to the elimination of uncontrolled versions. The team used OpenUtilities Substation for all design and drafting tasks. In this way, Essential Energy used Bentley's applications to create an IDDS, enabling virtual design reviews and streamlining the design and drawing approval process.

The interoperability of Bentley's applications and Microsoft 365 allowed Essential Energy to automate conversion of the approved

drawings into PDF copies that were immediately accessible to the onsite construction crews via their mobile devices, ensuring all relevant parties always had the most up-to-date information. "It wasn't until we could take advantage of Bentley's partnership with Microsoft 365 that we were able to formulate a working system, [an] end-to-end solution," said John Rogers, CAD Administrator at Essential Energy.

Upon completion of construction, Essential Energy re-sent drones to capture photos of the site and generate an as-built model with ContextCapture, closing the loop by performing a post-construction audit against the initial design.

Driving smart solutions in the energy sector

By automating previously manual processes, Essential Energy significantly reduced substation design hours. The implementation of the utility's Bentley-based IDDS has reduced project costs for design at Brewarrina by 50%. "We now believe we have bridged the gap in making IDDS not just financially viable for large-scale budget projects, but [now we can] also offer the same end-to-end project benefits in a low-cost solution," Turvey said.

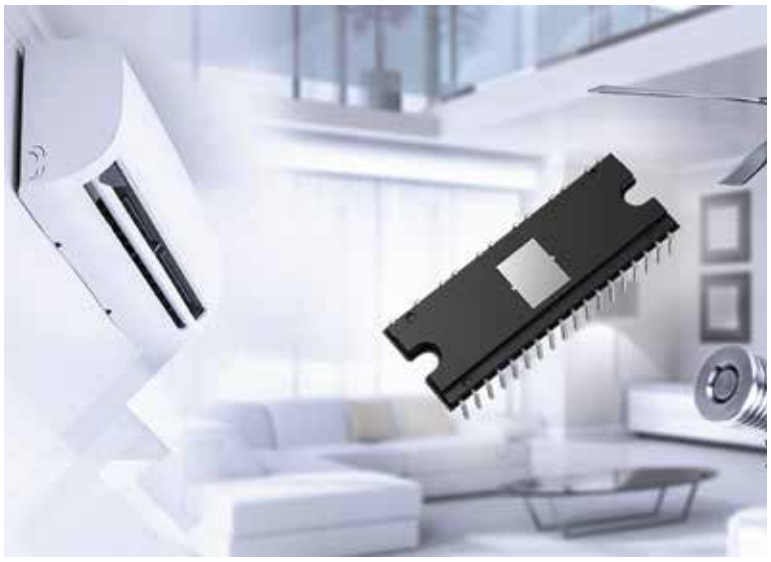
Using low-cost 3D reality models, clash detection and automated workflows rather than traditional manual methods improved quality and efficiencies, reduced work associated with design and construction errors, minimised travel, enhanced safety and decreased Essential Energy's carbon footprint. "IDDS and reality models provide accurate information and revolutionary viewing angles, which enable quick and safe design decisions and allow construction crews to reduce outage times, resulting in a resilient network," Rogers said.

The benefits Essential Energy has received by moving to an IDDS will help the company transition to a more comprehensive digital twin, according to Bentley Systems. With the increasing push to lower operating costs across the energy sector, Essential Energy is on the way to transforming its approach to capital works projects and the use of technology.

The utility aims to integrate bidirectional data flows and real-time visualisation between its IDDS and asset management system to identify high-risk assets, thus improving its operations and maintenance processes.

"As for the digital future, as Essential Energy builds its data lake of reality models, we will be able to use artificial intelligence to help identify defects in assets and use historical data to show time lapse visual conditioning models," Rogers said.

Bentley Systems Pty Ltd
www.bentley.com/en-AU/



IPDs for brushless DC motor drives

Toshiba has developed two small intelligent power devices (IPDs) for brushless DC motor drive applications such as air conditioners, ceiling fans, air cleaners and pumps. The devices, TPD4163K and TPD4164K, have output current (DC) ratings of 1 A and 2 A respectively.

Both products are housed in a through hole-type HDIP30 package, which reduces the mounting area by approximately 21% against Toshiba's previous products. This helps reduce the size of motor drive circuit boards.

As voltage may fluctuate significantly in regions with unstable power supply, the voltage has been increased from the 500 V of Toshiba's previous products to 600 V.

