

# SM

Apr/May 2023 Vol.16 No.5  
PP100007399

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## sustainability matters



End-of-life solar panel solutions | Smart energy transition | Smoking out sneaky stormwater



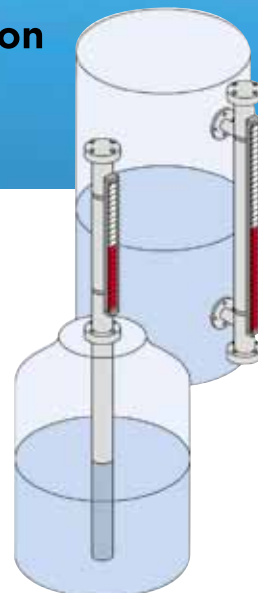


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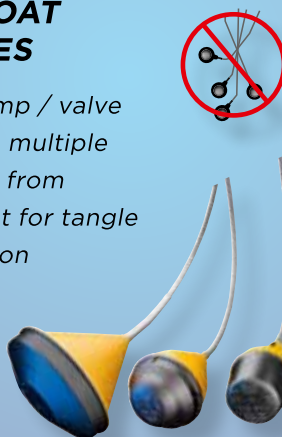
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# WORDS from the EDITOR

In March 2023, the Intergovernmental Panel on Climate Change (IPCC) issued its final warning for the 2020s to act swiftly on climate change.

The 'IPCC Climate Change 2023: Synthesis Report', compiled by almost 300 scientists across 67 countries, draws together all the contributions from IPCC's sixth assessment cycle, showing how action on climate change must be accelerated throughout the decade.

Australia risks the irreversible loss of coral reefs, loss of alpine species, collapse of forests in southern Australia, loss of kelp forests, sea-level rise, an increase in severe fire weather days and a dramatic increase in fatal heatwaves. Climate impacts such as worsening extreme weather are already affecting Australians, but further harms can be limited by moving beyond fossil fuels and getting greenhouse gas emissions to plummet.

The climate message has been delivered repeatedly and consistently many times before, and although there has been progress in renewable energy uptake, we are not moving fast enough.

Finance companies are now getting on board with climate action by insisting on a commitment to net zero before funding projects, so this should be positive for sustainable development.

With further government assistance, there are many opportunities available and some of the solutions are discussed in this issue, such as: cleaner energy — renewables; cleaner transport — EVs; and better waste management — resource recovery.

Enjoy the read!



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Printed and bound by Bluestar Print  
Print Post Approved PP 100007399  
ISSN No. 1834-917X



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# Solutions for end-of-life solar panels being researched

**A**ustralia's renewable energy sector is facing a quandary: how the nation will dispose of 80 million solar panels in an environmentally friendly way when they reach end of life.

People are installing solar photovoltaic (PV) panels to help the environment, but the industry now faces the anticipated waste that will be generated by 100,000 tonnes of panels due to be dismantled in Australia from 2035.

A University of South Australia (UniSA)-led study has proposed a product stewardship scheme for solar panels, which was prioritised by the federal government several years ago.

In a paper published in *AIMS Energy*, UniSA researcher Peter Majewski said incentives are needed for producers to design solar panels that can be more easily recycled.

"Australia has one of the highest uptakes of solar panels in the world, which is outstanding, but little thought has been given to the significant volume of panels ending up in landfill 20 years down the track when

they need to be replaced," Majewski said.

With landfill bans already in place in Victoria, installers have had to start thinking of recyclable materials when making the panels. Majewski said landfill bans are a powerful tool but require legislation to ensure waste is not just diverted to locations with fewer regulations.

Serial numbers that can track a history of solar panels could also help to monitor their recycling use and ensure they are disposed of in an environmentally friendly way.

"Several European nations have legislation in place for electric car manufacturers to ensure they are using materials that allow 85% of the car to be recycled at the end of their life. Something similar could be legislated for solar panels," Majewski said.

A primary material used in solar cells is silicon, which is the second most abundant material on Earth after oxygen and the most common conductor used in computer chips.

Because there is such a large demand for silicon, it is important to recycle it and reduce its environmental footprint.

"About three billion solar panels are installed worldwide, containing about 1.8 million tons of high-grade silicon, the current value of which is US\$7.2 billion. Considering this, recycling of solar PV panels has the potential to be commercially viable," Majewski said.

A potential solution is reusing panels, but users will need guarantees that second-hand panels will work properly and provide a minimum capacity in watts.

According to Majewski, any end-of-life legislation will need to address existing and new panels and support the creation of a second-hand economy.

A levy on the panels may also be needed to help finance an end-of-life scheme.

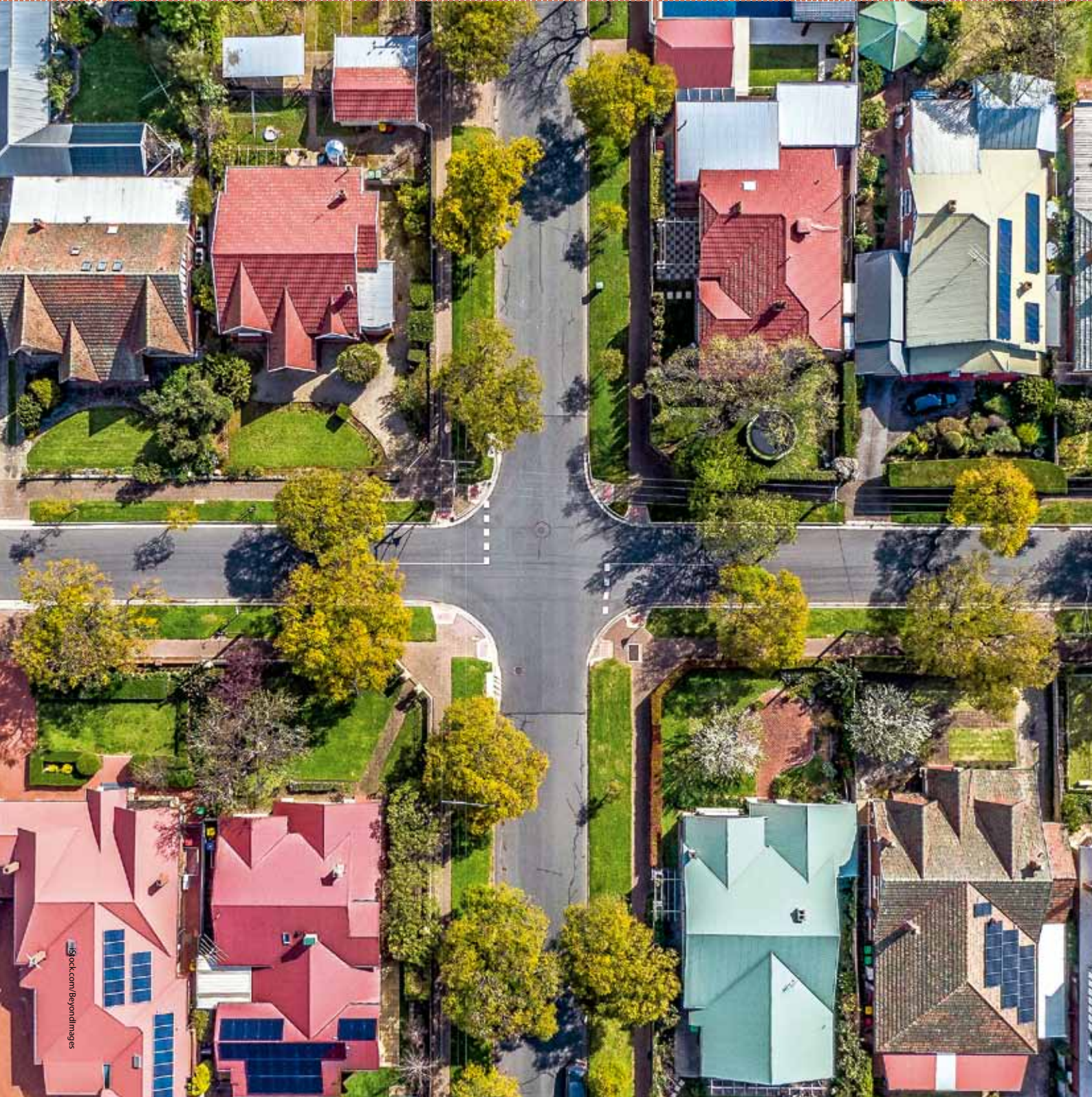
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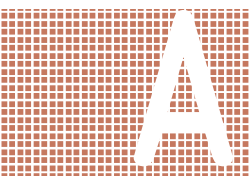
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# Intelligent technology enabling Australia's energy transition

*\*Alan Collier*







Australia is at the forefront of the global energy sector's shift from fossil-based systems to renewable assets and the way in which energy is consumed. For residential and small business consumers in Australia, this has mainly meant installing solar PV on their rooftop. However, there is a misalignment of consumer behaviour in using the generation of solar PV leading to excess energy being exported to the grid. This is great in theory but the physical realities of the grid mean that exporting energy is a significant issue for networks and market operators to manage.

### VPPs can increase grid reliability

Virtual power plants (VPP) and cloud services are leading the way to providing solutions to the issues at play. To be most effective, these solutions need to be considered by regulators and networks in ways that lead to increased participation by owners of renewable energy assets, allowing for value to be recognised and shared with participants, increasing the overall utility of the grid.

VPP technologies are required to enable an increasing number of duty cycles for enrolled assets. Australia has seen the introduction of Remote Disconnect Reconnect in SA in 2020, Emergency Solar Management in WA in 2022, Dynamic Exports in SA in 2023, Queensland Backstop in 2023. Each of these is driven by regulatory requirements to help secure the network from excess solar PV export at times of low-load volume. Without this, networks become constrained and face potential stability issues.

VPP technologies have been deployed as the technology to respond to this extension of static compliance requirements enabling dynamic and interoperable connection between behind-the-meter (BTM) assets and front-of-meter (FOM) grid. Without VPP technologies, the hosting capacity of the networks would be reduced, lowering export limits, and the community would lose access to the value of the clean energy produced.

Aggregation software is often limited to

the number of assets that can be enrolled to VPPs. There is a plethora of OEM systems deployed across Australia's 3.4 million sites with rooftop solar.<sup>1</sup> Many installed systems have been and continue to be unsophisticated systems unable to work with VPP services, requiring third-party gateways to be installed where available. These are at considerable cost to the system owner and payback can be questionable.

Leading OEMs are shifting to native systems. These are inverter units that are intelligent hubs, enabling aggregators and retailers to aggregate the assets into a VPP, meet dynamic compliance requirements and take advantage of value pools that can be shared with the system owner. The major benefits of native systems are that the OEM produces the most efficient and wide-ranging series of API and/or control processes, without additional investment.

### VPPs about accessing value

AEMO's 2022 Integrated System Plan<sup>2</sup> indicates the scale of the role that VPPs and other emerging technologies will have to play by 2050, expecting in the order of 31 GW of dispatchable capacity to be managed by these technologies. Bloomberg NEF<sup>3</sup> stated earlier in 2022 that there were 61 VPPs operating in Australia, with the majority servicing BTM energy storage capabilities.

There is a gap between the expected scale of future VPPs and the current state of engagement. Much of this gap comes from a limited access to value. Three key areas of value exist for VPPs:

**Wholesale market:** VPPs have, in the main, created value by trading in the wholesale

markets since inception, looking to either take advantage of windfall pricing or limited arbitrage opportunities.

**Frequency Control Ancillary Services (FCAS) market:** More recently FCAS markets have been opened with trials operated by AEMO, though the follow-up change to the specification has meant few new OEMs have FCAS-enabled systems ready for VPP participation.

**Network services:** These are yet to come to market where networks recognise the value of VPPs to their operations and the ability to play a stabilising role for the network. Change here requires a change in thinking in networks as well as regulation.

Having access to all three value pools will improve the return on investment for system owners, developing an expected growth in VPP offers.

### The future is bright

AEMO's ISP scenarios are achievable. We need the right mix of technologies, regulation and value pools to bring VPPs to their full potential. The community in Australia has been clear in their view based on the significant investment in renewable energy; now we need to make this work together to the benefit of the full utility of the energy network.

1. 1/3/2023 Rooftop solar poised to become Australia's biggest power source amid coal's demise, Daniel Mercer, ABC News <https://www.abc.net.au/news/2023-03-01/rooftop-solar-to-overtake-coal-as-australias-main-power-source/102033740>
2. June 2022, 2022 Integrated System Plan for the National Electricity Market (pp10, 39, 50), AEMO
3. 4/4/2022 Australian Virtual Plants Struggle to Meet the Hype, Wil Edmonds, Bloomberg NEF



*\*Alan Collier is Director of SolarEdge's Energy Services Division, which delivers energy services solutions from utility-scale energy storage systems, commercial solar to aggregated virtual power plant services. Collier works with many energy participants across the market from Tier 1 retailers to networks to startup enterprises. Prior to SolarEdge, he worked with Origin Energy for over six years. Beyond energy, he has worked in financial services, education, social housing and technology startups. Collier is passionate about effective disruption and accelerating the transition to a low-carbon electricity system, whilst maintaining resilience and economic value for customers.*

# EV charging

## — how to future-proof multi-residential properties

**T**he transition to electric vehicles (EVs) is well underway, and with it, the need to provide EV chargers in multi-residential buildings. EV charging presents multiple challenges in terms of infrastructure and cost. What do developers, strata managers and architects need to know? And what can be done to future-proof new and existing assets?

Electrical engineer Toby Murdoch is an associate at Ashburner Francis and installs EV charging systems into new and old buildings. “Managing energy supply loads and measuring and allocating cost are the two key issues,” Murdoch said, adding that understanding who will be charging EVs is essential to designing a system that will meet current and future needs.

Simon White, founder of design advisory consultancy DVLP, agreed. As design manager at property developer Aria for eight years, White has seen a rapid increase in demand for EV chargers. “The majority of investor purchasers ask about EV charging now,” White said. “Every owner-occupier purchaser wants guaranteed access to a charging point.” White noted that ESG is increasingly important to institutional investors, with electrification a prerequisite for Green Star certification.

