



Science, Technology and Education News from Australia, July 2018

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1. Science and Technology Developments

Australia leads whole wide world in batteries as market set to soar

Australia led the world in the total power of storage batteries installed in 2017, helped by a surge in residential battery installations supporting rooftop solar systems, a new report by Greentech Media finds. The report says annual installations of batteries around the world will leap six-fold in terms of power in five years – from 1.4 gigawatts in 2017 to 8.6 GW in 2022 – and nine-fold in terms of energy capacity, from 2.3 gigawatt hours to 21.4 GWh in 2022. Last year the combined power of batteries installed by Australia's 1.8 million solar rooftop homes and businesses and grid batteries such as Tesla and Neoen Australia's 100 megawatt Hornsdale Power Reserve in South Australia was 246 MW, a report by Australia's Chief Scientist Alan Finkel says. In terms of energy capacity, or "duration" – the time during which a battery can operate at full power -, Australia's battery installations were just behind the US, where 431 megawatt hours of batteries were installed compared to about 425 MWh in Australia. Germany and China each installed between 300 MWh and 400 MWh, Japan just over 250 MWh.

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E-waste mining could be big business - and good for the planet

Many millions of tonnes of televisions, phones and other electronic equipment are discarded each year, despite them being a rich source of metals. But now e-waste mining has the potential to become big business. Professor Veena Sahajwalla's mine in Australia produces gold, silver and copper - and there isn't a pick-axe in sight. Her "urban mine" at the University of New South Wales (UNSW) is extracting these materials not from rock, but from electronic gadgets. Research indicates that such facilities can actually be far more profitable than traditional mining. According to a study published recently in the journal *Environmental Science & Technology*, a typical cathode-ray tube TV contains about 450g of copper and 227g of aluminium, as well as around 5.6g of gold. While a gold mine can generate five or six grammes of the metal per tonne of raw material, that figure rises to as much as 350g per tonne when the source is discarded electronics. The International Telecommunications Union, estimates that about 45 million tonnes of e-waste was generated in 2016, and is expected to top 50 million tonnes by 2021. In 2016 alone, 435,000 tonnes of phones were discarded, despite containing as much as €9.4bn (£8.3bn) worth of raw materials.

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What a buzz: why we released millions of mozzies in northern Queensland

From November 2017 to June 2018, non-biting male mosquitoes infected with natural bacterium *Wolbachia* were released in trial zones along the Cassowary Coast of Queensland by scientists working on the Debug Innisfail project coordinated by CSIRO and James Cook University. The *Wolbachia* made the males incompatible with the local females, so when they mated the *Wolbachia* passed to the females, resulting in eggs that would never hatch. While final results are still being analysed, initial results show the population of the *Aedes aegypti* mosquito dropped by more than 80 per cent in just over three months. It was all part of an effort to trial whether specialised technology could reduce populations of the *Aedes aegypti*, an invasive mosquito capable of spreading diseases like dengue, Zika and chikungunya.

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A new battery recycling industry to tackle Australia's annual 3300 tonnes of lithium-ion battery waste could be on the cards, according to a new report

According to the report, '[Lithium battery recycling in Australia](#)', Australia could lead the world in the re-use and recycling of lithium-ion batteries, addressing this waste which is growing by 20 per cent each year and could exceed 100,000 tonnes by 2036. The report addresses growing demand for lithium-ion technology, currently used in vast quantities in electronic and household devices. An effective recycling industry could also stabilise global lithium supplies to meet consumer demand, the report says. The majority of Australia's battery waste is shipped overseas, and the waste that remains left in landfill, leading to a potential fires, environmental contamination, and risk to human health. CSIRO research is supporting recycling efforts, with research underway on processes for recovery of metals and materials, development of new battery materials, and support for the circular economy around battery reuse and recycling.

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Using synthetic biology to catch synthetic athletes

A team of scientists from the Alexandrov laboratory at the University of Queensland, uses synthetic biology techniques to create biosensors which produce light or an electrical current when activated by the presence of a molecule of interest. They identified one particular biosensor, which has great potential to be re-engineered for the purpose of sports drug testing, the glucometer strip used by diabetics to measure their blood glucose. They figured out how to re-engineer the glucometer technology - the enzyme to respond to almost any new target molecule. In the same way that diabetics have easy, affordable point-of-care testing, this research could pave the way for 'point-of-athlete' testing to help detect doping in sports. With This method costing only about \$1 per sample, large number of screenings could be done for the same cost as one of the current tests, requiring only a droplet of blood per athlete to do it.

