

10th International Conference on Sodium Batteries

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Keynote address

Check against delivery

May I begin by acknowledging the Traditional Owners, the Bidjigal and Gadigal people of the Eora nation, on whose land we meet. I also wish to pay my respects to their Elders, past, present and emerging.

Thanks for inviting me to address this, the 10th international conference on sodium batteries, organised by my alma mater, the University of Technology Sydney.

It's an extra honour on my part because I also serve as an adjunct professor with UTS's Institute for Sustainable Futures and UTS Business School. More on that combination a bit later on...

Now, I don't profess to be an expert in sodium batteries so you won't hear a lot from me about the exciting developments in your field.

That's what this broader conference is about. So I'll leave the chemistry to the many specialists you'll hear from in coming days.

Instead, let me share my view, as head of the Climate Change Authority, about the future of renewable energy coupled with storage.

Australia is, after all, in a very enviable position when it comes to making a successful transition off fossil fuels.

Indeed, with the prospect of political stability at the federal level for some time, investors can have more certainty about the direction of travel than in many parts of the world.

With Australia's 2035 emissions reduction target now settled too – based on our advice last month to the Government that they accepted – the speed of travel is better understood.

You might almost say Australia stands a global beacon - one powered by wind and solar energy, backed up by storage.

Let's hope we can convert that radiant concept into reality!

Science, of course, dominates our lives, even if most people don't always appreciate it – this audience obviously excepted.

You could say we are conducting a global experiment on our biosphere by burning fossil fuels and altering the chemistry of both our atmosphere and oceans.

We've had a good idea how this will end since about 1896 when the link between global warming from that fossil fuel combustion was established.

It's perhaps surprising that it took until about the 1970s to identify the impacts cycling carbon through the atmosphere would have on acidifying oceans.

Only by reaching net zero emissions – ideally by mid-century if not sooner – will we halt this potentially diabolical experiment.

And to achieve that necessary net zero goal while maintaining political support means we're going to need a lot of novel solutions – scientific and economic.

The former part is where you come in. We are blessed with more energy than we can feasibly use from renewable sources, particularly in Australia.

Having that energy available when we need it means rapidly expanding our storage capabilities. So-called “baseload” power doesn't require constant generation if you can shift its availability.

Batteries have long played useful roles in our lives but with the advances in technology in recent decades, energy storage is becoming viable on a vastly larger scale.

It's not just the convenience of the battery in your smart phone or toothbrush, of course...Increasingly, it's also the power supply for your car and the ballast for our electricity grids as we look to the skies for wind and solar energy.

So far, lithium-ion batteries have dominated the industry, and appear likely to do so for perhaps another decade.

This conference may have other ideas, but according to Bloomberg New Energy Finance, lithium iron phosphate should climb to a peak share of 92% of the utility-scale storage market by 2027.

After that, we should see emerging products - using alternative materials - beginning to erode that dominance.

Sodium ion batteries will be a part of those new alternatives - if not the main part - particularly for longer-duration energy storage projects.

The success of lithium-ion products is one reason why analysts such as Bloomberg have been paring their forecasts in the past year or so for how soon they expect sodium batteries to grab a sizeable share of the market.

Each doubling of lithium-based products has driven yet more innovations and lower cost, making it harder for sodium-ion rivals to get lift-off.

But lithium has its limitations, such as fire risks, that could open the door to alternative storage options.

Board a plane and you'll know authorities are wary about how much lithium you can pack into your hand luggage.

Poorly designed or damaged batteries have triggered a rising number of home fires in Australia, too, particularly for e-bikes.

To be clear, these challenges are more likely to relate to poor quality devices. Such episodes clearly represent a small minority otherwise we'd not be driving ever more EVs, or we'd be constantly checking our laptops or phones for signs of overheating.

While lithium is hardly a rare mineral, others such as sodium are much more common.

Crack the chemistry – as you all here are working to do – and we could be on the verge of yet another transformative technology.

There are, of course, doubters and defiers who would have us believe the answer to serving our hunger for energy is to “drill, baby, drill.”

That might have been the case some time around 50 years ago, but it's not the way forward today.

According to the International Energy Agency, almost all new investment in oil and gas since 2019 has been to replace depleting fields. As finite resources, those depletions are only going to increase.

Rather, we well into the era of “shine, baby, shine”, “blow, baby, blow” and increasingly, “store, baby, store.”

But, if we're really concerned about economics, the first step should be “save, baby, save”.

By that I mean we tend to pay too little heed towards energy efficiency. We might fret over the price of electricity and gas but not pay attention to what we're getting for those electrons or kilojoules.

The good thing is that the emerging electro-state – where electricity powers just about everything – will also usher in a far more energy-productive world.

When fossil fuels are combusted, much if not the majority of heat goes to waste.

Take those giant steam kettles within thermal power stations that James Watts might recognise if he were alive today. Or our petrol or diesel-engined vehicles, in which only a fraction of the energy released is useful.

According to researchers, Cullen and Allwood, about 88% of global primary energy is “lost” and just 12% delivered useful services.

Consider the advances being made to cut that waste. A modern LED lamp uses 60% less energy than early versions and less than a tenth as much as a traditional incandescent lamp.

Today's LED lamps also have a much longer life, leading to radical reductions in supply chain costs.