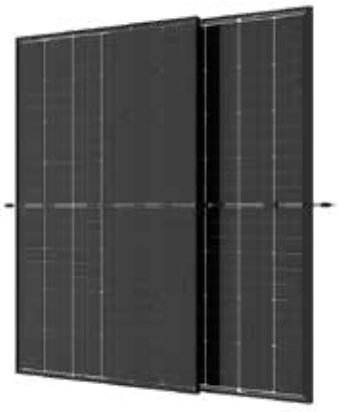
Toshiba (Australia) Pty Ltd
www.toshiba.com.au

Solar panel

Specifically designed for commercial and industrial applications, the Trina Solar Vertex S+ Series panel will suit rooftops, covered pedestrian walkways, car parks and other under-utilised business spaces of shopping centres, offices, factories and the like.

Incorporating Trina Solar's black design, the NEG18R.28's 1.6 x 1.6 mm dual-glass solar panel features high-transmission, AR-coated heat-strengthened glass on the front and heat-strengthened glass on the reverse.

Measuring 1961 x 1134 mm with a width of 30 mm, the Vertex S+ NEG18R.28 is a lightweight product weighing 23.5 kg. The S+ Series panels are engineered to yield maximum power output of 505 W and deliver 22.5% efficiency. The NEG18R.28 also includes PID resistance through cell processes and module material to reduce deterioration due to unwanted charge carrier movements.



The mono-facial dual-glass panel meets IEC fire ratings (Class A+C) and Australia's harsh environment performance requirements, indicating compatibility with both hot and cold environments. It has passed 35 mm hail tests.

Trina Solar Australia
www.trinasolar.com/au

Photoelectric smoke alarm

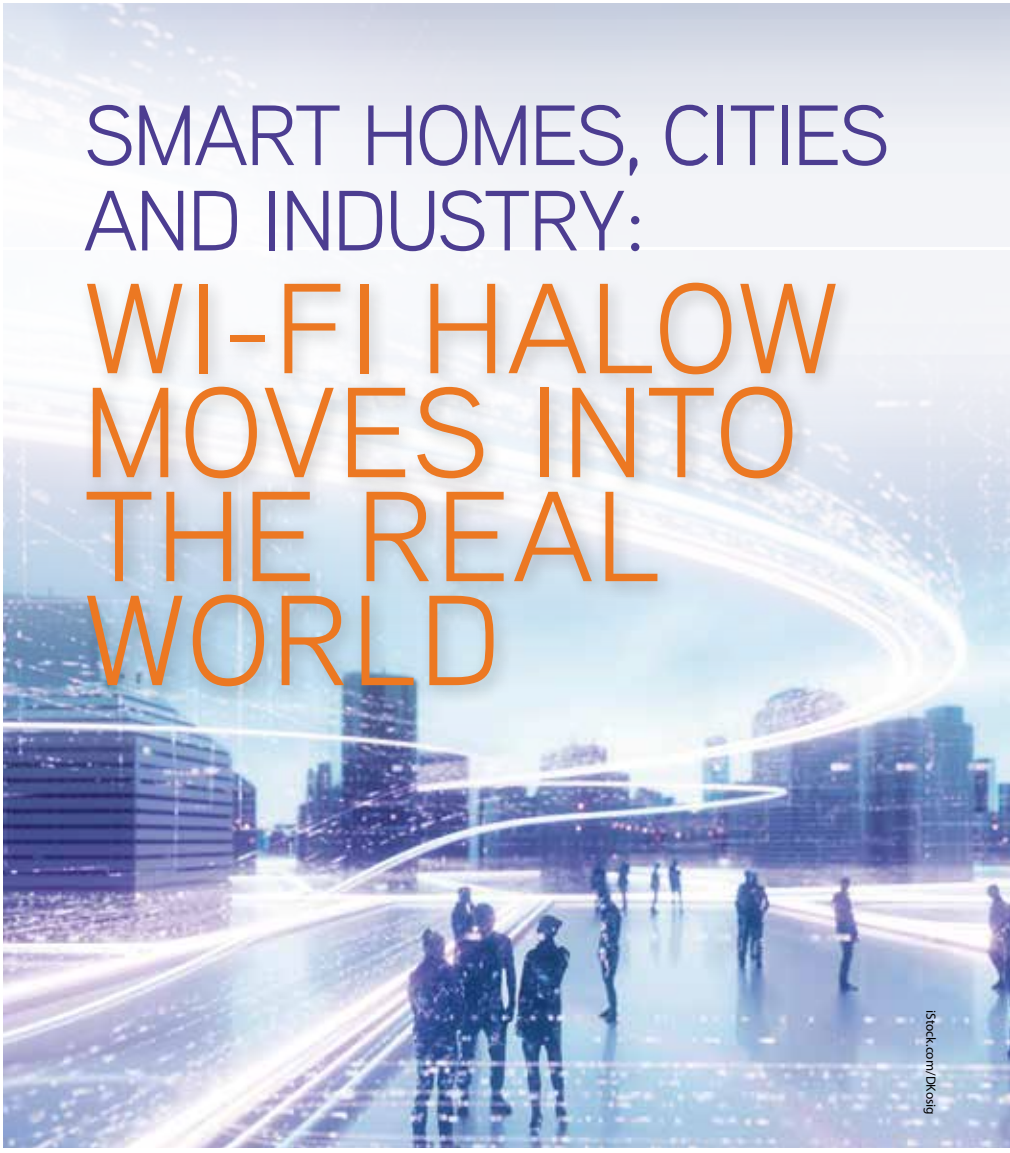
Legrand's photoelectric smoke alarms are engineered to detect visible combustion particles, providing early alerts for smouldering fires and dense smoke. The alarms' interconnected safety feature means that when one smoke alarm sounds, all interconnected alarms sound simultaneously, alerting occupants to fires regardless of where they start.

