The battle for baseload is over

Options for peaking capacity

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Introduction

Many people still see the energy debate as a competition between fossil fuels and renewables, but in truth that question has already been answered. According to the Australian Energy Market Operator (AEMO), we're in the midst of the fastest energy transition taking place anywhere in the world, and on the current trajectory it's possible that.

…renewables will make up more than **90%** of our energy mix by the mid-2030s, up from less than 30% now

Over 93 per cent of generation investment since 2012–13 has been in wind and solar capacity. Renewable energy now accounts for a greater share of generation than at any point since the construction of the Snowy Mountains Scheme.

In reality, the big question that remains is how we'll provide enough storage and firming capacity to fill temporary supply gaps in a market that will soon be dominated by renewables, as 63% of Australia's coal and gas-fired generation capacity is retired over the course of the next two decades.

The catch phrase for this capacity is dispatchable energy – power that can be switched on or ramped up as necessary to deal with peaks in demand. There are a range of options available to Australia at this point, each with vocal proponents, but from both an economic and environmental standpoint a number of them should be considered non-starters.

63% of coal and gas fired assets are retiring in next 2 decades

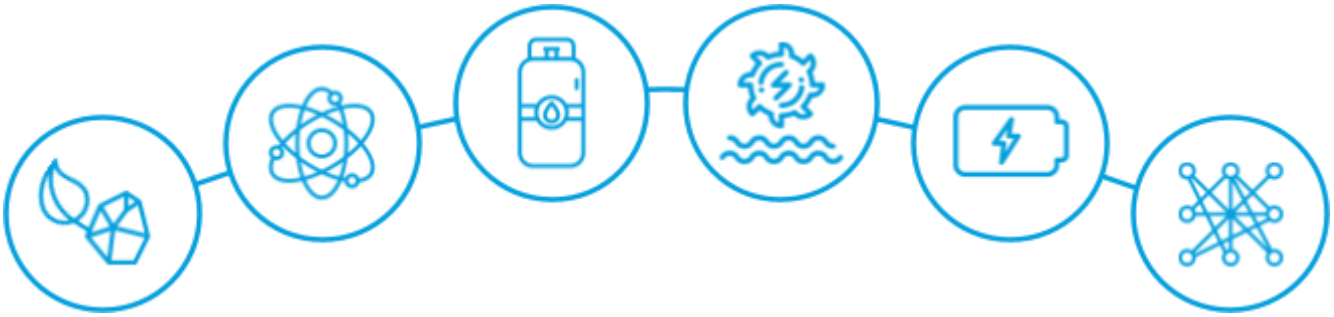
New coal

For all the flag waving for coal carried out by certain sections of the media and body politic, investors are loath to touch new coal projects in Australia, and for good reason. It's not purely because it is one of the dirtiest forms of generation available; there are (theoretically) ways to make coal cleaner, but there are few ways to make it cheap enough to compete against renewables into the future.

Part of the problem is the upfront cost – cleaner, more efficient coal generation requires new infrastructure, and Australia's coal generation is largely based around a fleet of rapidly aging power stations that would need to be replaced imminently with High Efficiency Low Emissions technology, which is expected to be a huge cost to government, since the economics are not as attractive for private investors.
The other hurdle is that, after efficiency, the second part of the clean coal equation – carbon capture and storage – is for the most part unproven technology, which despite billions in subsidies, hasn't proven to be commercially viable anywhere in the world.

Nuclear

Discussion is underway in NSW around lifting the state's ban on nuclear power to allow for the construction allow new generation of small modular reactors. Once operating, nuclear generation is low cost and produces zero emissions. But even on a small scale, the upfront costs of nuclear make it infeasible, with a recent study by the CSIRO and AEMO finding that the costs of generating from small modular reactors are still two to three times that of solar and wind generation, even when accounting for storage. Of course, this still ignores the issues of waste, weapons proliferation and public concerns around safety which plague nuclear power generation.



