BEFORE AN EXPERT PANEL
SOUTHLAND WIND FARM PROJECT

Under the	**FAST-TRACK APPROVALS ACT 2024**
In the matter of	an application for resource consents, a concession, wildlife approvals, an archaeological authority and approvals relating to complex freshwater fisheries activities in relation to the Southland Wind Farm project
By	**CONTACT ENERGY LIMITED**
	Applicant

TECHNICAL ASSESSMENT #1: ELECTRICITY SYSTEM BENEFITS

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18 August 2025

concept consulting

Electricity system benefits of the Southland Wind project

About Concept Consulting Group

We have been providing useful, high-quality advice and analysis for over 25 years. Our roots are in the electricity sector and our practice has grown from there. We have developed deep expertise across the wider energy sector, and in environmental and resource economics. We have also translated our skills to assignments in telecommunications and water infrastructure.

Our directors have held senior executive roles in the energy and telecommunications sectors, and our team has a breadth of policy, regulatory, economic analysis, strategy, modelling, forecasting and reporting expertise. Our clients include large users, suppliers, regulators and governments. Our practical experience and range of skills means we can tackle difficult problems and provide advice you can use.

For more information, please visit www.concept.co.nz.

Disclaimer

This report has been prepared for Contact Energy Limited (Contact), for the sole purpose of informing the Expert Consenting Panel's consideration of Contact's application for approvals under the Fast-track Approvals Act 2024

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Executive Summary

Key finding: If Southland Wind does not proceed, costs to consumers will likely increase by between $1.2 and $2.6bn, and emissions increase by 0.6 to 1.5 $MtCO_2e$.

In this report Concept Consulting Group (Concept):

- provide a brief description of the outlook for New Zealand's electricity market
- discuss the benefits of onshore wind generation from a national perspective
- assess the electricity benefits of the proposed Southland Wind project, including
  - reduced costs of electricity generation in New Zealand
  - reduced consumer bills, and
  - reduced carbon emissions.

Renewable generation will need to be developed at pace

Like every other industrial economy, New Zealand is facing significant future electricity demand growth due to: a) decarbonisation-through-electrification of transport, industrial process heat, and gas-fired space & water heating; and b) significant new demand segments such as data centres.

Coupled with the need to displace existing fossil-fuelled generation stations, this is giving rise to a projected need to build new renewable generation over the next three decades at almost seven-times the rate seen over the last three decades.

Onshore wind development should provide a $16bn benefit to New Zealand consumers and substantially lower emissions

Onshore wind generation, along with solar and geothermal, is projected to play a key role in meeting this need. However, if onshore wind generation were not an option to meet this need, our modelling indicates that it would increase electricity costs to consumers by almost $16bn in present value terms over the period 2025-2050.

This increase is due to:

- needing to develop higher-cost solar, geothermal, and *offshore* wind projects that would not otherwise need to be developed, plus
- calling upon a greater amount of high-cost thermal generation than would otherwise be the case. This will also materially increase New Zealand's emissions.

Southland Wind will reduce the time of electricity market scarcity, lower emissions, and displace more expensive renewable projects

If the Southland Wind project specifically were not to go ahead, we estimate it would increase the costs to electricity consumers by between $1.2 and $2.6bn in present value terms. This is because the loss of a project of such a significant scale will:

1) Prolong the time that New Zealand experiences elevated prices due to being short of renewable generation. Estimated cost: $0.5bn to $1bn.
2) Require more expensive wind and solar projects to be built to replace it. Estimated cost (additional to the above): $0.7bn to $1.6bn. In this, it should be noted that the Southland Wind project has some significant advantages compared to other projects – economies of scale and quality of wind resource – meaning that it is highly likely that the project is at the low end of the renewable cost-supply curve.

Some of the cost increase is due to increased operation of thermal stations. This is estimated to result in an additional 0.6 to 1.5 $MtCO_2e$ emissions. This is equivalent to between 22% and 60% of New Zealand's combined domestic and international aviation emissions for 2022.

1 Scope, context, and authorship of this report

1.1 Scope

Concept Consulting Group (Concept) has been asked to:

- provide a brief description of the outlook for New Zealand's electricity market
- discuss the benefits of wind generation from a national perspective
- assess the following specific benefits of the proposed Southland Wind project:
  - reduced costs of electricity generation
  - reduced electricity prices and consumer bills, and
  - reduced carbon emissions.

1.2 Context

We understand that this report is to be submitted as expert witness evidence in relation to Contact Energy's application for the Southland Wind project to be assessed under the Fast-track Approvals Act 2024.