Wireless interconnectivity via radio frequency (RF) technology eliminates the need to run interconnect wires between multiple floors and rooms in the home, making for flexible installation.

Installation options are available in two formats — surface mount and flush mount. Legrand's smoke alarms come with a five-year product warranty across the range as well as 10-year lithium battery backup.

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

SMART HOMES, CITIES AND INDUSTRY: WI-FI HALOW MOVES INTO THE REAL WORLD



The Wireless Broadband Alliance (WBA), a global organisation that connects people with the latest Wi-Fi initiatives, is moving its 'Wi-Fi HaLow for IoT' program into a new phase, showcasing 802.11ah Wi-Fi HaLow solutions in real-world use cases with contributing industry members.

Wi-Fi HaLow will be trialled for a range of applications, including smart home, smart city, building automation, smart retail, industrial IoT and agriculture technology.

Through these commercial deployments, WBA aims to demonstrate how Wi-Fi HaLow can extend the benefits of Wi-Fi into more Internet of Things (IoT) applications where unique technical challenges must be overcome to realise business benefits.

Wi-Fi HaLow's reported advantages include extended ranges, improved material penetration capabilities, extended battery life, enhanced device density, minimised end-to-end delay, a higher level of security, ease of installation and management, and elevated data throughput in IoT scenarios.

In coming months, the project team will test the following use cases and applications:

- **Smart home** — Evaluate Wi-Fi HaLow against traditional Wi-Fi in security cameras, HVAC, appliances, detached garage connections, solar power systems, power backup generators and EV chargers.
- **Smart city** — Focus on infrastructure monitoring, smart utilities and traffic management to highlight wider coverage benefits, high data throughput, increased device density and low-cost maintenance.
- **Smart building automation** — Conduct testing to support smart building applications such as physical security, surveillance, access control, safety alarms and water sensors.
- **Smart retail** — Showcase how Wi-Fi HaLow enhances consumer satisfaction and increases productivity for retailers and partners. The assessment will cover scanners, readers, point-of-sale equipment, asset tracking, security monitoring, warehouse robots and handlers.
- **Industrial IoT** — Focus on industrial applications including asset tracking, infrastructure monitoring, remote equipment control, safety automation and security monitoring.
- **Agriculture technology** — Trial smart agriculture or precision farming systems, including environmental monitoring, soil monitoring, plant health monitoring, actuator control and data collection for predictive breeding.

"The move to demonstrating Wi-Fi HaLow in real-world scenarios is an important milestone for the WBA and the contributing industry members supporting these activities," said Tiago Rodrigues, CEO of the Wireless Broadband Alliance.

"Each scenario will highlight how Wi-Fi HaLow solves connectivity problems, which previously may have required non-standard RF radio technology or incurred higher costs of ownership. A detailed analysis from these deployments will inform new deployment guides, helping wider industry to successfully roll out IoT solutions, without having to resort to proprietary or non-IP technologies to gain the automation, insights and business benefits that IoT promises to deliver," Rodrigues added.

Wi-Fi HaLow's features include operation in the sub-1 GHz radio band, the use of narrow channel bandwidths, an increased number of supported devices and new operating modes to accommodate battery-operated devices. It builds on the foundations of Wi-Fi, retaining such features as the most up-to-date levels of security and native-IP support inherent in all internet connectivity.