Gas and hydrogen

Gas is a useful adjunct to renewable energy – in the right market conditions it can be cheap, and gas-fired generators are relatively flexible, making them ideally suited as peaking capacity. Unfortunately leaning on emissions-intensive gas as a backup to renewables tends to defeat the purpose, and recent market history shows that its affordability can be highly subject to global pricing and export contracts for liquid natural gas to Asia.

The solution for gas proponents lies in the construction of plants that can run both on petroleum gas and zero-emissions green hydrogen, which is hydrogen that has been produced by renewable energy. It was recently announced that the first of these plants in Australia will be constructed in the Illawarra, and the controversial gas power station mooted for the Hunter Valley would also be hydrogen ready.

Under this model, electricity would be generated from hydrogen fuel, which was produced earlier by electricity from renewables, giving gas plants an effective role as a battery in a renewable-dominated market. As it stands, there are cheaper ways to achieve the same end and unless future technology changes that, hydrogen readiness is arguably just a way of making fossil fuel gas plants seem cleaner than they really are.

Pumped hydro

Pumped hydro is another option for storing excess energy from renewables for later consumption. It's reliable, highly amenable to scale and once primed, it is easily dispatchable – just open the gates and the turbines start turning. However, its cost and efficiency are highly dependent on geography (just witness the controversy

around Snowy Hydro 2.0), projects often have long lead times, and there are a limited number of sites where it can be deployed, especially when environmental sensitivities become an issue.

Batteries

Governments across Australia are investing heavily in new battery capacity to improve network reliability and support solar and wind generation. Battery construction involves short lead times (remember Elon Musk's 100 days or it's free pledge), and costs continue to plummet as technology improves. Importantly for the modern grid, batteries are deployable at scale and on a smaller, distributed basis, putting storage closer to generation and reinforcing the more granular future of our energy market.

In the words of the Australian Energy Market Commission, "with the global emergence of new technologies, the modern Australian electricity system is less linear and more dynamic, and in terms of the market, the lines between generators, retailers and customers are less clearly defined."

This transformation has been marked by the growth of distributed energy resources (DERs), such as household solar generation.

2.66m

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This is an enormous asset for our country, but it will take clever application of battery technology to fully utilise its potential. Clever innovation around concepts like Virtual Power Plants, which optimise the resources of a network of DERs to deliver energy at scale, are changing the face of wholesale distribution in the Australian market, potentially unlocking a new round of investment in disseminated small-scale infrastructure, including battery storage. Recent research conducted by Evergen suggests a sound appetite amongst existing small solar DER owners for further investment and innovation in the space if the incentive is clear.

Network realignment

Perhaps the most important but most often overlooked element of our renewable energy transition will be the way in which we adapt our market and infrastructure to the new reality. In terms of infrastructure this will involve steps such as introducing more interconnectors to spread supply and demand loads across states and regions, similar to the new project announced this month between NSW and South Australia. It will also involve an adjustment from a hub and spoke model concentrated around clusters of coal-fired plants to a much more distributed generation network where even the big generators lie near the edges.

At a market level, we'll likely see an increased focus on removing barriers to flexibility, allowing more dynamic pricing and incentives to shift consumption to times of low demand and rewarding DERs able to input at times of supply shortages.

Conclusion

It's a heady mix, but our current trajectory is highly encouraging, with the protests of those clinging to a centralised, emissions-intensive past being swiftly overridden by technology and the abundance of our continent's renewable energy resources.

As most home solar owners will tell you, once accepted, the economics of renewables are compelling, and in our opinion, we are confident that as a society we'll soon follow the millions of Australians with rooftop solar into a clean energy future.

About Evergen

Evergen is leading the charge using software to enable decentralised energy systems of the future. Founded in collaboration between AMP Capital and the CSIRO in 2015, Evergen has invested in some of the smartest, curious and most capable minds across the industry. Evergen now works with many retailers and network operators in Australia, in Europe, and Latin America. Evergen's mission is to kill a coal-fired power station in 10 countries by powering the transition to a resilient, renewable, decentralised energy system of the future.

For more information, visit https://evergen.energy/

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