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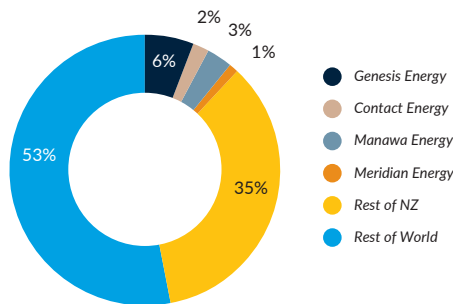
Sunny side up



Solar is about to become part of New Zealand's generation mix. One hundred and seventy three thousand terawatts of solar energy strikes the Earth continuously – more than ten thousand times the world's total energy use. But, when it comes to New Zealand's electricity market's transition away from fossil fuels, solar has long been spurned in favour of alternatives such as geothermal and wind. However, over the past 18 months there has been a tectonic shift in view. We've seen a flurry of announcements of intentions to build grid-scale solar that has now reached about 8.75 terawatt hours (TWh), the equivalent to around 20% of New Zealand's current electricity consumption.

Of note is who intends to build this solar generation. While four of the five large listed electricity companies have announced plans, they only make up a small percentage of the pipeline. Newcomers account for 88%, while international developers make up 53%.

BREAKDOWN OF POTENTIAL NEW ZEALAND SOLAR DEVELOPMENTS BY INVESTOR

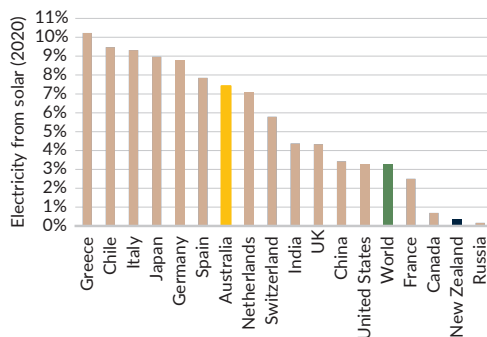


Source: Energy News, Company Announcements, Forsyth Barr Analysis

Why the sudden change of heart on solar?

Over the past decade New Zealand has been a global laggard in adopting solar technology, both rooftop and grid scale.

PERCENTAGE OF TOTAL ELECTRICITY GENERATED BY SOLAR (2020)

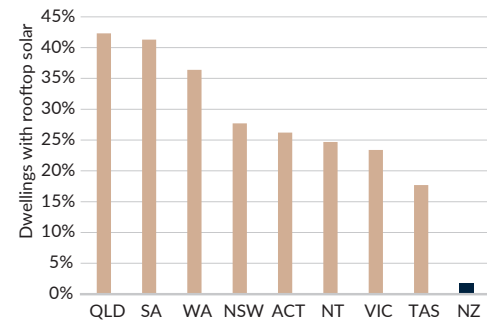


Our World in Data, Forsyth Barr Analysis

The muted rooftop uptake can largely be put down to the absence of subsidies, as well as a household demand profile that does not match the output from solar – household demand peaks in winter mornings and evenings whereas solar output is highest during the daytime in summer. Solar energy is great at supplying electricity for air conditioning, not so great at heating homes in winter.

AUSTRALIA VS NEW ZEALAND

ROOFTOP SOLAR UPTAKE

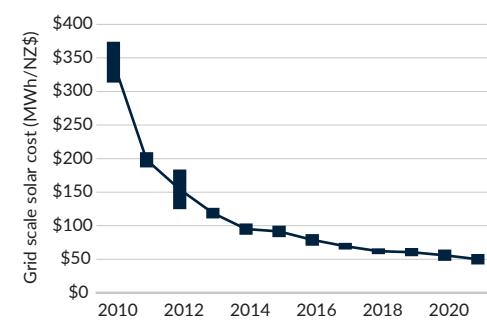


Source: Australian PV Institute, Electricity Authority, Forsyth Barr Analysis

When it comes to grid scale solar, again, no government subsidies has been a factor. The major barrier, however, has been New Zealand's strength in other renewable alternatives – wind and geothermal. These have been the main focus of development over the past two decades. In 2021, geothermal represented around 18% of New Zealand's annual generation output, wind around 6%, with rooftop solar back at less than 0.5%.