### Designing for peak demand

EV chargers place additional demands on the electricity grid. It is critical to ensure that a building’s energy needs can be met during peak times, which may only be a risk a few times a year, for example when air conditioning is running in the evening.







Superchargers can charge a car much faster than a standard charger but require DC power, an added expense.

EVs are generally twice the weight of petrol cars, so in older buildings with concrete floor slabs, too many EVs may mean the slabs need to be structurally reinforced.

Switchboards must be designed to cope, and depending on the size of the building, transformers may be required. This can be expensive.

While it may be too costly to engineer a system just to cope during peak periods, energy loads can be managed effectively using technology. A monitor on the electrical substation can send signals to the EV chargers to decrease or increase their charging rate to ensure the total building load remains safe.

Murdoch noted that emerging technology developed in Brisbane goes one step further, using AI to tailor the charge rate for each car. “As an example, during times of high demand the system can prioritise a car that is at 20% battery charge plugged in at 5.30 pm over a car with 70% charge plugged in at the same time,” he explained.

In the future, there is also the potential for car batteries to feed power back into the grid in the same way as home solar batteries currently do. In this scenario, a car could power an office or home during the evening when solar power is not functioning.

### New builds — get it right first time

With new builds, asking the right questions at the beginning of the design process is key to a future-proof system. How many people will charge how many cars, at what time of the day, and with what type of charger? Superchargers can charge a car much faster than a standard charger but require DC power, an added expense.

Murdoch warned against marketing a development as ‘EV-ready’ without first defining what that means for everyone involved. A decision needs to be made early on whether every car bay will be EV-ready and how many shared charging stations and vehicles will be available. He recommended that developers discuss the options at the beginning of the project and that architects

*The Standard by Aria, designed by Woods Bagot*



*Upper House by Aria, designed by Koichi Takada Architects*

engage electrical engineers during the DA phase to mitigate costly mistakes.

"We've worked on jobs where the architects haven't factored in the required space for the switchboards and transformers, and as a result, an entire apartment has to be reclaimed," Murdoch said. Understanding and defining what's needed may add a couple of thousand dollars in engineering fees at the start but could save hundreds of thousands of dollars later.

### The complexities of retrofitting

Retrofitting offers a different set of challenges. Murdoch said each property must be assessed on a case-by-case basis, with scale, existing infrastructure and geographic location all factors that impact the choice of solutions.

"For retrofits, we start by monitoring the existing system to measure its spare capacity. From there we can work out whether it can cope with EV charging or whether we need to upgrade the system and add



**Murdoch warns against marketing a development as 'EV ready' without first defining what that means for everyone involved.**

a transformer," Murdoch explained. This is also contingent on the grid in the local area having capacity, something the local energy supplier needs to advise on.

White noted that EVs are generally twice the weight of petrol cars, so in older buildings with concrete floor slabs, too many EVs may mean the slabs need to be structurally reinforced.

### Who pays?

This is the question that's top of mind for everyone. Ownership structures will determine who pays for the infrastructure, factoring in what electricity suppliers in different states are willing to contribute. In most cases, privately owned assets must pay for upgrades themselves.

Murdoch said the cost of electricity can be allocated in different ways. "In new developments of up to about eight storeys, it's not hard to feed power down from an individual dwelling to its car bay so that the electricity cost is charged directly to the owner's bill," said Murdoch, who likens this to simply adding another power point. "For larger developments where this isn't feasible, we can install metering devices that measure and charge by use."

For a retrofit, the owners need to fund the necessary infrastructure upgrade. As the number of EVs in general use grows, properties that don't have the capacity for EV charging will likely lose value. However, until EVs become the norm it may be hard to convince owner-occupiers to chip in. Installing communal chargers can be the best and most economical solution.

White noted that EV charging can be leveraged as a marketing tool. He said that at Aria's 'Upper House', a 32-level, Koichi Takada-designed tower due to open mid-2023, an EV charger backbone has been pre-installed throughout the basement and podium parking areas. "Distribution boards and full cable tray runs on each level simplify the process for residents to add a charger to their own parking spaces," White said.

"The capital cost means the residents can add a standard charger for around 60% less than if no backbone had been installed."

At Aria's completed development 'The Standard', three Tesla Series 3 vehicles were purchased and gifted to the body corporate for communal use. "The building has since enlisted the services of Ohmie Go to manage the booking, cleaning and insurance of the common vehicles," White said. "The communal vehicles mean a resident has less reason to have a second car, and over time, it will help to reduce the number of cars in these buildings generally."

### Stratas beware — get it in writing

Murdoch drew attention to the importance of ensuring that strata by-laws reference EV charging. For example, by-laws should clearly state if charging will be slower during peak periods and define rules around when you can charge and how charging is metered. Electrical engineers can add value by helping to draft strata by-laws.

"Clearly capturing the who, how and when of EV charging — whether for a new build or a retrofit — is enormously beneficial for everyone and can save a lot of arguments," Murdoch said. "It's a valuable service that engineers offer that is not widely known or leveraged."

Murdoch concluded that with the rapid evolution of technology in EV batteries, chargers and the associated management software, regular communication with engineers is the best way for developers, strata managers and architects alike to stay informed and avoid costly mistakes.



*Toby Murdoch, Ashburner Francis Associate/Electrical Engineering Manager. Image credit ©Leonie Bolt*

*Ashburner Francis  
ashburnerfrancis.com.au*





## STATIC VENTURI AERATION DEVICES

The EchoStorm, by Gorman-Rupp, is a range of static venturi aeration devices installed inline on the discharge side of self-priming pumps to introduce dissolved oxygen into the liquid being pumped. The liquid is moved through the internal nozzle creating a Venturi Effect. Air is drawn into the body of the EchoStorm, which mixes and oxygenates the liquid.

As these units are mounted on the bank (instead of floating on the water or being submerged in it), access is less complicated and safer, while delivering oxygen transfer outcomes. Unlike other methods of aeration, no rowboats, cranes or tethers are needed by operators to access them for monitoring, maintenance or repair.

EchoStorm units are used to reduce BOD, COD and  $\text{NH}_3$ , and also used to control/eliminate algae growth and to strip substances with low Henry's Constants such as  $\text{CO}_2$  and VOCs.

The aerator is available in a range of sizes to meet the aeration needs of multiple industries including municipal wastewater treatment, industrial wastewater treatment and potable water treatment.

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## PRESSURE TRANSMITTERS

Bestech Australia has been supplying high-accuracy pressure transmitters from Keller for the Australian water industry. These sensors incorporate silicon strain gauge sensing technology of a floating built-in piezoresistive transducer and a XEMICS CPU with an inbuilt 16-bit A/D converter that is designed for measurement accuracy. The resulting data is output through a serial RS485 interface, and is both mathematically and digitally compensated.

The housing of the Keller 33X pressure transmitters is designed with robust, waterproof IP67 protection for use in harsh and dirty environments. They also come with optional USB and RS232 converters for connection to laptops or desktops, as well as optional 4–20 mA and 0–10 V analog output.

These pressure transmitters are suitable for various applications, including floodgate design, laboratory experiments, industrial test benches and leak testing. The prog30 instrument programming software and the CCS30 data collection software are used for data visualisation. Live measurements can be taken, or a data logging system can be set up to record pressure data at predetermined intervals. The 33X series pressure transmitter also incorporates a temperature sensor that is placed close to the diaphragm in contact with the media, and is used to adjust the pressure sensor digitally at various temperatures.

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## SANITARY DRAINAGE GRATE

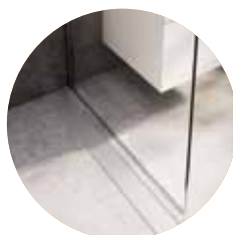
The Stormtech Wave Grate is an anodised aluminium drainage grate designed and manufactured in Australia, from 100% Australian materials.

Featuring a wave pattern, the grate is certified under WaterMark WMTS:-040:2021 to comply with the Plumbing Code of Australia and exceeds Australian Building Standards for quality and safety. An insulator has been invented to ensure the aluminium grate and stainless steel channel are separated to eliminate the potential for corrosion.

Other features include an easy-to-clean grate design with a silver, brass/gold or satin black finish, and it is available in modular kits, made to length, and fixed length units in both uPVC and stainless steel channels.

Suitable as a drainage alternative for residential and commercial bathroom applications, Wave Grate also has Green Tag certification.

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# PUTTING WASTE TO GOOD USE: HARNESSING THE POWER OF BIOSOLIDS

Andres Mansilla – Senior Engineer, Water Infrastructure, SMEC

**Solid waste management is a crucial yet overlooked factor in achieving a circular economy. We must re-evaluate our approach and integrate sustainable waste systems and processes to influence a solid waste renewable future.**

## Not just a waste — a resource with more potential

The treatment of wastewater isn't a new issue, but the way in which we dispose of the solid byproduct from the treatment process is an evolving affair. In densely urbanised areas, excess waste product is a prevalent issue, making transforming wastewater into a renewable source a necessary sustainable disposal solution. Wastewater sludge, once correctly treated, can create a major byproduct of solid mass called biosolids, which can be reused for applications such as fertiliser. It is achieved after wastewater sludge from domestic or industrial use has been properly treated to remove harmful bacteria and microorganisms, creating the fertiliser product. This solution is already in use amongst various farmers and agriculturists who turn to biosolids for its effectiveness over chemical fertiliser, due to its natural sufficiency of organic nutrients.

## Contaminants causing issues

A challenge facing biosolids is emerging contaminants. Artificial chemicals such as Per- and Polyfluoroalkyl Substances (PFAS) which are harmful to humans, end up in water largely via industrial surface runoff, landfill leachate or emissions. These contaminants are made from strong molecule bonds that are extremely difficult to breakdown, needing high temperatures to destroy them. It is also often cost prohibitive to break them down to a safer compound so that they can be re-used back into our food, agriculture and waterway ecosystems. And PFAS is not the only culprit, there are many new chemicals added to products we use every day and because they are new, their consequences often aren't known until years later.

## Technology to improve the way we create biosolids

The most effective way to break down PFAS is still improving with technology, but there are a couple of systems being utilised. Thermal processing is one method, which decomposes the PFAS via a range of incineration processes such as melting or boiling. Another common procedure is pyrolysis or gasification,



which atmospherically gasifies dried sludge at a high heat level. While these methods are efficient in breaking down the PFAS, the downsides are that they also have the potential to remove some of the beneficial nutrients for the use of biosolids as fertiliser, reducing its capacity to a soil enhancer or similar. That being said, these options still allow for PFAS to be safely disposed while transforming the waste solids into a product that can be on-sold.

## Multiple byproduct benefits from sewage treatment

As one product from wastewater treatment, biosolids' direct uses are as fertiliser or soil improver. However additional treatment can result in higher value, innovative products such as syngas (fuel), biodiesel, biochar, bio-oil, phosphorous, struvite, biomethane, ammonia and hydrogen.

There are many emerging technological trends for processing biosolids to generate these products, including; pyrolysis/gasification, optimised anaerobic digestion, steam reforming for hydrogen production, biomethane production, sludge drying,





*Coombabah Sewage Treatment Plant*

thermal hydrolysis processing (THP) and nutrient recovery. Further research and strategic planning is required to determine the most suitable technologies and the most beneficial products (whilst also dealing with emerging contaminants), but the possibilities are numerous.

### **An emerging industry — a missing link to a circular economy**

More and more projects are emerging that are taking the lead in transforming waste into byproducts. A biosolid hub has been developed at the Oxley Creek Sewage Treatment Plant (STP) in Brisbane, where biosolids are trucked in from other plants for further treatment and processing. Another hub is planned as part of an expansion at the Coombabah STP on the Gold Coast. Depending on site specific circumstances (e.g. distance between treatment plants), it is generally more efficient to create central hub infrastructure for these processes rather than using multiple biosolid processing plants.

SMEC has worked with Oxley Creek STP previously for their Steam and Biogas project, which was centred around maximising energy recovery and efficiency in the biosolids hub. The biogas from the digesters is used to generate electricity at the cogeneration. Prior to the upgrade the site boiler was running off natural gas, but now uses a mixture of biogas and natural gas to generate the steam required for the THP, therefore reducing natural gas consumption. In addition, previously the waste heat gas stream from the cogeneration was vented. Works involved replacing an existing waste heat boiler that utilised the energy from this waste stream to generate further valuable steam for the THP, reducing natural gas consumption further. Additional project works also involved adding an economiser heat exchanger to improve energy efficiency.

SMEC has also worked on strategy reports examining long term options for beneficial reuse of biosolids from treatment plants for water distributors in ACT and QLD. These reports both established long-term systems for managing biosolids using

current and, as they become commercialised, other processes. The main driver was ensuring the quality of biosolids met the markets that were economically accessible.

### **Image is everything**

Unfortunately, large parts of society still have negative connotations around 'wastewater' as there is reluctance to utilise a sewage byproduct to fertilise consumable items. However, as cities continue to expand, it is important to factor in renewable solutions for future developments. Currently there is a lot of planning in infrastructure for what is the most valuable way to treat and dispose of waste sustainably. If we could change the stigma around waste products to focus on its economic and sustainable potential, there is an untapped valuable market to harness.

### **Looking ahead: solutions with the end-product in mind**

Looking towards the future of circular waste management, we can hope that development for centralised byproduct hubs will continue. Turning our sewage treatment plants into a place where sewage goes in and renewable products come out. And not just human waste, but co-digestion with food waste and other types of waste. This will also aid in reaching the global net zero target when biomethane, electricity and nutrients can be recovered from sewage.

We, as an engineering industry, have an important role to play in progressing the concept of a bio-refinery into reality and also in helping raise awareness of the benefits of waste, the stigmas that need to be challenged, and contributions we need to be making to transition to a circular economy.