"The extensive capabilities and robust connectivity features of Wi-Fi HaLow elevate IoT to a heightened level, overcoming limitations imposed by older connectivity standards," said Zac Freeman, Vice President of Marketing & Sales of Newracom.

"This technology enables the deployment of IoT solutions with unprecedented scope, fully realising the vision of smart services without constraints. We are genuinely enthusiastic about sharing the transformative influence of Wi-Fi HaLow in real-world scenarios."

The WBA's 'Wi-Fi HaLow for IoT' white paper gives an overview of the features, expected use cases and markets for Wi-Fi HaLow.

EXPANDING AUSTRALIA'S GRID: IS UNDERGROUND POWER THE ANSWER?

The federal government has set a goal of more than 80% of electricity coming from renewable energy by 2030; one of the key pillars of this transition is the expansion of the grid to connect regional wind and solar projects, which involves new or upgraded transmission lines.

In order to better understand the challenges of expanding Australia's grid for renewable energy initiatives, scientists from Curtin University and The University of Queensland have undertaken a detailed comparison of overhead and underground transmission lines.

Their report, 'Comparing High Voltage Overhead and Underground Transmission Infrastructure', presents the complex technical, economic, environmental and social factors that affect the public's response to grid expansion projects.

Report lead author and Director of the Curtin Institute for Energy Transition Professor Peta Ashworth said the research underscores the need for increased public understanding of why new transmission infrastructure is needed and the trade-offs involved.

"While the decarbonisation of Australia's energy system is a global imperative, an informed and engaged public is crucial to ensuring fairness and understanding during this transformative journey," Ashworth said.

"Our research makes it clear that without strategic grid expansion, a successful transition to an eco-friendly economy is at risk and navigating the challenges ahead requires strong leadership, community involvement and fair consideration of all stakeholders."

The report underscored a growing debate about what grid expansion means for the natural landscape, farming practices, property values and tourism — all common issues emerging from the case studies.

However, when the benefits of underground lines such as environmental, aesthetic or reduced maintenance were presented, these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were not sufficient in people's minds to overcome the issues surrounding cost. Some of the views expressed by Queensland focus group participants included the following:

"We've got wide spaces and a huge amount of countryside and obviously [for the costs involved] to be putting in underground powerlines in, you know, the middle of the outback would be absolutely ridiculous."

"I think the problem is that we only have a limited of money to spend, whether it's at the state, local or federal level. So if someone said we can either put everything under the ground or we can have free public health care for all Australia, I'll probably go preferably health care."

The report found that transmission infrastructure projects are facing several challenges because of global and national factors such as increasing costs, availability of skilled labour, supply risks and delays in gaining approvals.

"OUR MISSION IS TO FACILITATE A SUSTAINABLE ENERGY TRANSITION THAT ENSURES FAIRNESS AND UNDERSTANDING IN EMBRACING THESE CHALLENGES … – PROFESSOR PETA ASHWORTH

It also found that alternating current overhead transmission lines have been proven worldwide over a long period of time to be the lowest-cost system for safe and reliable delivery of large amounts of energy over long distances.

However, it was difficult to ascertain the capital cost of underground compared to overhead transmission infrastructure due to the lack of recent projects, as well as current global and local economic factors with cost ratios varying from 3 to 20 depending on construction type, route length and specific project factors.

Co-author Professor Tapan Saha from The University of Queensland's School of Electrical Engineering and Computer Science said the team also found that, from a technical standpoint, high voltage alternating current (HVAC) underground cable transmission, while feasible, is limited to relatively short lengths due to the high electrical capacitance of transmission cables. On the other hand, high voltage direct current (HVDC) transmission can be considered as a viable option for long point-to-point connections and other specific applications.

"The challenges of underground cable transmission are rooted in the significant charging currents associated with their highly capacitive characteristics and reactive power compensation plants are necessary to mitigate the resultant energy losses, making this option economically demanding," Saha said.

"But overseas experience shows to gain public acceptance and regulatory approvals, undergrounding certain sections of transmission lines was necessary in specific locations, particularly urban and environmentally significant areas."

Despite the cost considerations, many study participants were looking for outcomes that can strike a balance between differing interests and priorities:

"I feel that everything needs a nice, even balance. You use overhead where it's going to be more cost-effective and you use underground where it's going to be more efficient. And I think that, you know developers: if they're working smart, they will deliver in a way that is environmentally friendly, is cost-effective, but also it is going to keep the cost down and keep the power on."