That picture is starting to change. The steady decline in solar costs, coupled with the relative ease of consenting, engineering and constructing solar, has boosted interest. Technology improvements over the past decades have made grid scale solar generation economically viable without subsidies. Since 2010, the cost of solar has fallen around 10% per annum, more if you go back earlier.

GLOBAL GRID SCALE SOLAR COST ESTIMATE



Source: Lazard, Forsyth Barr Analysis

As a late mover, New Zealand has the opportunity to avoid the pitfalls experienced by other countries such as Australia. Australia has seen an overbuild of solar in certain areas. The intermittency of solar generation – it only

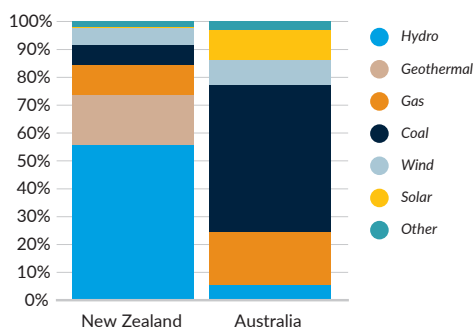


...many current users of fossil fuels...will need to be converted to electricity...

produces during the day and is highly dependent on overhead conditions — has led to volatility in the electricity market and, at times, negative electricity prices.

In our view, New Zealand’s experience with solar can and will likely be different. The Australian electricity market is dominated by thermal generation which can take days to ramp up and down. This makes it an unsuitable partner to solar — you want an alternative which can respond quickly when the sun isn’t shining. In contrast, more than half of New Zealand’s electricity system is hydro-powered which is highly flexible (so long as there’s water in the lakes!) and can easily be ramped up or down depending on whether the wind is blowing or the sun is shining.

AUSTRALIA VS NEW ZEALAND ELECTRICITY GENERATION BY SOURCE (2021)



Source: New Zealand Government, Australian Government, Forsyth Barr Analysis

large solar pipeline will be built. There remain plentiful wind and geothermal options that are cost competitive with solar. The recent spike in the price of key commodities and elevated shipping costs has seen the cost of solar panels rise for the first time. Anecdotes of delayed and cancelled projects around the world highlight that the economics of solar are often borderline. Over the longer-term the value of solar will likely be enhanced by the continued improvement in, and fall of the cost of, batteries — but the technology is not advanced sufficiently yet.

If New Zealand is to meaningfully lower its greenhouse gas emissions, many current users of fossil fuels — including transport, food processing, and manufacturing — will need to be converted to electricity. This will only be effective if that electricity comes from renewable sources. New Zealand is already fortunate to have a renewables dominated electricity system led by hydro and supported by geothermal and wind. But the task ahead should not be underestimated. Not only must New Zealand replace the roughly 15% of existing fossil fuel electricity generation, it must build enough new generation to meet the growth in electricity demand. Which according to one Transpower forecast will be about 70% above current levels by 2050.

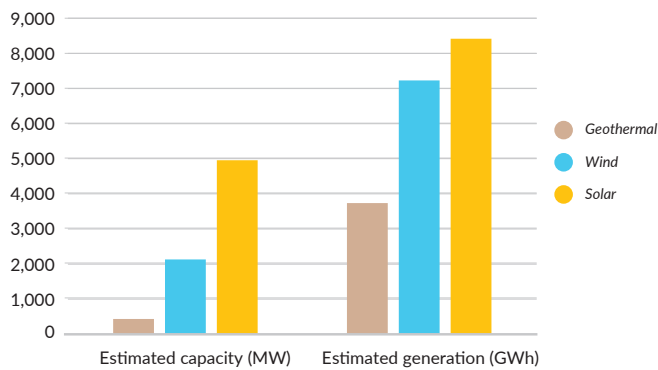
While possible, we’re not convinced all of the



**...solar has earned
a seat at the table...**

Geothermal and wind will continue to play a role, as will new technology developments over the coming decade, but solar has earned a seat at the table. Adding solar to the mix improves New Zealand's long-term options for successfully navigating toward a lower emissions future.

NEW ZEALAND SUMMARY OF ANNOUNCED GENERATION PROJECTS AND INTENTIONS (INCLUDING THOSE UNDER CONSTRUCTION)



Source: Energy News, Company Announcements, Forsyth Barr Analysis



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