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*Scientists are racing to find solutions to clean up microplastics, which affect our oceans, soil, animal life, and ultimately end up being ingested by humans, too.*

# Our plastic planet – and fashion is not helping sustainability

**S**even years back, a marine biologist filmed a sea turtle with a straw stuck up its nostril. The video went viral and drew global attention to the plastic polluting our oceans. That visual served as a catalyst and helped accelerate the move away from single-use plastics in many parts of the world. But there's also plastic that cannot be seen and these microplastics find their way into our waterways, soil, livestock and aquatic life, and eventually into humans.

A recent study commissioned by World Wildlife Fund for Nature (WWF) revealed that humans could be consuming 5 g of microplastics each week. That equates to the weight of a credit card, according to

University of Newcastle, which conducted the research for WWF.

Littering and inadequately managed waste are often considered amongst the main causes of plastic waste. While large pieces of plastic waste are readily visible, research studies now indicate that microplastics are a growing area of concern. While wide awareness about some forms of visible plastic pollution such as straws and grocery bags is leading to bans in many jurisdictions, it will be more difficult to legislate against microplastics.

Plastic pieces measuring less than five millimetres across are considered microplastics and are often created by the fragmentation of large plastic pieces over time. Primary microplastics are also mass-produced when manufacturing abrasive

cleaning agents, plastics manufacturing and plastic powder for moulding.

Cosmetic microbeads used in facial scrubs are also a significant source of microplastics. The fashion industry too is coming under scrutiny and is considered the largest source of primary microplastics accounting for close to 30 to 40% of the global microplastics pollution.

Laundry wastewater is a major source with synthetic textiles in particular releasing acrylic, nylon and polyester microfibres. With every wash, synthetic fabrics release microfibres which are similar to microbeads found in cosmetics. A garment can release 700,000 fibres in a single wash.

Scientists are only beginning to understand the effects of synthetic textile waste. Microfibres are the major marine pollutant



throughout the world, with an estimated 13 million tonnes of coastal synthetic fabric waste entering the ocean each year. The adverse impact on animal life is significant. Australian researchers have discovered that zooplankton exposed to microplastic fibres produced half the usual number of larvae and that the resulting adults were smaller.

Microplastics are also extremely persistent, and it is close to impossible to remove them once they find their way into the environment. Plastics smaller than 100 nanometres are nanoplastics typically formed when microplastics are exposed to light at moderate temperatures. These can impact humans and animals at the cellular level, passing through cells and tissue. One study that deliberately let pregnant mice inhale extremely tiny particles later found them in almost every organ in their fetuses.

Microplastics from a variety of sources — manufacturing, textiles, laundry, industry — find their way into wastewater systems. Preventing the spread of microplastics would be the most beneficial and practical solution and it is important to look at the role that sewage plays in the distribution of microplastics. Between 80 and 90% of the plastic particles contained in sewage persist in the sludge, according to a UN study.

Sewage sludge is commonly applied to fields as fertiliser, and as a consequence, several thousand tons of microplastics end up in our soils each year and even in our tap water. Terrestrial microplastic pollution is much higher than marine microplastic pollution — estimated to be four to 23 times more, depending on the environment.

The surfaces of tiny fragments of plastic also act as carriers for disease-causing organisms and spread through the environment. Microplastics can also interact with soil fauna, affecting their health and functions. New research shows that the presence of microplastics can stunt the growth of earthworms, and even cause them to lose weight — potentially having a serious impact on the soil ecosystem.

Sewage is a significant distributor of microplastics with 80 to 90% of the particles contained in sewage, such as from garment fibres, persisting in the sludge. Sewage sludge is then often applied to fields as fertiliser and it has been estimated that



several thousand tons of microplastics end up in our soils each year.

Scientists are racing to find solutions to clean up microplastics. There is work being done on magnetic liquids and plastic-eating mushrooms, but a viable mass-scale remedy is not yet in sight. Preventing microplastics from entering our environment, it appears, may be the best approach and the first and best line of defence currently.

CST Wastewater Solutions provides locally developed drum screen technology that can prevent blockages, overflows and environmental damage. “Our technology’s fine screening capabilities go down to 200 microns and can be implemented in municipal sewage systems and by industrial users,” said Michael Bambridge, Managing Director, CST Wastewater Solutions. “The horizontal drum screens will screen out a lot of microplastic you can see, which is a step towards addressing this significant environmental threat.”

CST’s horizontal in-channel rotary drum screening technology is locally manufactured and built to be both robust and adaptable. Compared with traditional screening at wastewater treatment plants, its in-channel technology has lower fluid head loss at peak flows to increase solids removal efficiency.

When dealing with fine screening of larger flows, the technology has the advantage of mechanical simplicity, self-cleaning and high-efficiency screening. This can result in reduced maintenance and lower whole-of-life costs compared with other types of screens, such as band and inclined drum screen designs.

There are growing calls for industry to close the plastic tap to prevent the oceans from becoming plastic soup. Effective wastewater screening can go a long way in alleviating the problem.

CST Wastewater Solutions  
[www.cstwastewater.com](http://www.cstwastewater.com)



## SMART ULTRASONIC WATER METER

AMS Water Metering has achieved WaterMark certification for the Qalcosonic W1 Australian Utility Version smart ultrasonic water meter.

Along with the NMI R49 metrology approval, AS3565.1 water meter approval and AS4020 drinking water approval, the WaterMark approval now means that the meter is fully certified for supply into the Australian water utility market.

AMS Water Metering fits brass threaded adapters, a dual check valve and a copper conducting strip to produce the Australian Utility Version, which meets the requirements of the Australian water utility market for end-to-end length, dual check valves and electrical conductivity.

The compact, fully integrated smart ultrasonic water meter has a one-piece moulded composite plastic body with an IP68 rating. The ultrasonic measuring technology has no moving parts and is designed to maintain accuracy throughout the life of the meter. It is available with fully integrated Lo-RaWAN or NB-IoT communication protocols and the battery life is up to 16 years.

AMS Water Metering  
amswatermetering.com

## REVERSIBLE DRUM VAC

EXAIR's High Lift Reversible Drum Vac is suitable for the safe recovery of fluids like coolant, hydraulic oils, sludge and chips, wastewater, tramp oil and liquid spills. The product's high-powered vacuum is able to lift thick liquids up to 1400 cP to a height of 4.6 m, filling a 205 L drum in less than 85 s. With the turn of a knob, the same stainless steel pump can quickly empty the drum. The flow rate in and out of the drum can be controlled with the knob, making it suitable for dispensing liquids.

Electrically operated all-purpose vacuums aren't designed for use in industrial environments and as a result, motors wear out quickly and impellers clog. Powered by compressed air, this vacuum has no moving parts, no electric motor to wear out and has no impellers to clog, assuring maintenance-free operation. It is designed for continuous and heavy-duty applications where electric vacuums fail due to motor wear or clogged impellers. It can also be used for lighter-duty applications.

It is CE compliant, has built-in pressure/vacuum relief and attaches quickly to closed head 205 L drums. An automatic safety shut off valve prevents spills or overfilling.

Compressed Air Australia Pty Ltd  
www.caasafety.com.au

## BATTERY WITH HYBRID INVERTER

Redflow has integrated its zinc-bromine flow batteries with Deye's hybrid inverters. The inverter offers the ability to have a direct connection of solar and batteries in a three-phase grid-connected inverter and can also continue charging batteries from solar PV even in the event of a grid outage, as well as a backup generator input.

As a CEC-listed grid-connected inverter, the Deye hybrid inverter now has more options regarding the use of Redflow's ZBM flow batteries. It is designed to simplify the way users connect to the grid and seamlessly integrates batteries and solar.

In tests, the Deye inverter demonstrated complete compatibility with Redflow's ZBM3 zinc-bromine flow battery.

The Deye 10 and 12 kW three-phase hybrid inverters are fully AS4777.2:2020 certified and CEC approved for the Australian market and integrate with solar PV arrays, 48 VDC battery storage, grid and generator connections in a single device.

For larger storage systems, up to 10 Deye inverters can be clustered together in parallel to service large commercial site deployments.

Redflow will also provide the option to integrate the Deye hybrid inverter into its QuadPod energy storage solution — a custom-designed, scalable, 40 kWh, pre-wired enclosure.

Redflow Limited  
www.redflow.com





## ANALYTICAL INSTRUMENT

Mettler Toledo's Easy VIS analyses liquid, translucent samples for their optical spectrum, colour and water parameters. The compact instrument is designed to take over the measuring tasks of a colorimeter, a spectrophotometer and water testing methods such as titration.

A typical place for product is the QC lab at small manufacturers in the food and beverage industry, environmental testing labs or any industry needing quality control and supervising their process or wastewaters.

It may be used during multiple steps of the production process, including the inspection of raw materials, quality control of semi-finished and finished products and testing the water quality of wastewater.

It contains a visual user interface with workflow guidance and operates within a wavelength range of 330 to 1000 nm. Its light source is a tungsten lamp that can be easily replaced when needed.

The instrument comes with 25 pre-installed standard-compliant colour scales such as ICUMSA for sugar colour, ESBC for beer quality analysis and OIL CIELab for wine colour determination. For spectrophotometry, the sample is analysed at the wavelengths where the sample has its absorption of light. It measures the transmitted or absorbed light and reveals the sample's concentration or purity.

In the testing procedure, one cuvette holds the blank measurement and another is prepared with the sample. After the analysis method is chosen, the cuvette is placed in the cuvette holder and the PathDetect function recognises which path length is measured. The measurement begins when the lid is closed and results show up on the screen. The EasyDirect software allows for results to be saved automatically or exported to an external storage device or data management system.

Mettler-Toledo Ltd  
www.mt.com



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# CUSTOMERS INVESTING IN SOLAREGE INVERTER SOLUTIONS HAVE MADE A SMART CHOICE

**S**olarEdge systems enable customers to access additional revenue streams either by participating in Virtual Power Plant (VPP) offers, or through SolarEdge's ability to meet new regulations for dynamic export.

## Additional revenue means improved Return on Investment (ROI)

SolarEdge customers have access to a range of features and capabilities that can help them accelerate the ROI of their solar energy systems by optimising energy production, participating in new revenue-generating programs, and improving system reliability. We call these services SolarEdge Grid Services (GS). By utilising SolarEdge GS, customers can achieve a faster return on their investment and generate more revenue from their solar energy systems.

GS works as a cloud-based service immediately available on SolarEdge installed systems when internet communications are established. GS deliver the opportunity for many sites to work together and access new revenue generating programmes such as energy market participation, demand response and data insights. These are the areas that create value and can be shared to end customers.

GS VPP's are provided by SolarEdge's energy retail, network services and aggregator partners. These services are facilitated via SolarEdge systems and only operate where customers choose to participate in a VPP offer.

## Access comes directly through SolarEdge native solutions

SolarEdge hardware components installed at a customer's home or business are 'native' GS systems, meaning customers do not need to purchase additional equipment and installers do not need to worry about integrating third party assets. This is important as the cost of installing third party assets is an expensive addition to the installation and can erode the value created from enrolling in VPP.

Native systems make installation easier and increase certainty of compliance for installers and solar retailers.

## Access to exporting extra solar PV generation to the grid is changing

The ongoing success of solar in the energy system is driving unintended consequences, namely on days where

solar generation is high, but load in the network is low and constraints can happen, potentially putting the grid at risk.

Networks are moving to put dynamic export limits in place, with the intention for all new solar systems to allow the network operator to remotely update solar systems' grid export limits to help maintain grid stability where on some days the export limits are reduced. For example, in South Australia, the benefit to SolarEdge system owners is that for most of the year, they will be able to export up to six-times more energy back into the grid, compared to non-compliant sites which will be limited to small, 1.5 kW fixed export power limits.

SolarEdge is a leader in this space, being the first vendor to certify and offer this native dynamic export service in South Australia and confirmed on CEC listing.

SolarEdge's smart inverters achieve this capability without the complexity and additional costs of adding third-party controllers.

## SolarEdge solutions increase value today and into the future

SolarEdge Grid Services helps customers to access additional revenue from their renewable energy investment, accelerating ROI.

Our native systems deliver effective, diverse and valued services for customers, energy retailers, networks and aggregators alike. Native systems help installers on-site removing the need to install additional components and programme third party products together, while giving customers and aggregators the confidence for firm response rates during events.

SolarEdge is a global leader in smart energy technology. By leveraging world-class engineering capabilities and with a relentless focus on innovation, SolarEdge creates smart energy solutions that power our lives and drive future progress.