Alan Pears a doyen of energy efficiency in this country, has estimated compressed air systems in Australia consume about 10% of industrial electricity, but operate with a typical efficiency of only 10 to 20%.

Electric alternatives can save 90% and improve productivity by sharing data to optimise process performance, Pears says.

You can see why the Climate Change Authority places great store – excuse the pun – in electrification when it comes to driving down greenhouse gas emissions.

Indeed, we will need to electrify much of industry, mining, transport, even agriculture if we are to deliver on the target of cutting 2005-level emissions by 62-70% by 2035.

We have cut emissions by about 29 percentage points over the past two decades and need to deliver at least that reduction – and then some – over the coming decade.

You can imagine that it's not going to be without challenges – which is why we argue that the target is ambitious. [On a per capita basis, the reduction from 2005 levels is 76-81%...with few peers among Paris Climate signatories.]

But we should be optimistic.

The plunge in solar energy panel prices has shifted the economics of decarbonisation in the past decade. Falling battery prices will reinforce the competitiveness of renewables even more in the years ahead.

For a country like Australia, with our remarkable solar and wind resources, the opportunities are similarly impressive.

We already have the highest penetration rate of solar PV on our rooftops, with more than a third of our homes generating electricity.

The take-up of the Government's home battery program, knocking about a third off the price of the product, has been extraordinary but also instructive.

Since the scheme began in July, we've been adding about 1000 batteries every weekday. The average battery size is heading towards 20 kilowatt-hours in parts of the country.

Of course, the scientists in this room know there are more gains to come, perhaps vastly more.

Indeed, energy developers are taking the cue from the ultra-cheap auction prices for utility storage in China. They can see that past predictions are routinely rendered obsolete.

Regulators here and elsewhere need to constantly update their forecasts too.

The so-called Integrated System Plan that serves as a blueprint for Australia's electricity grid is reviewed every two years – arguably too long an interval given how fast markets are moving when it comes to solar and storage costs.

Breakthroughs in the various forms of sodium batteries should add momentum to these trends.

Flying into Sydney you might have looked down at all those factories, warehouses and shopping centres and wondered why most aren't blanketed with solar panels. These sites often operate at their peak during the day...and many would generate more than they can use.

That's a market still largely untapped. Falling prices for panels and batteries should help fill that market opportunity – with sodium-ion batteries among the likely offerings in the future.

There are also many promising co-benefits from a big burst of battery installations. For one thing, we may need a lot less transmission to be built than presently anticipated.

Australia's national electricity market, or NEM, is already among the most sprawling on the planet – stretching in an arc from northern Queensland, through NSW and Victoria to Tasmania, and around to South Australia.

Having abundant storage from sodium batteries may also reduce the need to build a fleet of new gas-fired peaker power stations.

These were only likely to be used irregularly anyway, but fewer of them may be needed altogether. That would ease the squeeze on domestic gas supplies in sectors that are relatively difficult to electrify.

And reducing demand for new gas equipment has another benefit. Try to order a new gas turbine for power generation and you'll be joining a multi-year queue.

Big batteries of various materials may also cut the need for pumped storage plants. These hydro ventures are well-known from an engineering standpoint...they have a role to play but they can be challenging to construct, as our giant Snowy 2 project demonstrates.

Batteries, in fact, can be assembled in modular form, at speed, with limited social license issues to contend with, and with reduced risk of budget blowouts.

In theory, emerging technologies could also diversify supply options. As Bloomberg has noted, China dominates the lithium supply chain, sodium-ion products are being developed elsewhere.

As with any dynamic industry, though, not every venture is going to succeed. US-based Natron Energy had planned a huge sodium-ion battery venture worth about \$2 billion Australian dollars in North Carolina but last month those well-advanced plans were halted.

It's possible that firm's hurdles will be discussed during this conference – and how those hurdles might be cleared in the future.

I began this talk by describing Australia's potential to be a global beacon for climate action – powered by renewable energy and backed up with storage.

Australia has a wealth of resources – renewable above the ground as I've mentioned, and a periodic table's worth of minerals beneath it. Sodium chloride is among them, as is lithium.

These resources have long attracted overseas capital that has helped build one of the most prosperous economies anywhere. This allure can be burnished anew with the right policy settings.

The Government here has a plan to invest in manufacturing – the Future Made in Australia program.

Picking which emerging technology and company to back is no easy feat – and structuring the incentives to crowd-in private investment seems to be the smartest way to proceed.

In the case of green hydrogen, for instance, the Government support typically kicks in only when production begins.

Should Australia get into backing sodium-ion batteries at scale, a similar approach would appear to make the most sense, although there may also be the need for strategic grants and investments too.

I would like to add one final ingredient to what I hope will make a successful mix for the future.

Tapping capital from home and abroad is one thing that Australia has a strong track record to be proud of.

We also boost an outsized representation when it comes to scientific achievement, sometimes home-grown, and other times from talent that has been drawn to these shores.

Investment, though, in basic science in Australia has been lagging some overseas counterparts. Our companies, too, have often not set aside the same share of revenue for Research & Development as their global counterparts.

For Australia to be serious players in emerging fields such as sodium batteries will require serious investment in science by governments at federal and state levels, and by our companies.

There are great benefits awaiting those who succeed in this, the greatest economic and technical transformation since the Industrial Revolution.

Here's hoping Australia pulls its weight – and then some – in this global race to the top.

Thanks for your attention, and here's wishing this conference every success.