Ashworth said while there is no one-size-fits-all answer, involving both project developers and communities in open discussions can help to build trust in the process and more successfully lead to the identification of a preferred option.

"Our mission is to facilitate a sustainable energy transition that ensures fairness and understanding in embracing these challenges, and by engaging our communities to foster an improved understanding of the trade-offs, we can pave the way to a climate-friendly future," she said.

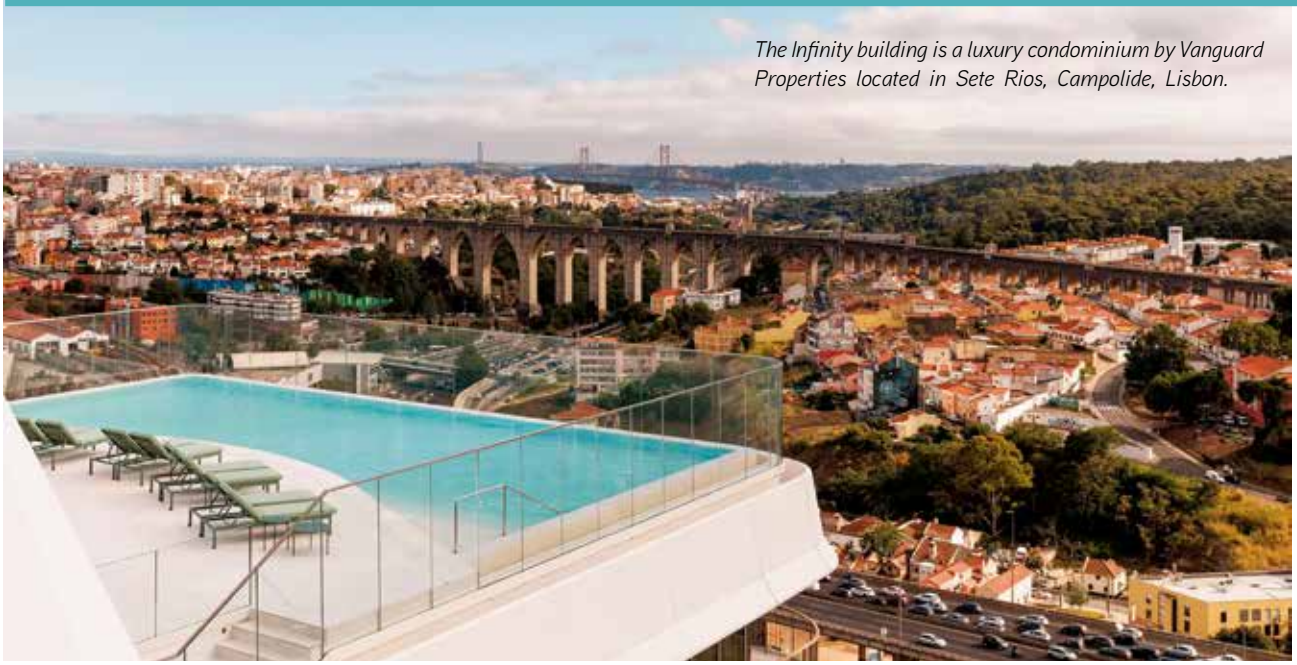
The research was funded by Powerlink, a state government-owned corporation that develops, operates and maintains the high-voltage electricity transmission network in Queensland.

It should be noted that participants in the focus groups were from communities in Queensland and were not directly impacted by current or proposed transmission line developments.

1. The final report is available at http://research.curtin.edu.au/ciet/engagement/publications/transmission-infrastructure/.

CASE STUDY

Preparing one of Portugal's tallest buildings for e-mobility



The Infinity building is a luxury condominium by Vanguard Properties located in Sete Rios, Campolide, Lisbon.

The Infinity building is a luxury condominium located in Sete Rios, Campolide, Lisbon. Owned by Portuguese property developer Vanguard Properties, it is one of the city's largest residential projects, with above-ground 26 floors, 195 apartments and 352 parking spaces — in total covering more than 50,000 m^2 of floor area.

The developer envisages Infinity as an iconic residential spot in Lisbon's city centre with environmental engineering and sustainability at its core. To this end, Vanguard has engaged Siemens Smart Infrastructure to supply and install 200 VersiCharge wallboxes and an intelligent charging management system in the building.

The building's integrated electric vehicle (EV) charging solution was customised by Siemens engineering and software teams in Portugal, and allows for dynamic and intelligent onsite charging management. The VersiCharge wallboxes are distributed over six charging islands, across three floors of the building.