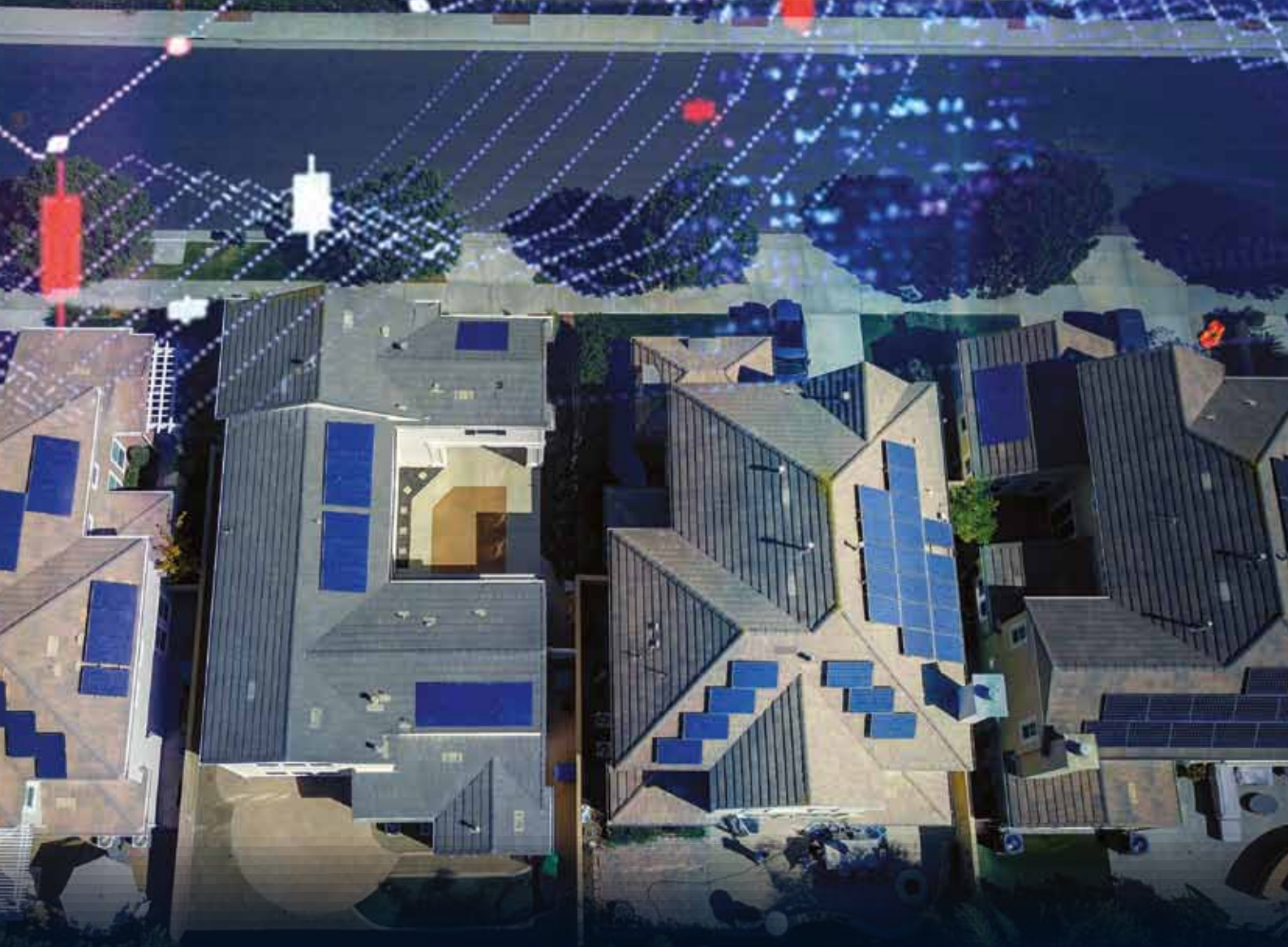
SolarEdge continues to work at the forefront of energy market needs in Australia supporting a successful transition to a clean energy system.

**solar**edge



**SolarEdge Technologies (Australia) Pty Ltd**  
[www.solaredge.com/aus](http://www.solaredge.com/aus)





solar**edge**

# Achieve Improved Returns with **SolarEdge Grid Services**

Offer Customers New Revenue Streams for Faster Returns



## Using smoke to draw out sneaky stormwater



SA Water is set to begin discharging small amounts of artificially generated smoke into Naracoorte's sewerage network to test for any incorrect or illegal stormwater connections as well as broken or cracked sections of pipe.

The commonly used method will help SA Water identify where stormwater is entering the sewers, which can contribute to overflows following a heavy rain event.

After putting the smoke into the network, the utility will look for escape points such as stormwater downpipes on the side of a building's roof guttering, or from the road surface of a broken inspection point lid.

Peter Seltsikas, Senior Manager of Capital Delivery, SA Water, said Naracoorte was selected for this testing due to the high number of sewage overflows at the local treatment plant's pump station after heavy downpours.

He says that SA Water is taking a proactive approach to identify sources of intrusion after monitoring indicated there may be points in the network receiving excess stormwater after rain. Though a level of stormwater infiltration is normal, recent events have overwhelmed Naracoorte's network and significantly raised the volume and flow of sewage.

"The increased flow also elevates the risk of overflows to the environment or onto a person's property and we want to help minimise the chance of this to ensure our sewers are able to continue protecting public health," Seltsikas said.

Information gathered during the inspections will inform a range of solutions, such as repairs or remediation options for local property owners.

"We appreciate that some people may not be aware they have an illegal stormwater connection on their property, but it's important the issue is rectified to reduce the risk of overflows and keep our sewers healthy," Seltsikas said.



The odourless, grey smoke, similar to that used at concerts or for special effects, is harmless to people, plants, animals and the environment. It does not stain and it dissipates within a few minutes.

The inspections will take place between 7 am and 5 pm each day until Thursday, 8 December.

SA Water has informed the local community and the Country Fire Service of the work. It may require access to easements along the roadside, as well as driveways and front yards.

"There will be no disruption to our local customers' sewerage service as a result of the work, and they can keep using taps and other plumbing fixtures as per usual, as smoke won't come out where there is a water seal, such as in a toilet," Seltsikas said.

**SA Water**

[www.sawater.com.au](http://www.sawater.com.au)



## Generating electricity from wastewater

The purification of various water resources, from rainwater to wastewater, is a high-energy process. So, what if electricity could actually be generated during the process? A research team has developed a multifunctional membrane that can simultaneously generate electricity while purifying wastewater into drinking water.

Scientists from the Korea Institute of Science and Technology's (KIST) Electronic Materials Research Centre and Myongji University's Department of Materials Science and Engineering have partnered to develop an advanced membrane that can simultaneously provide drinking water and generate continuous electricity from various water resources, such as sewerage/wastewater, seawater and groundwater.

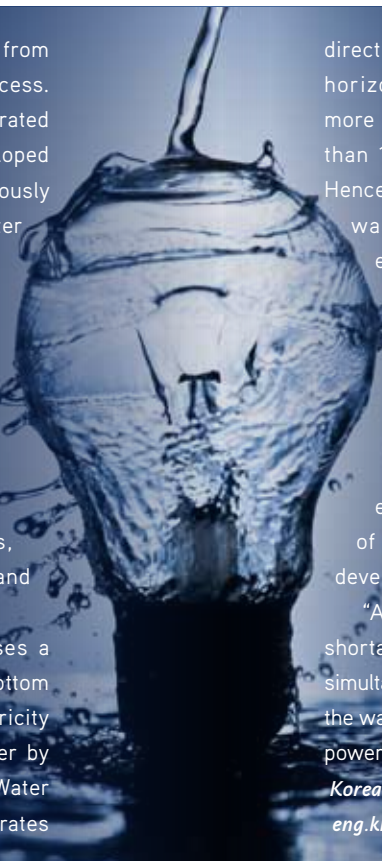
The "sandwich-like" membrane comprises a porous membrane that filters water at the bottom and a conductive polymer that generates electricity at the top. It is designed to purify wastewater by controlling the direction of the water flow. Water flowing perpendicularly to the membrane generates

direct current by the movement of ions along the horizontal direction. The membrane can reject more than 95% of the contaminants of sizes less than 10 nm (one hundred-millionth of a metre). Hence, microplastics and heavy metal particles in wastewater can be removed, and continuous electricity can be generated for more than 3 h with only 10 µl (microlitres) of water.

The membrane has a high potential to be commercialised as it can be manufactured using a simple printing process without size restrictions. The research team is currently conducting follow-up research to generate electricity while improving the water quality of wastewater to the level of drinking water by developing the membrane for an actual factory.

"As a novel technology that can solve water shortage problem and produce ecofriendly energy simultaneously, it also has great potential applications in the water quality management system and emergency power system," said Dr. Ji-Soo Jang from KIST.

*Korea Institute of Technology*  
[eng.kist.re.kr/eng/index.do](http://eng.kist.re.kr/eng/index.do)



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# WHEN IT COMES TO WATER, ARE WE STEWARDS OR SECURITY GUARDS?

**W**ater is at the heart of our much-loved Aussie lifestyle — our quality of life, our jobs, our businesses and our communities depend on it. However, the challenges facing water utilities are growing more complex every day.

With climate change, extreme weather, population growth and industrial development all placing greater pressure on our finite water supplies, there has never been a more urgent need for innovative and sustainable solutions to manage our most precious resource.

Two distinct concepts play a crucial role in protecting our water resources: water security and water stewardship. Every water utility has a role to play in both.

## How is water security different from water stewardship?

Water security refers to the proactive protection of water resources. It considers the political, economic and social factors — including the impact of climate change and population growth — that influence water availability and quality. This means considering climate-independent sources of water and planning our infrastructure and strategy around those factors.

On the other hand, water stewardship involves adopting an ethical and sustainable approach towards water management, where collaboration with local communities, customers and stakeholders is emphasised to develop innovative approaches. The aim is not only to use water responsibly but also to manage it in a way that benefits both the environment and the community.

At Urban Utilities, we're focusing on security and stewardship side-by-side to ensure our water is protected and conserved for generations to come.

## Net Zero by 2032

Climate change is one of the most pressing challenges facing our planet today, and it's putting unprecedented pressure on our water supplies.

We acknowledge that, in the future, we're more likely to have:

- more frequent and longer droughts,

- periods of low rainfall and low inflows into dams,
- less water available due to factors including increased evaporation and
- increased demand for water for cooling our urban and regional environments.

We're committed to doing our bit to reduce our greenhouse gas emissions and help mitigate the impact of climate change on our water resources.

To this end, we've set some strong-minded sustainability goals, including a commitment to reaching Net Zero greenhouse gas emissions by the time Brisbane hosts the Olympic and Paralympic Games in 2032.

This is an ambitious target for a water utility. Achieving it will require significant effort, investment, and cooperation — after all, water and wastewater treatment are essential but energy-intensive processes.

To achieve Net Zero, we're focusing on three key elements:

- improving our energy efficiency,
- increasing our use of renewable energy,
- and investing in local offset projects.

One of the ways we're improving our energy efficiency is by embracing innovative, cost-effective technologies.

For example, we recently grew our own 'superbugs' to treat wastewater, as part of the Australian-first Anammox biological treatment process at our largest wastewater treatment plant in Brisbane, which has reduced our energy use.

We've also installed solar panels in key regional plants, and are continuing to generate our own clean, renewable energy from wastewater treatment. In fact, since we were formed in 2010, we've generated more than 125,000 MWh from cogeneration, which is enough energy to power up to 27,000 homes for a year!

## Recycled water

Another key element of our sustainability roadmap is recycled water — water that has been used once and then treated to





remove contaminants, making it safe for reuse, rather than returning it to the environment.

Adding recycled water to the mix eases pressure on our drinking water supplies, reduces nutrients in waterways, and improves the well-being and liveability of communities. Recycling water also reduces energy use, which leads to lower greenhouse gas emissions.

At the moment, we supply recycled water to hundreds of customers across our 14,000 km<sup>2</sup> service region, primarily for agriculture and irrigation. The water is used to:

- green local sporting fields,
- support farmers,
- breathe new life into country racetracks and
- help grow new koala habitats.

We also supplied recycled water to Brisbane Airport Corporation to support the construction of their second runway, saving more than 500 Olympic-sized swimming pools of drinking water in the process.

### Embracing growth and opportunity

If water isn't sustainable, industry isn't sustainable.

The demand for recycled water from industrial customers has increased significantly in the past year, and we're thrilled to be an enabler of this important and rapid shift toward more sustainable and responsible business.

Several major international companies have recently announced sustainability strategies that prioritise water stewardship, and we're seeing this trend mirrored at the local level too.

We recently reached out to several of our biggest commercial water users to learn more about their sustainability goals and we're happy to hear all have set sophisticated targets — with most having specific water stewardship goals.

We're also particularly excited about a number of emerging green industry participants who are focused on using non-potable water sources to create eco-friendly products like cardboard pulp, green hydrogen and concrete.

Right now, we recycle an average of around 10,000 megalitres of water every year, but as more and more customers show interest, we're excited to explore ways to increase our impact together and meet their evolving Environmental, Social, and Governance (ESG) needs.

Customers with a commitment to sustainability aren't just setting the standard but shaping the future, and we're here to support them every step of the way.

### Brisbane 2032...

The recent announcement that Brisbane will host the 2032 Olympic and Paralympic Games has also accelerated the pace of change in our service region.

Brisbane is set to be the first climate-positive Olympic and Paralympic Games, and we're thrilled to be playing our part to ensure large-scale, global events can be done sustainably.

As we approach 2032, we'll work closely with customers and stakeholders to help them meet any ESG requirements set down by the organising committee for constructing sustainable precincts.

We're also exploring opportunities to design and build innovative and sustainable water and wastewater infrastructure for key precincts that will benefit our community long after the closing ceremony.

### ... and beyond!

The next decade will throw up plenty of challenges as we look to shape the future of water for our customers and communities, and we're committed to exploring all options to secure a diverse water supply for our regions.

This means further exploring the use of climate-independent water sources like desalination and purified recycled water, both for residential and industrial use.

As a water utility, we have an opportunity and a responsibility to pursue sustainable water solutions, and we're excited to be doing so alongside like-minded industry partners. We're committed to continuing our journey further into sustainability and helping our business customers meet their ESG requirements.

After all, waste is only waste if it's wasted!

For more information, visit [urbanutilities.com.au/waterventures](http://urbanutilities.com.au/waterventures).



**Urban Utilities**  
[urbanu.com.au/wvsm](http://urbanu.com.au/wvsm)

## Turning seawater into hydrogen fuel

RMIT University researchers have developed a method to split seawater directly into hydrogen and oxygen, skipping the need for desalination and its associated cost, energy consumption and carbon emissions.

Hydrogen has often been touted as a clean fuel of the future with potential to solve critical energy challenges, especially for industries that are difficult to decarbonise. However, emissions-free 'green' hydrogen, made by splitting water, is so expensive that it is largely commercially unviable and accounts for just 1% of total hydrogen production globally.

Nasir Mahmood, lead researcher and Senior Research Fellow at RMIT, said the method he and the researchers developed is simple, scalable "and far more cost-effective than any green hydrogen approach currently in the market".

A provisional patent application has been filed for the new method, detailed in a lab-scale study published in Wiley journal *Small*.

To make green hydrogen, an electrolyser is used to send an electric current through water to split it into its component elements of hydrogen and oxygen.