1.2.1 Code of Conduct

In this context, we confirm that we have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. In particular, unless we state otherwise, this assessment is within our area of expertise, and we have not omitted to consider material facts known to us that might alter or detract from the opinions we express.

1.3 Authorship

This report has been prepared by Simon Coates and Rachel Holden.

Simon Coates is a director at Concept Consulting, and leads its modelling practice. Throughout his 35-year career, he has advised market participants and public sector agencies (particularly the Electricity Authority, MBIE, and the Commerce Commission) on electricity market issues, including undertaking market modelling and market forecasting.

Prior to joining Concept in 2007, Simon was at Contact Energy in a variety of roles, finishing as Chief Information Officer. Prior to Contact, Simon was a Senior Consultant at an Oxford-based energy consultancy where he specialised in European electricity market analysis.

Simon has a first class honours degree in Physics, and a Masters in Environmental Technology (Energy Policy specialisation).

Rachel Holden is a Senior Consultant at Concept Consulting. Since joining Concept in 2012, Rachel has specialised in advising public and private sector clients on regulatory policy, market design, and economic analyses.

Rachel is an economist who started her career at the Reserve Bank of New Zealand as a financial markets and economic analyst. From there she moved into regulatory policy roles, working at the Commerce Commission and consulting on energy and environmental policy at two other consulting firms.

Rachel has a BCA Hons, 1st class (Economics, Money and Finance), and a BSc (Mathematics, Statistics).

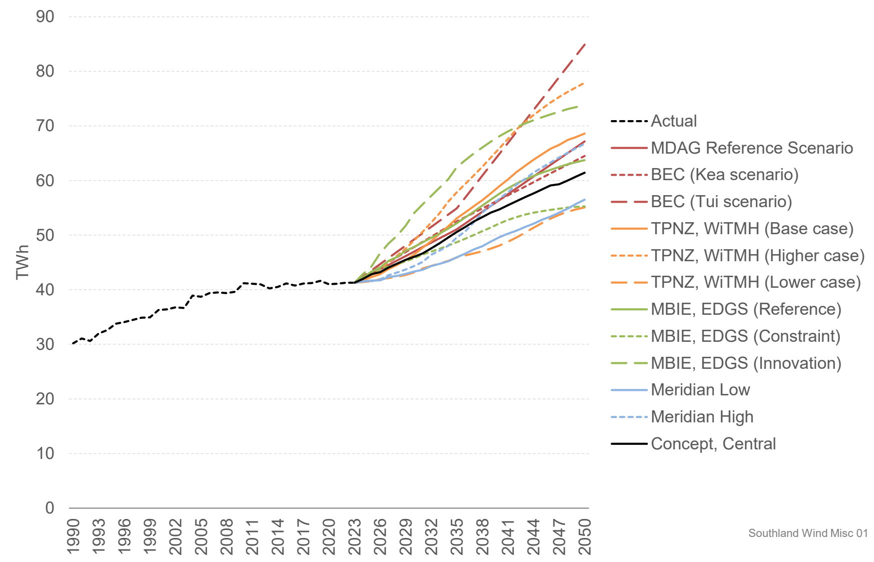
2 Outlook for electricity market

2.1 Electricity demand is forecast to increase substantially

The total demand for electricity in New Zealand is currently around 40,500 GWh per year.[1] Electricity demand is forecast to grow substantially over the next 25-30 years as electricity is used to help decarbonise the economy. Most of the increase is expected to come from rising ownership and use of electric vehicles (EVs), switching away from fossil fuels as a source of process heat in industry, and switching away from gas and LPG for space and water heating. These drivers of increasing demand will likely be partially offset by improving energy efficiency. Additionally, significant demand growth may emerge from new types of demand, including data centres, and the production of 'e-fuels'.[2]

The expected upward trend in electricity demand is illustrated by Figure 1 which shows some long-term New Zealand electricity usage projections published in recent years by different forecasters.

Figure 1: Projected future electricity demand[3]



While there is some inherent uncertainty in these demand projections (particularly further out), we note that all the parties represented in Figure 1 are predicting significant growth (33% – 100%) in electricity demand over the next 25 years.

[1] Ministry of Business, Innovation and Employment (MBIE). *Electricity data tables.* [Electricity statistics | Ministry of Business, Innovation & Employment].
[2] E-fuels are liquid or gaseous fuels that use renewable electricity as a primary input source. Examples include liquid fuels for transport, and hydrogen as a gaseous fuel.
[3] Sources: MBIE data, Market Development Advisory Group data, Transpower (TPNZ) data, Business Energy Council (BEC) data, Meridian Investor Presentation, Concept analysis.