The dashboards, which Siemens describes as intuitive and easy to use, present comprehensive information to the building manager or operator who can instantly view all information about each charger, as well as monitor energy consumption in real time. Precise reports per apartment based on monthly consumption are produced, facilitating optimisation of the building's energy performance.

This energy management system is also ready for the future integration of photovoltaic or other renewable energy generation, as well as energy storage systems that will contribute further to energy efficiency and the reduction of the building's greenhouse gas emissions. The system includes the latest cybersecurity functionalities.

"Managing EV charging infrastructure via intelligent load management is crucial for sustainable energy systems and grid stability," said Markus Mildner, CEO eMobility at Siemens Smart Infrastructure.

The contract includes delivery of the scalable SICAM Dynamic Load Management (DLM) system, based on the SICAM A8000 power automation platform. The SICAM A8000 series is a modular device range for telecontrol and power grid automation applications in all areas of energy supply. Robust and responsive, SICAM DLM is a charging station management system that is prepared to receive grid

Siemens has provided an intelligent charging management system to the Infinity building, one of the tallest residential sites in Lisbon, Portugal.

constraint signals from distribution system operators (DSOs) and to integrate local distributed energy resources (DER) and energy storage systems — important features for the energy transition.

It facilitates communication with chargers, from which it extracts information related to consumption and offers dynamic charging management algorithms. As part of the Siemens Xcelerator portfolio, an open digital platform designed to help customers accelerate their digital transformation easier, more quickly and at scale, the device supports a dynamic load management strategy for the operators of the building.

Vanguard's sustainability goals for Infinity fit in with Portugal's recovery and resilience plan, which includes the deployment of 15,000 EV charging stations by 2025.

"Real estate activity has a considerable impact both environmentally and socially on the community," said José Cardoso Botelho, CEO of Vanguard Properties.

"Infinity is a project of immense pride to us, and an important reference of our digital transformation. We are glad to have collaborated with Siemens to create a sustainable building for tomorrow."

Siemens Ltd
www.siemens.com.au

HOW DOES HVAC STAND UP TO BUSHFIRE SMOKE?

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Recent Australian research has revealed the dangerous composition of bushfire smoke, as well as the potential of heating, ventilation and air-conditioning (HVAC) systems to protect us from it.

Scientists from University of Technology Sydney (UTS) and UNSW Sydney analysed bushfire smoke by examining particles caught in commercial air conditioning filters. Their study, published in the journal *Environmental Pollution*, highlights the importance of having bushfire-ready infrastructure.

Bushfire smoke can cause or exacerbate conditions such as asthma, chronic obstructive pulmonary disease (COPD) and heart disease, and lead to an increased risk of hospitalisation and death.

"The bushfires that raged across Australia during the 2019–2020 'Black Summer' produced an enormous amount of air pollution, with plumes of smoke travelling long distances and cloaking Sydney and surrounding areas," said UTS PhD candidate in environmental science Raissa Gill, who led the study.

"We wanted to find out more about what was in the bushfire smoke we were breathing. By using commercial air-conditioning filters, we were able to capture and analyse the chemical composition of particles that would otherwise have been inhaled," she said.

The researchers collected particulate matter from HVAC filters in UTS Buildings 4 and 7 during the peak of the Black Summer bushfires, as well as one year later as a reference point.

They found daily particulate matter concentrations were generally 2–3 times higher than normal, with hourly concentrations reaching up to 10.5 times the usual maximum. This exceeded the national standards on 19% of days across the four-month sampling window. The particles were also finer and contained a different mixture of toxic chemicals.

"Bushfire aerosols contained much smaller, rounder particles than urban aerosols, making them more likely to be inhaled into our lungs and to transfer toxic elements into our bloodstream," said co-author UTS Professor Martina Doblin.

"These particles also contained more soluble forms of mercury, as well as higher concentrations of sulfate, nitrate and fluoride ions and metals including manganese, cobalt and antimony. Mercury is quite toxic even in low concentrations and can cause neurological problems and lung damage."

The study revealed the diverse chemical changes that severe bushfire events exert on the atmosphere. Understanding these changes is crucial for assessing the impact of bushfires and their potential consequences for human health and environmental quality.

"While air quality in Sydney is usually good by world standards, recent evidence has clearly shown that the handful of days that we get every year with high pollution loads from bushfires and dust storms lead to significant disease and death in the community," said co-author UTS Associate Professor Fraser Torpy.