These electrolyzers currently use expensive catalysts and consume a lot of energy and water — it can take about nine litres to make one kilogram of hydrogen. They also release chlorine, which is toxic to the environment.

"The biggest hurdle with using seawater is the chlorine, which can be produced as a by-product. If we were to meet the world's hydrogen needs without solving this issue first, we'd produce 240 million tons per year of chlorine each year — which is three to four times what the world needs in chlorine. There's no point replacing hydrogen made by fossil fuels with hydrogen production that could be damaging our environment in a different way," Mahmood said.



The researchers' process omits carbon dioxide and produces no chlorine by using a special type of catalyst developed to work specifically with sea water.

The study, with PhD candidate Suraj Loomba, focused on producing highly efficient, stable catalysts that can be manufactured cost-effectively. The new catalysts use little energy to run and could be used at room temperature, Mahmood said.

"Our approach focused on changing the internal chemistry of the catalysts through a simple method, which makes them relatively easy to produce at large scale so they can be readily synthesised at industrial scales," Loomba said.

According to Mahmood, the technology has promise to bring down the cost of electrolyzers enough to meet the Australian Government's goal for green hydrogen production of \$2/kg, making it competitive with fossil fuel-sourced hydrogen.

The next stage in the research is the development of a prototype electrolyser that combines a series of catalysts to produce large quantities of hydrogen.

**RMIT University**

[www.rmit.edu.au](http://www.rmit.edu.au)

## Turning beverage cartons to construction products



saveBOARD has opened its first recycling facility in Australia. Located in Warragamba, in south-west Sydney, the \$5.5 million facility has the capacity to process up to 4000 tonnes of materials annually and employ up to 12 local staff to operate the plant.

Supported by the Australian Government's Recycling Modernisation Fund and the NSW Government's Waste Less, Recycle More initiative, the facility will manufacture construction products entirely from used beverage cartons that would otherwise end up in landfill. The product — a sturdy, lightweight alternative to conventional plasterboard, plywood or particle board — is 100% recyclable.

The project is the first collaboration between Tetra Pak and SIG Combibloc in Australia, under the umbrella of the Global Recycling Alliance for Beverage Cartons and the Environment (GRACE). It is a joint initiative with saveBOARD and its partner Freightways.

The opening ceremony of the facility was co-hosted by saveBOARD and Tetra Pak.

Paul Charteris, CEO and Co-Founder of saveBOARD, said the facility will support the circular economy and enhance the construction industry's drive towards more sustainable construction practices, showing the importance and value in recycling and opting for recyclable products.

Andrew Pooch, Managing Director of Tetra Pak Australia and New Zealand, said, "We're incredibly proud to be part of this sustainability journey alongside saveBOARD, as we look at even more innovative ways we can convert carton packaging waste into useful applications, and contribute to a strong circular economy."

This forms part of Tetra Pak's commitment to develop more packaging in line with the 2025 National Packaging Targets. The partnership with saveBOARD shows that innovation in recycling comes in many forms.

The launch of the first saveBOARD facility in Australia marks a step in advancing the infrastructure needed to support carton recycling and enable circular economy locally. In late 2024, saveBOARD will be opening another facility in Campbellfield, Victoria, after receiving \$1 million in funding from the Victorian Government.

**Tetra Pak Marketing Pty Ltd**

[www.tetrapak.com/au](http://www.tetrapak.com/au)





# How construction tech can help infrastructure projects go green

Climate change has compelled a wide range of industries to put more focus on going green by building sustainability into their products and practices. For construction, when you factor in the massive investment in infrastructure projects, it represents an opportunity to put those in place on a grand scale.

**T**hese developments have made construction technology more relevant than ever. From environmentally friendly design in the early stages to delivery of energy-efficient structures at handover and beyond to operations, construction tech in its varied forms is poised to help the industry meet regulatory as well as societal expectations for making green building an achievable reality.

## Exploration of sustainable designs and materials

It helps to think of infrastructure projects as having a reciprocal relationship with their environment. Using 3D modelling processes known as building information modelling



(BIM), design teams are now able to take a multifaceted approach to designing with that relationship in mind.

There's no doubt that sustainable materials are better for the environment than traditional materials for many reasons — lower carbon footprint, less potential for pollution and contamination, and so on. But it's not enough that sustainable materials are used in infrastructure projects; there must be a corresponding reduction in the amount of resource waste produced, including time, money and materials.

And this is where BIM, ever the multi-tasker, shines once again.

## Prevention of wasteful mistakes

Mistakes happen, but their consequences depend on whether they're discovered and corrected in time to avoid depleting material supplies and further damaging the environment. This speaks more to process than technology; however, two mobile-enabled construction tech options in particular can help keep environmentally unfriendly mistakes from happening or worsening: building commissioning software and punch list software.

When these processes and their respective software are implemented at the start of construction instead of close to the completion date, construction mistake elimination takes a more proactive approach than reactive.

Today, BIM's systems design and materials exploration processes help create more sustainable buildings that are energy efficient, promote health and wellbeing, reduce pollution and improve indoor air quality. It's this kind of construction technology that will create meaningful change towards a more sustainable industry now and for future generations.

*InEight Pty Ltd*  
[www.ineight.com/](http://www.ineight.com/)

# Is Australia in the race to become a clean energy superpower?

**A**s economies around the world enter into a bidding war for market share and dominance of hydrogen production, Australia is at risk of being left behind in the race to become a clean energy superpower, despite it being well placed to develop a clean energy export market due to natural advantages.

An analysis of the US Inflation Reduction Act's (IRA) clean energy incentives in research from Deloitte Access Economics suggests that Australia could lose market share to the US and export 65% less renewable hydrogen by 2050.

Meanwhile, the Australian Hydrogen Council (AHC) has released a paper detailing what it believes would be an appropriate response by the Australian Government to the IRA and other international incentives that are increasingly attracting investment in hydrogen.

## The hydrogen tipping point

The Deloitte Access Economics report, Australia's Hydrogen Tipping Point – The urgent case to support renewable hydrogen production, found that without action, Australia's scaled renewable hydrogen production may be delayed by a decade until the mid-2030s, and its hydrogen industry may never reach a comparable scale to fossil fuels.

The analysis suggests there may be a goldilocks zone for policy intervention – around a \$2/kg hydrogen production credit, approximately half the level of the maximum credit in the US for renewable hydrogen, reflecting Australia's underlying comparative advantages.

This would require a \$15.5 billion public investment over a decade and, if done right, would put Australia on track to produce almost 16 million tonnes of renewable hydrogen a year by 2050, with exports worth \$17.5 billion a year. This would also lead

to the creation of clean industries to offset the decline of existing fossil fuel industries.

Pradeep Philip, head of Deloitte Access Economics said: "We have a wealth of comparative advantages in green industries like hydrogen but we're at risk of falling behind in the race to net zero. Despite Australia's clean energy ambitions, the reality is our global competitiveness is declining. The US Inflation Reduction Act looks set to cut Australia's renewable hydrogen lunch."

Matt Judkins, Deloitte Access Economic Partner, said Australia has an opportunity







to take advantage of its natural assets to produce products that meet zero carbon ambitions, such as green steel, green aluminium and zero carbon fertilisers. “We can’t afford to lose this race.”

### Call for strategic action

The AHC paper calls for ‘immediate action’, listing six recommendations to enable the hydrogen sector to move forward. The recommendations include:

1. Underwrite demand through a revenue support mechanism to incentivise do-

mestic production of critical chemicals and metals.

2. Increase and expand ARENA funding for trials and demonstrations looking at decarbonisation of the production processes for carbon-intensive industries.
3. Develop bespoke joint support packages between Australia and its trading partners.
4. Develop a revised hydrogen strategy.
5. A revised hydrogen strategy should explicitly value and support the development and commercialisation of new

technologies and industries, to ensure a pipeline of technologies and researchers in Australia.

6. Consider establishing a case manager approach within government to assist project developers and funders to tie all potential sources of support together, as well as assist in the coordination of planning and approvals.

Dr Fiona Simon, CEO of the Australian Hydrogen Council, recommends that the government underwrites demand through a revenue support mechanism, such as contracts for difference, to incentivise the domestic production of strategically important chemicals and metals such as iron, ammonia and methanol.

“Beyond the next 12 months, a revised hydrogen strategy is crucial to incentivise hydrogen production in areas where Australia has a competitive advantage, such as the production of iron. Funding could be matched by the states and territories, or split so that one funding stream defrays capital costs and the other provides long-term underwriting for contracts.

“A renewed focus on job creation, building sovereign manufacturing capabilities and helping heavy industry decarbonise should be a key focus of an updated strategy.

“We welcome the government’s commitment last week to review the National Hydrogen Strategy and hope to see a cohesive plan that reduces uncertainty and complexity for investors.

“This cannot be left to chance, or to the whims, complexities and uncertainties of a nascent market. Governments must be market makers at this stage of the energy transition. This is not only about funding for pilots but also major infrastructure investment in the public interest. Becoming cost competitive with fossil fuels will not happen without extensive government policy and subsidies.”

*Deloitte*

[www.deloitte.com](http://www.deloitte.com)

## Smart water meters rolled out across Auckland



To better manage water usage across the city of Auckland, Watercare has started rolling out smart loggers on water meters for commercial premises. This is designed to also save on manual reads and improve billing accuracy for commercial premises.

The project is part of a service solution designed by Spark IoT that includes a device and SIM management platform that makes device and data management easier. Currently, 3300 water meters have been logged and connected on the Spark NB-IoT network to provide usage information to Watercare, with an additional 2500 meters to be logged.

Nish Dogra, Watercare's Smart Network Lead, said this technology could improve water management across New Zealand.

Dogra said water is one of the most undervalued resources, and it is vital to give more consideration towards how it is sourced, treated and distributed. In these processes, technology is a key enabler and the smart meters being rolled out can help with water efficiency by identifying faults and leaks to be fixed.

"The data has already helped us to identify a number of large leaks on our customers' premises, which we've flagged

with them so they can fix them quickly. For example, one school's water use had skyrocketed from about 6000 litres a day to more than 70,000. There was no obvious water leaking on the grounds, but a specialist leak detection agency was called in and they found a massive leak under volcanic rock that was losing about 46 litres every minute," Dogra said.

This helped save money for the school and save thousands of litres of water.

Watercare supplies more than 400 million litres of water to Auckland every day, drawing water from 27 sources.

"By integrating IoT technology with the water management processes, operators can be warned faster of potential process issues, detect leaks more easily and improve distribution," Dogra said.

The new technology will play a greater role in how Watercare and its customers manage water, according to Spark's Principal Innovation Business Development Manager, Matt McLay. This transition to a smart meter network will improve sustainability and efficiency.

McLay said the smart meters will help monitor water use efficiency, optimise billing accuracy, promote more efficient consumption and deliver maximum value to businesses.



*Matt McLay, spark IoT*

The NB-IoT network provides wide coverage and is suited to battery-powered metering systems. It is also activated across cell sites, providing coverage to about 90% of the population.

Research analysis commissioned by Spark IoT and undertaken by NERA Economic Consulting shows that water metering solutions can provide a potential net benefit of NZ\$28 million in the market across a 10-year period up to 2027 from efficiencies and cost savings.

**Watercare Services Ltd**  
**[www.water.co.nz](http://www.water.co.nz)**



## Major sewer upgrade beneath Brisbane underway

As part of a major infrastructure upgrade to cater for Brisbane's growing population, a new tunnel will be dug beneath one of its busiest motorways.

This \$45m Urban Utilities project involves building a kilometre-long wastewater pipe four storeys below ground, running from Bowen Hills to Windsor.

According to Urban Utilities Spokesperson Michelle Cull, the pipe will be one of the largest in Urban Utilities' 9000 km wastewater network. This catchment area is expected to grow by around 37,000 people over the next 30 years.

The pipe will be built using trenchless and remotely operated technology, with most of the construction work taking place beneath the city's streets.

"A tunnel borer weighing 29 tonnes, the equivalent of around 16 cars, will tunnel up to 14 metres below ground to install the new 2-metre diameter pipe," Cull said.

This will allow the upgrade to be made with minimal impact on traffic, customers and the community, far from



the traditional tunnelling methods used by miners to build the city's largest and oldest sewer pipe in 1915.

A competition was held with Fortitude Valley Secondary College students to design artwork for the tunnel.

"The budding artists presented their work which resulted in the borer being decorated with a river-inspired design by Year 9 student Simone Baquiran," Cull said.

**Urban Utilities**

[www.urbanutilities.com.au](http://www.urbanutilities.com.au)



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# INNOVATIVE TECHNOLOGY SOLUTIONS REVOLUTIONISE HYDROGEN PRODUCTION

As the world becomes more aware of the urgent need to address climate change and reduce greenhouse gas emissions, industries are looking for ways to operate more sustainably. One promising solution is the use of hydrogen, a clean and renewable energy source that can be used to power a wide range of industrial processes. As a result, the hydrogen fuel industry is growing faster than ever before. We see more partners across the entire hydrogen fuel value chain, and you need expert suppliers who have the flexibility to meet a wide variety of designs and applications, from electrolyzers to fuel cells. In this evolving landscape, enhanced technology, more profound expertise and a stronger commitment to value-creating solutions guarantee a market advantage.

## Your trusted partner across the entire hydrogen fuel value chain

Emerson's extensive portfolio of measurement, control and electrical equipment for hazardous areas is designed to address the quality and performance needs required by companies within the growing hydrogen fuel market. Working with brands, such as Appleton™, ASCO™, Fisher™, Micro Motion™, Rosemount™ and TESCOM™ means you can expect innovative, extremely precise and reliable products designed specifically for your demanding hydrogen fuel applications. In addition, this technology is backed by global support from industry experts who understand your reliability, safety and cost expectations.