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2. Education and Science Policy

New Research Hub to transform industrial processes for separation technologies

A new Australian Research Council (ARC) Research Hub based at Monash University will focus on research that will accelerate Australia's manufacturing capabilities in separation technologies and machinery, and train the next generation of industry-ready researchers. The new ARC Research Hub is receiving \$4 million over five years through the ARC Industrial Transformation Research Hubs scheme, part of the ARC's Industrial Transformation Research Program. The hub will develop advanced separation materials, innovative products and smart processes to reduce the energy consumption of separation processes used by many important Australian industries. The Industrial Transformation Research Hubs scheme fosters collaborative research activity between the Australian higher education sector and industry, designed to focus on strategic outcomes deemed not independently realisable.

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Australia tipped to overtake the UK as a magnet for international students

A new report by the British-based Centre for Global Higher Education predicts Australia will become the world's second highest destination for international students by 2019. Its forecasting reflects that international student numbers have risen by up to 14 per cent a year in recent years. Over the last six decades, Australian universities have built higher education into the nation's third largest export according to Universities Australia Chief Executive Catriona Jackson — an export now worth \$30 billion a year for the Australian economy. A recent Treasury paper confirms that Australia's system of limited work rights for international students does not harm Australian jobs and wages — including for younger workers.

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AI ethics hits political nerve

The regulation of artificial intelligence ethics is now a "live political issue", with several heavyweight players calling for urgent action on the matter. With \$30 million in funding for the creation of an AI roadmap and national AI ethics framework in this year's federal budget and a growing push from the Opposition for legislated regulations, it is likely to become a major issue in the lead up to the next federal election. Australia's Chief Scientist Dr Alan Finkel has urged all political parties to get on the front foot and address the myriad issues that artificial intelligence is creating. "Artificial intelligence is coming on like a freight train. We will look back on 2018 as the year that artificial intelligence really crashed into public awareness, triggering both excitement and concern. I welcome that conversation," says Dr Finkel. Across the ditch, NZ is urgently developing an AI action plan and ethical framework, while Germany became the first country late last year to legislate a series of ethical rules for autonomous vehicles. In Australia, the issue is currently centred on how artificial intelligence could be regulated to ensure it is ethical, with a particular emphasis on driverless cars.

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Bridging the tech skills gap with new data-driven talent

TAFE Digital, Australia's largest online education provider in Australia, and Ribit.net, a student jobs-matching platform, which is part of CSIRO's Data61 have announced a collaboration that will help connect TAFE Digital students to Australian startups and innovative companies offering jobs and work experience in emerging areas such as big data analytics, cybersecurity, fintech, medtech and artificial intelligence. The Ribit platform made accessible to TAFE Digital students will connect employers with student talent with skills in cyber security, AI and machine learning, information networking, website development, database design, business and data analytics. The agreement between the two organisations will involve inviting students to join the Ribit network, giving them exposure to thousands of companies looking for tech talent around Australia, and provide the opportunity for students to attend targeted events per year which introduce them with companies that are investing in data-driven talent.

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Cash: Govt the innovation enabler

Industry and Innovation Minister Michaelia Cash says the federal government's role in Australia's startup ecosystem is as an "enabler" and it's the industry's responsibility to drive it. Senator Cash cited how government grant programs like the Incubator Support Initiative had enabled industry to develop initiatives such as SheStarts, which received half a million dollars in grant funding last year. Senator Cash also spoke of the economic benefits that women could deliver if there were more female-led startups, particularly in the areas of STEM (science, technology, engineering and mathematics). Senator Cash said that the government still plans to appoint a Women in Science Ambassador by the end of the year. The Prime Minister Malcolm Turnbull announced the creation of the role on International Women's Day in March. It is unclear, however, whether the person appointed to the ambassador role will work with the women's advisory panel that is chaired by Senator Cash.

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UN ranks Aust second for eGovt

Australia has ranked number two in the world in the UN's 2018 bi-annual e-government survey for the second time in a row. Australia trails just behind Denmark, which was ranked number 9th a year earlier, while the UK slipped from first place to fourth spot. The e-government development rankings measure countries' use of information and communications technologies to deliver public services, including the quality of online services, status of telecommunication infrastructure, and existing human capacity. In its report, the UN cited the Australian's government's decision to create a Digital Transformation Agency as one of the underpinning reasons behind Australia's performance. Efforts to improve data sharing within government such as the signing of the Open Data Charter in April 2017 were also highlighted. Australia's Acting Minister for Digital Transformation Dan Tehan said the result reflected the federal government's commitment to transform Australia's digital landscape.

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