"Studies that build an understanding of these high pollution events are critical in helping us determine what is causing these health crises, and will lead towards a better understanding of how we can protect vulnerable members of the community," he said.

While HVAC systems are generally not designed specifically for bushfire smoke, research[1] on indoor air quality in Canberra during the 2019–2020 fires showed that outdoor concentrations of fine particulate matter were up to 10 times higher than measured values indoors with air conditioning.

Encouragingly, the current study shows the UTS HVAC filters were able to capture a significant portion of bushfire smoke, reducing exposure to toxic particles for staff and students working in these buildings. It also underscores the importance of considering higher-rated HVAC filters during fire seasons and maintaining and replacing the filters regularly.

"Australians face significant obstacles in achieving satisfactory air quality during major bushfire events. Many homes and older buildings rely on natural ventilation or have poor HVAC filtration efficiency and gaps that allow smoke to enter. These systems can also be costly and complicated to manage for effective protection during bushfires," Gill said.

"Given that severe bushfires are projected to increase with climate change, the role of bushfire-ready infrastructure in maintaining public health, as well as the need to reduce greenhouse gas emissions, is now more pressing than ever."

1. https://journal-buildingscities.org/articles/10.5334/bc.87

EV charging station

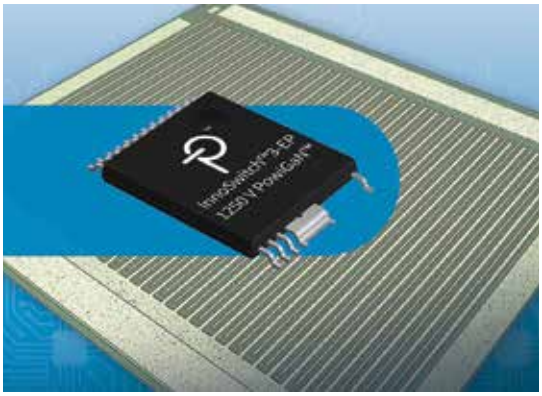
The EVlink Pro DC 180 kW from Schneider Electric is a fast charging station designed for commercial and industrial buildings. It seamlessly integrates with load management systems such as EcoStruxure EV Charging Expert to intelligently distribute energy from the building to the EV charging stations in real time.

The charging station is interoperable with building management systems such as Power Monitoring Expert and EcoStruxure Building Operation, which simplify daily operations for building operators by consolidating all information as a single-pane-of-glass solution. The solution is also certified with dozens of charging station management systems (CSMS), enabling building owners and charge point operators to integrate and curate a charging system that fits their needs, with the data visibility and back-end supervision necessary to efficiently manage their system.

Key features include scalable power from 120–180 kW, ISO15118 plug & charge and smart charging readiness, third-party lab certification and a housing with C4M corrosion protection for operation in harsh environments and extreme temperatures of up to 50°C without power derating.

The charging station also has reinforced embedded protection and a charge interrupt button for security, along with sensors for shock and water ingress awareness, with real-time notifications in the event of any issues at the charge point. AutoCharge vehicle recognition automatically initiates a charging session upon plugging in the registered EV, enabling dynamic simultaneous charging of two vehicles for maximum power usage efficiency.

Schneider Electric
www.se.com/au



GaN switch IC

InnoSwitch 3-EP 1250 V ICs are the newest members of Power Integrations' InnoSwitch family of offline CV/CC QR flyback switcher ICs, which feature synchronous rectification, FluxLink safety-isolated feedback and an array of switch options: 725 V silicon, 1700 V silicon carbide and PowiGaN in 750 V, 900 V and now 1250 V varieties.

Designers using the InnoSwitch3-EP 1250 V ICs can specify an operating peak voltage of 1000 V, which allows for industry-standard 80% de-rating from the 1250 V absolute maximum. This provides headroom for industrial applications and is suited to challenging power grid environments where robustness is needed to defend against grid instability, power surges and other disturbances.

Power Integrations
www.power.com/?segment=none

Outdoor security camera with siren

With a powerful 105-decibel alarm, the Netatmo Outdoor Security Camera with Siren can distinguish between a person, animal and vehicle, and can learn to recognise the difference between harmless and suspicious movement.

The camera keeps tabs on both welcome and unwelcome visitors, package deliveries and animals coming onto the property, with homeowners receiving real-time notifications via smartphone when an unknown person or vehicle is detected.

Images are accessible 24 hours a day from a smartphone, including night captures thanks to infrared vision.