### Electrolyser

The biggest hurdle to overcome in scaling-up hydrogen production is achieving commercial viability or progressing towards the \$2 /kg gold standard. After the reduction in the cost of renewable energy and the reduction in the cost of the electrolyzers themselves, electrolyser efficiency improvement, increased stack life and loading

hours present the greatest opportunity for opex reduction. This requires access to data facilitated by Emerson's pervasive sensing strategy based on a range of WirelessHART instrumentation. This can then feed advanced digital twin solutions such as those from AspenTech to model remaining useful life and gain a better understanding of where the optimisation in performance and lifespan may be found.

### Level Measurement

Reliable level measurements in the electrolysis of water ensure safe and efficient operations of the plant. Radar transmitters offer a maintenance-free solution with a high level of accuracy, resulting in improved product purity through proper separation of hydrogen, oxygen and water and minimal risk of ionising demineralised water.

- Unmatched accuracy, reliability and ease of use.
- Advanced diagnostics enable process insight and proactive maintenance.
- HART®, Foundation Fieldbus and WirelessHART® connectivity.





### Point Level Measurement

Rosemount Vortex flow meters are gasket-free, non-clogging instruments that eliminate downtime and maintenance costs associated with plugged impulse lines.

- Isolated sensor allows for inline replacement, improving worker safety.
- SIL 2/3 certified for Safety Instrumented Systems.
- Dual and quad meters eliminate the need for multiple flow meters, reducing complexity and cost.



### Fuelling Stations

As fuelling stations transition to hydrogen fuel, you are encountering more risk. Your customer wants to ensure they are dispensing the right amount of fuel and at the right pressure quickly and safely. Here are some solutions that can help you develop high-quality, precise, safe and easy to maintain fuelling station systems from the storage tank or tube trailer to the dispenser.

### Flow Measurement

The Micro Motion High-Pressure Coriolis Flow Meter portfolio offers a wide range of pressure thresholds without compromising the integrity of the flow measurement reading and eliminates the need to utilise multiple devices. Designed with the challenges of high-pressure hydrogen in mind. Constructed with all stainless-steel wetted components to avoid embrittlement issues from high-pressure hydrogen. Offered in three different pressure ranges to meet the specific needs of both the hydrogen car and the bus and truck market.



### Temperature Measurement

The Rosemount X-well technology provides precise temperature measurement that does not require thermowell or process penetrations, thereby eliminating potential leak points. This surface temperature sensor solution simplifies the process and reduces complexity. It is also easy to retrofit and requires less installation time.



### High-Pressure Measurement

The use of Rosemount pressure transmitters in high-pressure applications ensures heightened safety and minimal downtime. These transmitters are designed to offer unparalleled reliability

and accuracy, even in the toughest environments. The transmitters feature gold-plated SST diaphragms that provide protection against hydrogen permeation, further enhancing their durability and performance.



### Fuel Cell

Hydrogen is an important energy source of the future and can be used to power passenger cars, commercial vehicles, drones and forklifts, replacing traditional heavily polluted carbon fuels and chemical battery power. It can also provide backup power supply for critical applications like data centres.

Here are some products that provide reliable and safe operation of any type of fuel cell, including PEMFC, PAFC, SOFC and MCFC. Compact and lightweight designs permit you to create high-power density systems. Robust and extremely reliable products mean longer life and reduced downtime.

### Flow Control

ASCO solenoid valves, both direct and pilot-operated, offer an excellent solution for regulating the flow of fuel from a storage tank to a fuel cell stack in vehicles. These valves are highly dependable, constructed with durable materials that ensure a prolonged lifespan and minimal internal leakage. They are pressure-rated up to 30 bar and can be equipped with an optional heating module to facilitate cold start-up conditions.

### High-Pressure Hydrogen Control

TESCOM Onboard Pressure Reducing Regulators are specifically designed for the challenges of delivering precise hydrogen pressure to on-vehicle fuel cells.

These designs are proprietary and feature a tight no-flow shutoff of pressure in various operating scenarios. Furthermore, these regulators have wide operating flow ranges that allow them to deliver consistent downstream pressure, even as fuel demand varies.

### Achieve your desired operational performance through flexible service support

A strong partnership with an automation expert, such as Emerson, strengthens the position and long-lasting competitive advantage. It will give flexible support to meet the demands of an expanding hydrogen fuels market.



**Emerson Automation Solutions**  
[www.emerson.com/au/automation](http://www.emerson.com/au/automation)

## LABORATORY MEASUREMENT SENSORS

Endress+Hauser has launched five laboratory sensors compatible with its Liquiline CML18 handheld laboratory analysis device. The Memosens CPL53E, CPL57E, CPL59E, COL37E and CLL47E liquid analytical sensors now join the CPL51E.

Using the bayonet connector, the handheld CML18 and Memosens sensors work out of the box with support switching output parameters — such as pH, dissolved oxygen and conductivity — at the measuring point. Users can begin making measurements without initial calibration because the instruments are pre-calibrated at the factory.

Memosens 2.0 sensors are suitable for laboratory measurement and random process grab sampling.

The CPL53E glass PH sensor is built for all-around use in the lab, covering everything from lab sampling to random process grab sampling.

The CPL57E pH sensor is designed for low-conductivity water applications in all industry types.

The CPL59E pH sensor is built to withstand harsh conditions in chemically aggressive fluids.



The digital COL37E dissolved oxygen sensor enhances oxygen measurement with a fast response time.

The CLL47E is a four-electrode conductivity sensor for random sampling and measurements in the lab with a measurement range of 5  $\mu\text{S}/\text{cm}$  to 200  $\text{mS}/\text{cm}$  and a process temperature range of 0 to 100°C. This sensor is suitable for measurements in drinking water, cooling water, wastewater and process media (such as cleaning solutions).

Endress+Hauser Australia Pty Ltd  
[www.au.endress.com](http://www.au.endress.com)

## EV CHARGER

Schneider Electric has launched its EVlink Home charger. The charger incorporates new features aimed at making at-home charging easier to install and more cost-effective to use.

The design includes anti-tripping functionality through its optional peak controller. The feature means homeowners can run multiple devices on the home power system, such as dishwashers, aircon and pool pumps, while charging the car at the same time.

The charger also features integrated RDC-DD protection, meaning it requires only a Type A circuit protection in the distribution board, which is claimed to be a safer and more affordable alternative to Type B protection.

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## Trial solution to aged care waste problem



Used incontinence products from residential aged care make up half of the landfill waste in the sector. In the search for more environmentally sustainable disposal solutions, operators hit a stumbling block with no suitable options available. Essity, which manufactures and supplies global incontinence brand TENA, launched a large-scale trial to find a better way.

Rochelle Lake leads Essity's Project Divert, an industry collaboration that is assessing the suitability of pyrolysis technology to dispose of incontinence products during a six-week trial funded by the Commonwealth Government National Product Stewardship Investment Fund.

Lake said when customers started asking for a better solution than landfill, she and her team explored what the waste

industry could offer. It turned out no one in the sector had a viable alternative.

Estimates suggest that the amount of absorbent hygiene product waste produced by adults could be up to 10 times that produced by infants by 2030.

"We have an aging population in this country and incontinence product use is rising, so finding a way to deal with this waste is critical," Lake said.

The Project Divert trial, which launched in early February, is based at the Med-X Healthcare Solutions facility in regional Victoria. It uses pyrolysis technology developed in Victoria by Earth Systems, which heats waste materials in the absence of oxygen, meaning lower emissions than traditional incineration. The waste is then converted to a biochar that may have several commercial applications.

The trial involves 10 waste collection sites across Victoria and will process approximately 16 tonnes of waste over six weeks.

One of the participants in the trial is Arcare Knox Aged Care in Wantirna South, a 115-resident facility that uses more than 1200 incontinence products each week.

CEO Colin Singh said the facility is "keen" to find a more environmentally responsible and cost-effective way to deal with incontinence product waste.

When the trial concludes, TENA and Essity will assess the feasibility of a more permanent solution.



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The new charging box family AC SMART offers the optimal charging solution for every application scenario in the private and commercial sector and sets new standards with its smart functions. From simple charging with a single charging point through integration into smart grids to the complex management of entire charging parks. The platform-based charging concept with its basic equipment in three lines ECO, VALUE and ADVANCED covers the most common applications and can be adapted to individual applications by means of standardised interfaces and versatile configuration options.

[www.weidmuller.com.au](http://www.weidmuller.com.au)

## OPEN-FRAME 15-INCH PANEL PC

Backplane Systems Technology has released iBase OFP-151-PC-NVK, an open-frame 15-inch panel PC and a SCADA (Supervisory Control and Data Acquisition System)

management solution. It displays the real-time status of equipment such as freezers, air conditioning, lighting systems and power meters, serving as a communication bridge between sensors and the cloud to transmit equipment operating status.

The platform features modularised functional blocks for customisation across all venues in the retail industry. The panel PC comes with easy-to-mount, open-frame modular design with optional coloured frames. It supports IP65 front panel protection against dust and water and is built with industrial-grade components and has fanless operation in temperatures of up to 50°C. OFP-151-PC-NVK is installed with the Novakon iFACE Designer, a comprehensive object-oriented UI/UX graphics editing tool that utilises numerous industrial automation standard protocols, PLC drivers and universal IoT cloud protocols. This allows the platform to provide connectivity among diversified industrial equipment and devices, such as sensors, power meters, controllers, PLCs, IO modules and IoT cloud platforms.

Backplane Systems Technology Pty Ltd  
[www.backplane.com.au](http://www.backplane.com.au)



## SAFETY AIR GUNS

EXAIR safety air guns have been designed to eliminate the safety issues associated with some low-cost air guns. They are built to be durable and comfortable, with each model using an engineered air nozzle that entrains large volumes of surrounding air. Low air consumption and noise level help to ensure safe operation, and all models are OSHA compliant for noise and dead-end pressures.

VariBlast Precision Safety Air Guns are lightweight with a focused blast of air. Designed with a variable flow trigger, the airflow is adjustable and can produce a range of different force values from the same nozzle by pulling the trigger.

Soft Grip Safety Air Guns are cast from aluminium with a four-finger trigger to reduce fatigue over long periods. A large variety of air nozzle options provides a solution for light- to heavy-duty blow-off applications.

Heavy Duty Safety Air Guns are designed for rough surroundings and robust blow-off applications. Built from a cast aluminium body and full rubber grip, they are available with powerful nozzles to solve blow-off problems.

TurboBlast Safety Air Guns produce high airflow with force values up to 10.43 kg. The light touch activation trigger creates a powerful blast of air and includes a 'dead man's' grip that turns the air off if the air gun is dropped.

Compressed Air Australia Pty Ltd  
[www.caasafety.com.au](http://www.caasafety.com.au)



## COMPOSTABLE PALLET WRAP

Great Wrap Compostable Pallet Wrap is made with food waste, which is designed as a replacement for petroleum-based pallet wrap and plastic pollution.

The product is home-compostable and can either be returned to the soil to add microbial value to agricultural land or repurposed to create new materials.

Great Wrap  
[www.greatwrap.com.au](http://www.greatwrap.com.au)





# Creating resilience, mitigating disaster



**F**rom facing a global climate crisis, to navigating a global pandemic, it's never been more important for organisations to increase their resilience in the face of disaster.

And by mitigating risks and reducing their impact, businesses around the world are realising that championing sustainable development not only saves lives (and revenue), but also helps them to achieve a competitive advantage.

Graduates of emerging postgraduate degrees like the University of Newcastle's Master of Disaster Resilience and Sustainable Development are leading this change.

The degree equips people from diverse backgrounds to understand resilience and sustainable development principles, and systematically apply them to avoid disasters, operate through extreme events and emerge better placed to face the future.

It's designed for those in management positions (or those aspiring to be) whose work involves resilience-building through the mitigation of impacts arising out of extreme events — which can be as varied as natural disasters, data breaches, political instability, terror attacks or health epidemics.

**Maddy Lackman chose to pursue postgraduate study firstly with a Graduate Certificate of Disaster Risk Reduction and then a Masters in Disaster Resilience at the University of Newcastle. As a disaster resilience professional, Maddy feels like she has built a better understanding of disaster resilience across a range of contexts.**

"The program focused on resilience rather than just response and recovery, which led to more diverse opportunities for me.

"I was also keen to work with the faculty there because they all had an interest in post-disaster recovery and reconstruction," Maddy said.

"It changed my perspective of how resilience principles can be applied in different contexts, and career paths now seem endless," she said.

Maddy really enjoyed that the program was a mixture of practical and theoretical classes, and that her classmates all came from such diverse places.

"My classmates were incredible and came from diverse backgrounds. It was great learning from them," she said.

**She is currently employed as a disaster resilience specialist for a consulting firm in Victoria called ResilientCo.**

"We support local councils and organisations to help enhance their capacity and capabilities to manage disasters.

"I help my clients understand their disaster risk and the different ways to reduce their vulnerabilities and increase their capacity," she said.

A major drawcard of the University of Newcastle's degree is its development in partnership with the United Nations, and its delivery through CIFAL Newcastle — a United Nations training centre with a focus on disaster resilience and sustainable development.

The result? Graduates are emerging with the best-practice knowledge and skills needed to implement the new UN Sustainable Development Goals and the Sendai framework for Disaster Risk Reduction — and make a real and lasting impact.

"The program was directly linked to the UN and focused on international contexts," Maddy said.

The University of Newcastle offers their Master of Disaster Resilience and Sustainable Development full-time or part-time, online or face to face. With options to undertake a Graduate Certificate, or the Master's program, Maddy believes it's worth the plunge.

"It will definitely strengthen your understanding of key resilience principles and give you the tools to apply them in a real-life context," she said.

## Career boom

Don't be surprised if you start hearing the term "resilience officer" more and more. Organisations are increasingly embracing this terminology — and the intention behind it. Whether it's in local government, planning and implementing strategies for town planning, urban and rural development, community safety or service continuity in times of emergency, demand is growing.

Career opportunities are increasing in the private sector too — in business continuity, environmental protection, risk management, disaster recovery planning, emergency and crisis management, and workplace health and safety functions.