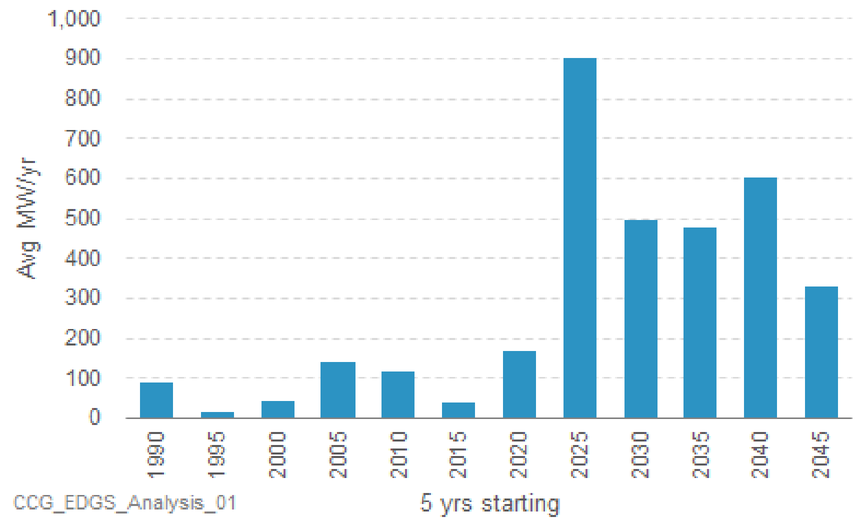
2.2 Renewable generation will need to be developed at pace

New Zealand will need to build a vast amount of new renewable generation in the next few decades. Some of this is needed to displace existing fossil-fuelled generation to directly reduce electricity sector emissions. However, an even greater volume will be needed to meet the projected electricity demand growth discussed above in section 2.1.

The pace at which new generation is developed (particularly renewables) will need to increase substantially. The required pace of development is going to be particularly acute in the next five to ten years given that New Zealand's supply / demand balance is in a situation of relative scarcity, which is giving rise to the current situation of high wholesale electricity prices – as discussed in section 4.1 later.

As shown in Figure 2 below, according to the government's central ('Reference') scenario, around 500 MW of new renewable generation capacity needs to be built every year until 2050 to keep up with demand growth and displace existing fossil generation from much of their current operating duties. This will require much faster build than has occurred over the past few decades, which averaged approximately 75 MW of renewable generation capacity build per year for the period 1990 to 2020. Further, as existing renewable generation projects reach the end of their economic life and need re-powering (as is already happening to some of New Zealand's oldest windfarms and geothermal power stations), the actual amount of renewable generation capacity needing to be built will be even greater.

Figure 2: Historical and projected annual rates of gross renewable capacity generation additions[4]



[4] Source: Concept analysis of various historical data and Concept modelling of market futures. This projection uses the 'Concept, Central' demand projection shown in Figure 1. This assessment ignores the extent to which capacity will need to be built to replace existing power stations that have reached the end of their economic life. Such 'repowering' is unlikely to be a material issue for utility solar generation but could be more significant for windfarms.

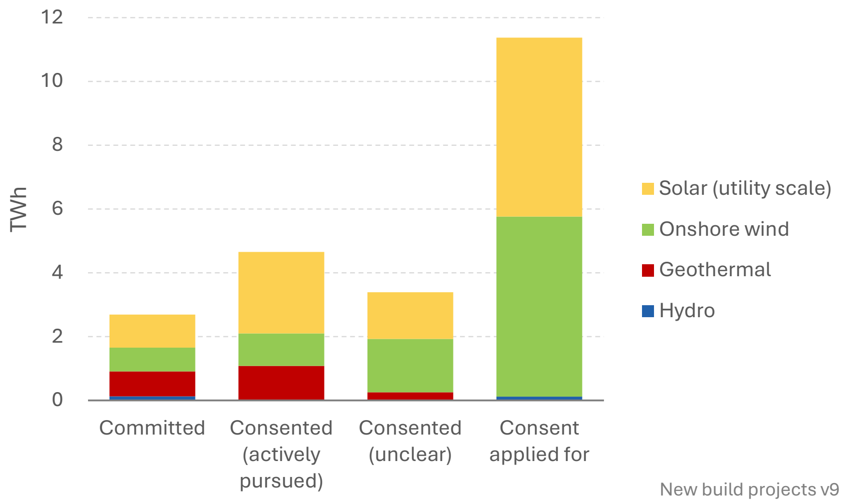
3 Benefits of wind generation from a national perspective

3.1 Wind generation is expected to be a significant contributor to future renewable build

The exact make-up of the new generation build will depend on a range of factors including the relative costs of different technologies and the availability of consented sites. However, wind generation is expected to make up a significant part of this generation build alongside utility solar generation and some geothermal.