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

FINDING ONE FAULTY SOLAR PANEL IN A SEA OF MILLIONS

Associate Professor Rahul Sharma

Up until now, finding faults in individual panels on a solar farm has been a time-consuming and expensive business. A tech startup from The University of Queensland has developed an AI-based system designed to address this problem.

"The challenge with large solar farms is detecting any faulty or underperforming solar panels hidden in a sea of millions," explained Associate Professor Rahul Sharma from UQ's School of Electrical Engineering and Computer Science.

"It's impractical to install monitoring hardware on each panel, inspect every panel for damage or clean every panel to remove dirt. We needed to find a way to automate that process."

Sharma and his team developed Solaris^{AI} in order to detect faults in solar farms without the need to install additional hardware, making the process fast and cost-effective. The technology works at the array and string panel level and sequentially extracts vital information, monitoring for degradation, soiling, wiring faults and tracker problems, as well as pinpointing any maintenance needed.

"Underperformance in Australian solar farms costs the industry around $400 million a year," Sharma said. "We're aiming for Solaris^{AI} to reduce those losses by half, and potentially deliver an uplift in revenue of up to 8%."

There are plans for the technology to be deployed at Edify Energy's Hamilton solar farms at Collinsville in North Queensland and Genex Power's Kidston solar farm in North-West Queensland.

Edify Energy CEO and founder John Cole said it was an exciting project.

"The key to maintaining grid reliability and achieving success as a network operator is effective and efficient asset management," he said.

"This technology has the potential to drive solutions to the world's energy crisis."

The UQ team partnered with German-based electronics and connection technology company Weidmüller to develop early prototypes. Solaris^{AI} was founded by UQ's commercialisation company UniQuest, spearheaded by investment from Uniseed as well as the UniQuest Investment Fund.

"UQ is committed to sustainable energy and renewable energy generation," said UniQuest CEO Dr Dean Moss.

"This is a fantastic commercial opportunity backed by top-notch research with the potential to generate huge economic and environmental benefits."

Rugged tablet

Part of Getac's 5G rugged device portfolio, the F110 fully rugged tablet enables workers to operate under a wide range of challenging conditions. Powered by a quad-core 11th Generation Intel Core i5/i7 processor, multitasking is fluid.

With Intel's Iris Xe Graphics, the tablet is easy to use and see, even when visibility is limited. Enhanced connectivity options deliver rapid data transmission from any location, with the added Thunderbolt 4 port offering a 40 Gbps connection, expanding end-to-end solution capabilities.

Getac Technology Corp

www.getac.com

Reset Data co-founders Marcel Zalloua and Bass Salah at the ResetData Test Lab.

LIQUID COOLING FOR DATA CENTRES

Data centres consume approximately 1% of all electricity generated globally, or about 200 terawatt hours per year. Much of this power consumption comes from cooling and environmental control requirements, as the server CPU and GPUs used for cloud computing generate large amounts of heat. As server chips become more powerful in coming years, the energy needed to cool them will also increase.

In order to address this issue, Australian-owned and -operated cloud service provider ResetData has opened a test and simulation lab for its liquid-cooled data centre server technology in the Sydney CBD.

Operated in collaboration with infrastructure from Dell Technologies and Intel, it is one of the first facilities in the Asia–Pacific region capable of testing and simulating workloads in a liquid-cooled environment, allowing local businesses to access more sustainable, high-performance infrastructure as a service (IaaS) for demanding applications including artificial intelligence and machine learning.

Traditional data centres use air cooling, requiring high-performance air conditioning to maintain an optimum temperature. Those data centres also consume large amounts of water as part of their operation.

ResetData uses immersion cooling, which suspends the server racks and their processors in liquid. By using liquid cooling, the company reportedly delivers an approximate 45% reduction in CO_2 emissions as well as an estimated 40% reduction in overall cloud cooling computing costs to end users compared to traditional air-cooled data centres.

"The reality is, traditional data centres consume a lot more energy than they should," said ResetData co-founder and Managing Director Bass Salah.

"By working with high-performance technology providers such as Dell Technologies and Intel, we are developing the next generation of data centre technology at our test and simulation lab. We're able to showcase how the partnership between the technology and cooling system uses far less power and water than traditional solutions, yet is still able to meet customer needs for high-performance cloud workloads, like artificial intelligence and machine learning."

According to ResetData, liquid cooling has the additional benefit of reducing the overall size of the data centre due to the efficiency of the cooling technology. This leads to lower real estate expenditure and allows data centres to be located in places not otherwise suitable for traditional data centre infrastructure.

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