To learn more about studying a Master of Disaster Resilience and Sustainable Development at the University of Newcastle, visit [newcastle.edu.au/disaster-resilience](http://newcastle.edu.au/disaster-resilience).

University of Newcastle  
[www.newcastle.edu.au](http://www.newcastle.edu.au)



## Cotton farmers undergo textile waste trial

Cotton farmers in New South Wales and Queensland have launched phase 2 trials to identify a scalable, long-term solution to the issue of textile waste in landfill.

Goondiwindi's Sam Coulton, who hosted the phase 1 trial, is being joined by Gunnedah's Scott Morgan, a leading cotton farmer in sustainability. Morgan said his decision to take part in the trial was easy given his early adoption of a large-scale solar generation project and numerous water conservation projects.

"I'm excited about returning 100% cotton back to farms because I think it's the right thing to do for the environment by helping close the circularity gap. My strong hope is that the cotton waste can improve soil health and organisms — thereby improving crop yields," Morgan said.

Following flooding events in late December, Morgan was able to distribute around 2.4 tonnes of the shredded material onto an already planted cotton field, thanks to Thread Together, a charitable organisation that adopts an ethical response to the issue of fashion excess. The material was watered into the soil and the resulting crop is looking good, standing at about 50 cm and scheduled for harvest in late May.

Coulton was also impacted by extreme weather and logistics issues, managing to apply 600 kg of cotton waste onto one plot on his farm. Though this was less than hoped for, it was still significant in his second year of circularity trials. Since application, Sam has furrow cultivated and irrigated and the material has broken down significantly.

"The first phase was positive, but with COVID and poor weather we were limited in what we could achieve. I am hopeful this phase will lead to a major transformation in cotton circularity," Coulton said.

Soil scientist Oliver Knox, who is overseeing the trials, has found that cotton textile waste has no adverse impact to soil health or cotton yields.

Knox said new test results from Phase 1 were very encouraging.

"We found that organic carbon in the top 10 cm of soil from phase 1 has increased to 1.08% from .77% and that is a significant jump. Sulfur has also increased from 4.5 mg per kg to 7.4 mg per kg and that indicates improved soil fertility and health," he said.

For the 2022/23 trial, program partners Cotton Australia, Goondiwindi Cotton, the Cotton Research and Development Corporation (CRDC) and Sheridan have been joined by Thread Together.



According to Thread Together CEO Anthony Chesler, the company is dealing with excess stock rather than cotton waste.

"Thread Together never declines a donation of excess clothing and sometimes this creates more supply than demand. As part of this new challenge, we were pleased to work with Worn Up to ensure 100% cotton garments were shredded and dispatched to Gunnedah," Chesler said.

Tanya Deans, President Hanes Australasia, said progress towards circularity is an important part of sustainability, and Sheridan, together with the wider Hanes

businesses, is committed to the cause.

"I'd also like to thank the CRDC and Thread Together for supporting this mission with their generous contribution as well. This is just the beginning of innovative solutions on our shores and we are proud to be a part of it," Deans said.

CRDC provided funding for Knox to continue his research and development and has committed almost \$2m in funds over the next three years for a suite of projects to complement the initial work and increase understanding of the topic.

"This program could be a game changer, but we need scientific rigour to fully appreciate the soil science and the long-term impact of returning cotton textiles to the farm: carbon footprint, impact on soil health, waterways, benefits to farmers, brands and other stakeholders," said CRDC Executive Director Ian Taylor.

One of the projects currently underway is a three-year investment with the University of Newcastle to further investigate the effects of dyes and finishes from waste material on soil health, especially on the diversity, growth and functioning of soil microbes, which are critical for the health and resilience of soils across the landscape. The project will also look at ways to pelletise cotton textiles through biological breakdown of the waste material to enable spreading on fields using existing farm machinery.

Brooke Summers from Cotton Australia is leading the Goondiwindi and Gunnedah circularity project.

She said the phase 1 results show it's possible to find a solution and help close the loop on circularity. Phase 2 should help bring this solution a step closer, but only with the committed involvement of governments, industry groups, brands and potential investors.

Phase 2 will be monitored closely by Dr Knox at both locations with all results being scientifically assessed before a full report is produced to guide future circularity developments.

**Cotton Australia**  
[cottonaustralia.com.au](http://cottonaustralia.com.au)



# Compressed air for PET blow-moulding production

Compressed air is critical to blow-moulding production and the opportunities to improve supply side efficiency are highly prevalent.

**M**easurement and recording of actual pressure flow inside the production equipment can assess the actual performance of the compressed air system. This identifies any areas where compressed air problems are causing limitations on productivity and quality of production, the improvement of which in turn can lead to lower energy use costs and increased production rates.

All blow moulding processes require stable compressed air pressure delivered to the moulding machine to control quality and maintain productivity. In most blow moulding processes, compressed air is used to inflate the parison, a tube-like piece of plastic with a hole in one end through which compressed air can pass. The compressed air also cools the part after inflation to final form, but prior to ejection from the mould.

In PET bottle blowing, high-speed machines use compressed air to produce bottles at rates of over 20,000 bottles per hour. The rate of pressure rise becomes dependent upon the pressure differential driving the flow from the air inlet of the machine to the cavity. The higher the inlet pressure the faster the rate of pressure rise.

Increasing the system pressure is a common way to maximise productivity and still produce good product. Unfortunately, higher pressure leads to wasteful artificial demand, elevated compressor energy and maintenance costs, and inefficiency in managing the system.

## The real costs of higher system pressure

Blowing the part as quickly as possible leads to very high rates of flow in supply components creating high pressure drop. A blow

machine running 24,000, 500 mL bottles per hour can consume 90 m<sup>3</sup>/min depending upon setup creating significant pressure drop in the headers and filters delivering the air. In order to make acceptable bottles with this level of pressure drop the system has to operate at dramatically higher than necessary pressure.

This higher than necessary pressure means each bottle requires a greater volume of air, and because the header pressure is elevated to increase the inflation pressure differential, the blow pressure continues to rise to higher than required pressure after the bottle is fully moulded. For every bar of pressure increase above the required blow pressure, the volumetric flow required increases by the volume of the bottle. For example, one bar in excess pressure for a 500 mL bottle times the production rate equates to 1.5 m<sup>3</sup>/min in artificial demand.

## Higher maintenance and energy costs on the compressors

The most common compressor for achieving these pressures is a 3-stage reciprocating machine which uses valves to control the flow of air through the stages. At these higher pressures the temperatures are higher, increasing the stress and wear on critical components. Where it was possible to substantially decrease the discharge pressures, maintenance cycles are extended by as much as 25–30%. Power is also reduced at the lower discharge pressures by a ratio of 1% energy reduction for every 5% pressure reduction. A reduction of 700 kPa or 16% will mean about a 3% energy reduction at the compressors.

## Capturing the efficiency opportunities

The first step in capturing efficiency opportunities is to minimise the pressure

drop within the moulding machines, which normally requires removing and/or replacing pneumatic components with those of higher flow capability. The regulators and filters are critical items and must be examined closely by measuring the pressure drop while the machine is blowing bottles. Localised storage receivers can minimise pressure drop by supporting the very high rates of flow during each blow cycle with stored air. This storage must be located as close to the point of consumption as possible; for example, it must be tied into the pneumatic circuit after the filter and regulator to be of any value.

## System management

Managing this level of pressure change requires significant modifications in the approach to system management. While compressed air storage tanks can be expensive, maximising the storage is essential with most compressed air systems as the lack of appropriate storage is even more costly if additional compressors are required to run part loaded to deal with the rates of pressure change.

An appropriate automation system which calculates the rate of pressure change and makes intelligent decisions regarding the appropriate supply-side response can make a significant difference in energy costs and reduce compressor cycling, wear and motor starts. Avoiding unnecessary compressor starts due to the rate of change can mean saving many thousands of dollars in energy costs per year.

Kaishan Compressors offers an assessment and advisory service for upgrading, replacement, design and installation of new systems to match production demands.

Kaishan Australia Pty Ltd  
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## Blue-green algae issue solved for protein rendering unit

Craig Mostyn Group is one of Australia's leading diversified food and agribusiness companies. Established in 1923, the company is now claimed as Western Australia's largest vertically integrated pork, lamb and beef business. It also has seafood operations, which include three abalone farms and multiple sites across Tasmania. Its protein rendering unit, Talloman, is a core division of the Craig Mostyn Group, and when it started to have issues with a wastewater treatment pond, plant manager Carlos Mendes went looking for a solution.

The EchoStorm venturi aerator from Gorman-Rupp was recommended to him and he contacted Hydro Innovations (Australian Gorman-Rupp distributor) for a solution. Mendes wanted a reduction in BOD, COD, NH<sub>3</sub> and also a solution to a troublesome blue-green algae issue.

Adding dissolved oxygen to aerobic bacteria allows organic compounds in wastewater to be broken down quickly, preventing it from becoming septic and odorous. The addition of dissolved oxygen allows these organic compounds to be converted into non-polluting compounds.

### The solution

Based on the size of the pond, the inflow rate and water analysis provided, Hydro Innovations recommended a 4" (100 mm) EchoStorm system. This system comprises a Gorman-Rupp U4B60S-B self-priming centrifugal pump with 15 kW motor, 'powering' a Gorman-Rupp V4A EchoStorm venturi aerator.

The EchoStorm is a static venturi aeration device that is installed on the discharge side of a Gorman-Rupp self-priming centrifugal pump to introduce dissolved oxygen into the liquid being pumped. With no moving parts, the EchoStorm will only require routine maintenance of the Gorman-Rupp pump. The simplicity of the system makes it easy to install, operate and maintain.

The U4A60S-B 4" self-priming effluent pump is highly efficient because of its multi-vane impeller and 'straight-in' suction design, making it a good choice for keeping power consumption of the system low. It is also capable of passing a 20.6 mm solid and operating on suction lifts up to 6.1 m.

The pump draws in water from the lagoon, then pumps it at pressure through the EchoStorm unit, which draws in atmospheric air, mixes it with the water and delivers it back to the lagoon. The unit not only 'saturates' the water with dissolved oxygen, but it also 'conditions' the flow, breaking down organic matter into smaller particles, allowing for enhanced organics reduction. This conditioning effect also ruptures the buoyancy vacuoles within the blue-green algae, causing it to sink, depriving it of the sunlight required for growth and stripping CO<sub>2</sub> from the water, depriving it of carbon dioxide.

Mendes and the Talloman evaluation team liked the idea of the equipment being mounted on the bank of the pond, rather than floating in the middle of it, and could see the ongoing benefits of easier access and the maintenance advantages of the system. As a safety-first company, the team also saw the system as being much safer for operators than other systems they had seen.

But as the technology is relatively new to wastewater treatment in Australia, Mendes was cautious in his evaluation about the results



the system could achieve moving forward. Hydro Innovations, however, was very confident of the success of the system (unit) and not only offered a five-year warranty on the pump (which is standard), but also a money back guarantee if the unit failed to deliver the promised results. Mendes was happy with this arrangement and proceeded with the purchase.

### The results

The Talloman crew did an excellent job setting the unit up exactly to specifications, and wanted to be sure their investment in the future was a good one. To this end, Mendes had his crew track the progress of the EchoStorm by measuring the total of all taxa from 'Day 1'. When the unit was installed in March, total taxa measured 217,000. Mendes called off the measuring when the last reading was taken in May, where the measure was down to 6630 (a reduction of 97%). Needless to say, Mendes and the Talloman team are happy with the results.

They have also been pleased at how easy the unit is to access for monitoring and maintaining.

The EchoStorm aerator units are available in sizes from 2" (50 mm) through to 6" (150 mm), but multiple units can be used to cater for larger requirements.

When the application calls for even higher levels of oxygen, much larger (and even more efficient) pumps can be utilised, each providing flow to two, three, four or even five EchoStorm venturi aerators. The efficiency of these pumps drives up the standard oxygen transfer efficiency (SOTE) even further. The use of multiple EchoStorm units also enhances mixing and virtually eliminates dead spots that are often left by competing technologies.

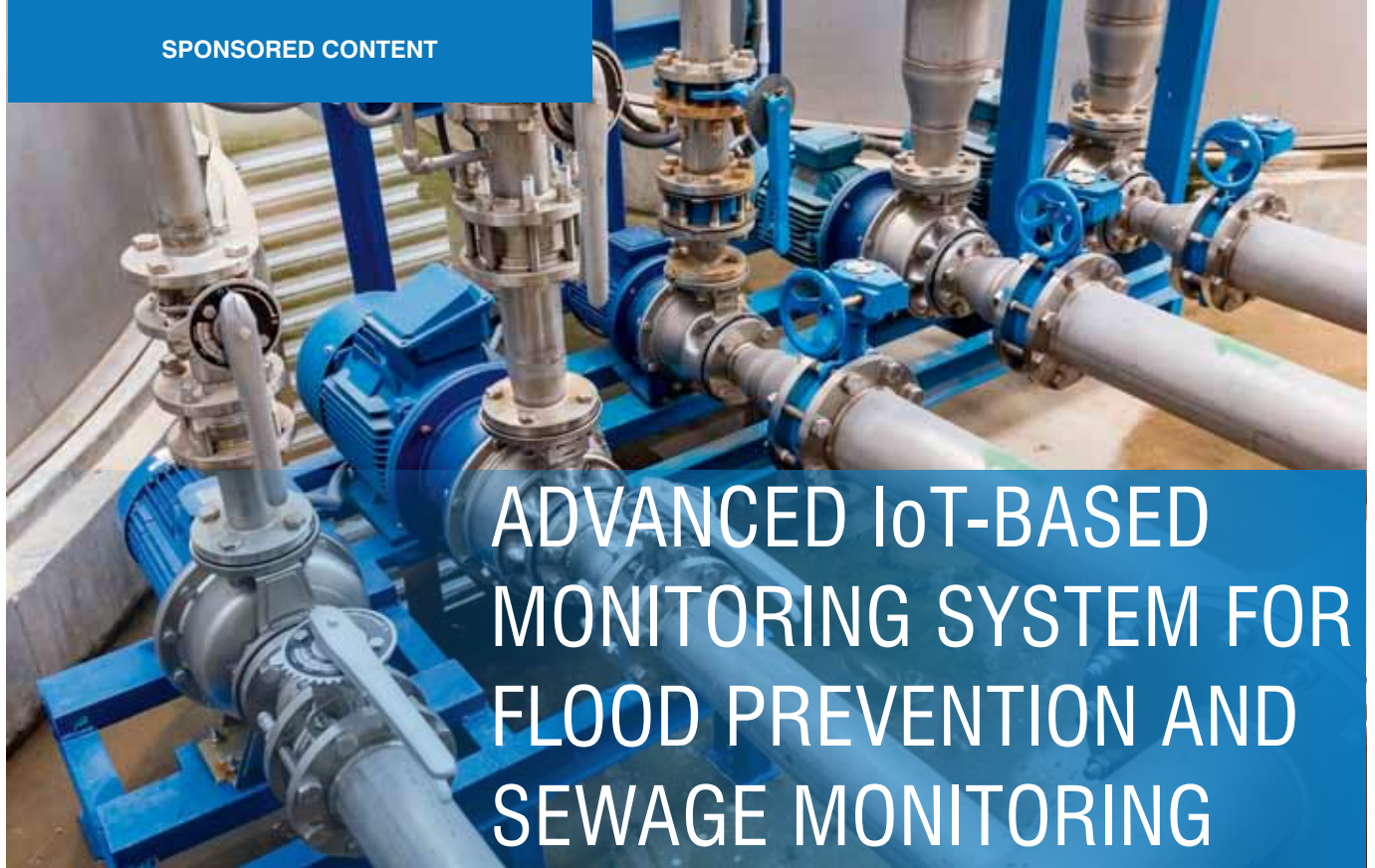
EchoStorm units are versatile because they can draw water from any level in the water source and from any part, and can discharge it at any level and any part. This gives the asset owner numerous options for mixing or creating different treatment zones.

Venturi aerators are not used just for treating food process wastewater, but also for treating municipal wastewater and mine water, and also for lake destratification.

**Hydro Innovations**

[www.hydroinnovations.com.au](http://www.hydroinnovations.com.au)





**T**idal/Flood gates are designed to protect the local residents and communities from floods. They are installed in high-risk areas to control water flow entering the municipalities. The gates are closed when the flood alert is issued or the abnormal water level is detected. Otherwise, they can be left open during normal operations to open access through the riverway.

This system has prevented flooding in Venice, London and many other high-risk cities. In this system, the gates can communicate with each other via a network and are equipped with intelligent control and monitoring systems. The collected data, including current weather conditions, sea currents, etc, is sent to the central control room to help operators decide when to close the gates.

Flood gates operate pneumatically by pumping air into the gates which allows them to rise to form a protective barrier. For safety purposes, the measurement data from sensors had to be extremely precise and accurate to control and monitor the gates.

Bestech Australia provides high-precision sensors and data acquisition for test and measurement applications. The high-accuracy KELLER 33x pressure transmitter has been used in the design of floodgates. It offers an extremely high accuracy measurement within 0.01% of full scale due to its built-in microprocessor with an integrated 16-bit A/D converter. This allows the sensor to adjust for the effect of temperature and non-linearity via mathematical compensation.

An independent data recorder and a remote transmitter can be installed for a more sophisticated system. This configuration can transmit the data from the monitoring sites to the control room over the GSM mobile phone network via SMS, e-mail or FTP to provide real-time warning of a possible flooding event.

This advanced IoT-based monitoring system provides several benefits:

- Able to issue advanced warnings to all areas.
- Early identification of potential floods, enabling appropriate measures to be taken.
- Real-time monitoring.

#### Other Applications: Sewage Monitoring and Control System

Our pressure transmitters have been widely used for water level monitoring and the design of flood prevention systems due to their high accuracy and reliability for long-term measurement. The benefit comes in the flexibility to customize the sensors to fit almost all industrial applications, from test and measurement to large-volume OEM manufacturers. Customers can choose from various pressure ranges, output signals and electrical connections to fit the sensors into their specific requirements.

For example, Bestech has supplied sewage pressure sensors to the local water authority in Australia to monitor and regulate real-time peak flow in a pressure sewage system. The purpose is to achieve operational efficiency through dynamic management of sewage flow, which also minimizes spill risk as each tank is remotely monitored and controlled.

Sewage pressure transmitters must possess superior toughness and abrasion resistance as they operate in harsh and challenging environments. The sensor head should also be designed such that materials do not get stuck on the diaphragm which will return erroneous measurements. Our engineers design and test these sensors in our in-house facility in Melbourne to ensure they meet the customer requirements.

Offering more than 40 years of industrial experience, Bestech Australia supplies high-precision sensor technology from world-leading suppliers to support test and measurement applications in Australia and New Zealand. We complement this with our own design and full local technical support to assist you until the completion of your projects.

For more information, contact 03 9540 5100 or enquiry@bestech.com.au to speak with one of our engineers regarding your measurement challenges.

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# Renewable energy trends for 2023

**R**atedPower, now a part of Enverus, has released its annual findings derived from nearly 100 diverse industry experts from across the world and more than 101,000 simulations of its software. According to the results, the focus for 2023 will be on accelerating the adoption of renewable energy power generation, reducing the levelised cost of electricity (LCOE), fuel diversification and energy storage investment.

"In the year ahead, we expect the green transition to provide a massive boost to investments in solar photovoltaics (PV) — for residential, commercial and industrial, and for utility-scale installations. The industry is increasingly looking at ways to incorporate battery storage and clean, green hydrogen into renewable installations to maximise supply," said Andrea Barber, Vice President of Power & Renewables at Enverus and Co-founder of RatedPower, upon release of the report.

## Key trends revealed in the report:

### *1. Instability and grid saturation cause concern*

Grid saturation and instability has joined permitting and regulation as the biggest challenge the renewable industry is facing in the coming year, with both issues cited by 68% of respondents. The increase in costs is widely mentioned amongst the respondents as a major challenge. More than 40% of survey respondents have also cited the increasing lack of skilled personnel, land availability and raw materials.

### *2. Energy storage gaining more attention*

When asked about technologies with the highest potential, experts still mention energy storage as a trendy topic, but agree that the future might be in newer PV technologies that contribute to the deployment of renewable capacity at the scale needed for global decarbonisation. Agriphotovoltaics, floating PV, vehicle-integrated PV and building-integrated PV are promoted as routes to expanding solar capacity.

### *3. US and China on top but Australia still up there*

For the first time, the US has overtaken China as the country with the highest

growth potential, with 60% of responses placing USA at the top, followed by China with 46%. India and Australia also made the list with their ambitious renewable plans.

### *4. Diversification is key*

Diversification of renewable energy is one of the top three key success factors of a leading energy company, according to 68.5% of respondents. Almost all industry professionals believe that automation, digitalisation of the processes and energy storage need to be the focus of investors to help with the grid saturation and instability challenges.

### *5. Other data*

The data shows an increase in the popularity of string inverters over central inverters for the past two years. The simulations based with these inverters are 53% and 47% respectively.

Although solar tracking systems accounted for more than half of the simulations, there seems to be a growing trend towards the use of fixed structures, which increased by 3%.

Bifacial modules simulations kept growing last year, reaching a total of 71.87% of simulations, up from 57% in 2021.



# Australasian Waste & Recycling Expo

## AWRE | 26-27 July 2023 | ICC Sydney

Australia's national platform and trade event for the waste, recycling and resource recovery sector returns to Sydney in 2023. Running from 26-27 July at the ICC Sydney, visitors will be able to explore a showcase of full circle innovative products and sustainable solutions to collect, process and recycle waste more smartly. Expect to see some of our nation's leading brands including Isuzu Trucks, Komatsu Australia, Telford Smith Engineering, STG Global, NSW EPA, HYVA and Liebherr-Australia.

Visitors can look forward to a specially developed show floor reflecting the changing and developing market, featuring three new and returning zones — the recycled zone, innovation zone and organics zone, sponsored by the Australian Organics Recycling Association. Plus, two free-to-attend education theatres, covering an impressive array of topics across key industry actions and insights from policy and regulation, trends and insights to practical and tangible

solutions from innovators shaping the future direction for Australia.

Returning after its inaugural debut in 2022, the AWRE summit will now run for a full day in 2023. 'Australia's Reality Check — Recycling & Residuals', will cover topical areas including the state of our resource recovery system, the reality, roadblocks and solutions to help us progress towards national targets and the challenges and policies surrounding residuals management in Australia. Hosted by the Australian Council of Recycling, National Waste and Recycling Industry Council and Waste Contractors and Recyclers Association of NSW, delegates can look forward to high-level collaboration between industry, government and waste generators.

Beyond the exhibition and summit, AWRE will also be introducing its new AWRE Awards, a new and exciting initiative in 2023. The awards will shine a spotlight on the waste, recycling and resource recovery



industry's latest innovative solutions, most impactful and inspiring projects, and the individuals and companies leading them. Stay tuned for further updates!

AWRE is set to offer an exciting agenda of events across the two days, with registration now open. Discover the latest in waste and recycling and connect with like-minded experts as we propel Australia to lead the charge to global and national waste targets — together.

*Diversified Communications Australia*  
[www.divcom.net.au](http://www.divcom.net.au)

## Bringing the renewables industry together to build a brighter future at Smart Energy 2023

### A year of change

2022 was a year of massive change. At last we are in an era of hope and optimism for renewable energy and positive climate policy. 2023 is the year we do the heavy lifting to implement at every scale. To make up for a lost decade of inaction and delay, we must do much more to achieve a lower carbon footprint through low-emissions vehicles, smart choices in energy-efficient appliances, the electrification of homes and workplaces, and programs to support solar, wind and storage technologies. Governments (state, territory and federal) are finally working together to plan and implement the zero-carbon energy future Australia deserves, through coordinated smart energy policies, planned and funded renewable energy build-outs, and a vision for a zero carbon energy export industry.

We are absolutely committed to this wonderful industry, and the Smart Energy Conference and Exhibition will once again

provide our community with a chance to connect, learn and share information (as well as see the latest products) over a fantastic two-day event.

### Smart Energy 2023

Australia's premier solar, storage and smart energy event is back in early May 2023 bigger and better than ever. The Smart Energy Conference and Exhibition welcomes everyone with a stake in the renewable energy industry to join in these free two-day events happening on 3 and 4 May at ICC Sydney.

The Smart Energy Council believes sharing knowledge is key to our successful transition to a greener, cleaner future. Smart Energy 2023 will proudly present a top line-up of expert speakers: industrial and technical specialists, project developers, financiers and key policymakers, market analysts and advisors, across three conference streams. CPD points will also be available.

The event will provide many opportunities for networking — mix with new and old colleagues during and after conference sessions in a convivial setting.

### Register today and share with your networks

We invite you to be a part of powering progress in the smart energy sector, and we believe that only if we all work together, Australia will succeed in transitioning into a renewable energy superpower. For more information and to register head over to [smartenergyexpo.org.au](http://smartenergyexpo.org.au).

#### Event information at a glance:

Smart Energy Council Conference & Exhibition 2023

**When:** 3-4 May 2023

**Where:** ICC Sydney

**Web:** [smartenergyexpo.org.au](http://smartenergyexpo.org.au)

*Smart Energy Council*  
[www.smartenergy.org.au](http://www.smartenergy.org.au)

# Construction industry's pathway to net zero by 2040



istock.com/pcc609

**R**esearchers from UNSW Sydney have developed an online resource that provides a pathway to achieving 'whole of life' net zero carbon for Australian buildings by 2040.

*Race to Net Zero Carbon: A Climate Emergency Guide for New and Existing Buildings in Australia* is a 40-page guide which details critical information about materials and construction best practices to help architects, engineers and planners transform the building industry towards net zero carbon buildings.

The world's built environment is responsible for 37% of global energy-related greenhouse gas emissions. In Australia, it is responsible for one-fifth of all our emissions.

Carbon emissions within the built environment occur across all stages of a building's life cycle.

"Our guide draws on Australian climate data but has global applicability," said Professor Deo Prasad, who is lead researcher of the guide.

"Historically, most professionals have only focused on reducing the operational

carbon footprints of buildings. Operational carbon refers to what is required for the building to run once it is built, like energy use in heating or cooling."

Operationally carbon-friendly buildings are fully powered from on-site and off-site renewables, which offset the buildings' carbon emissions.

Meanwhile, embodied carbon footprints, which are accrued before a building is even constructed, have usually been overlooked by the industry.

"There are significant amounts of emissions embedded in the materials and construction of the building itself and these need to be addressed and offset in order for our built environment to be truly net zero," Prasad said.

"Our guide goes deeper than just operational offsetting. It illustrates a 'whole of life' approach to buildings — considering where building material comes from, how they are transported to the construction site and so on."

The best way to minimise the embodied carbon footprint is by retrofitting and reducing materials in use. If that's not possible,

then employing low-carbon materials such as green steel and concrete alternatives during the construction process is best, which is what the guide provides a roadmap for.

The guide also details post-life opportunities for buildings destined to be demolished — creating opportunities to expand the circular economy.

"Buildings don't have a cradle to grave life cycle," Prasad said. "It's more like cradle to cradle. Materials from demolished buildings can go on to have a future life through recycling and reuse."

"For example, it's possible to avoid demolishing old or undesirable buildings as their concrete structures can stay put and the building can be refurbished."

"Timber, aluminium and glass can be reused or recycled somehow into new products."

The challenge in the building industry right now is to get past one-off cases and move into a mainstream situation where net zero construction is the norm. Prasad hopes the guide will also help Australia position itself as a leader in the global race to net zero in construction.



# FREE

to industry and business professionals



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**VIC:** Dandenong MRF • Dandenong GBP • Hallam Recycling • Coburg Recycling **SA:** Adelaide SMRF



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