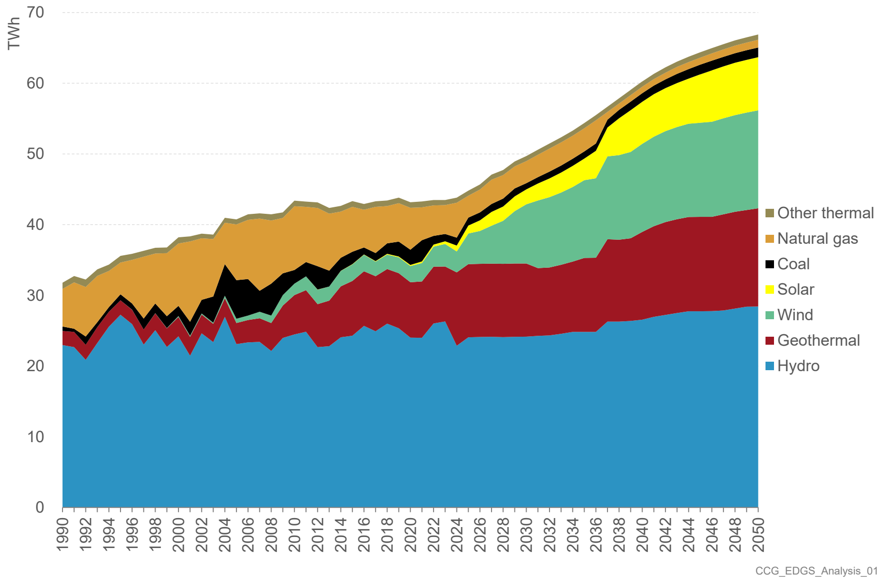
For example, Figure 3 shows a breakdown of publicly announced renewable projects that have at least reached the stage of applying for consents, split by technology and development stage.

Figure 3: Future generation pipeline (GWh)[5]



Looking further ahead, the Ministry of Business, Innovation and Employment's (MBIE) electricity demand generation scenarios (EDGS) project that growth in wind generation will make the greatest contribution of all the energy technologies to meeting demand growth and displacing fossil generation. In its Reference case scenario, MBIE projects that the amount of electricity generated from wind generation in 2050 will be almost five times the amount generated in 2024 – see Figure 4 below. This projected increase may be an under-estimate, as EDGS assumes that a material slice of new supply will come from hydro generation. However, this may not be achievable due to consenting constraints and economic challenges, and even more wind and solar generation may need to fill this gap.

Figure 4: Historical and projected future electricity supply (MBIE EDGS reference case)[6]



[5] Source: Concept calculations based on publicly available information.
[6] Source: MBIE EDGS data.

3.2 Wind generation should materially lower the costs of electricity supply

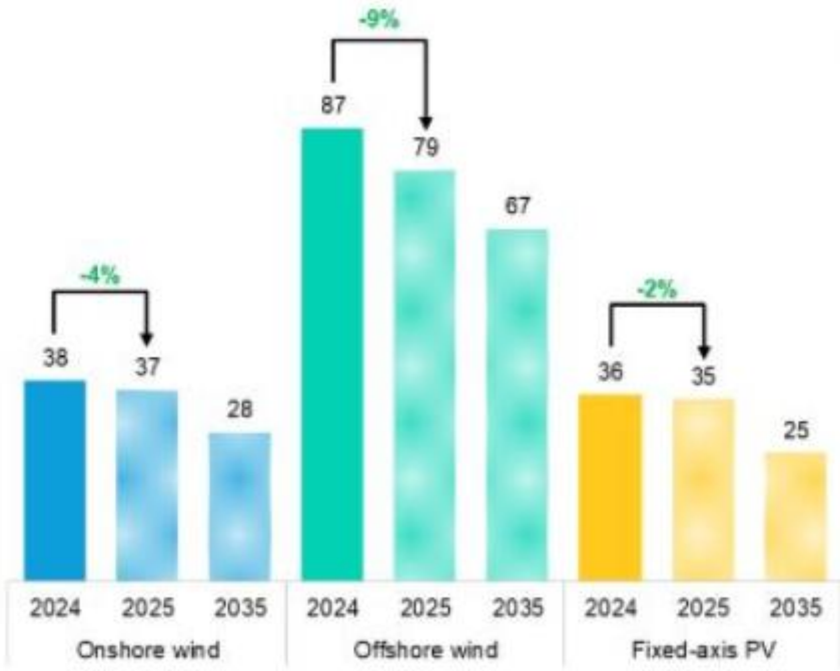
The reason that wind is projected to be the most important source of new generation is for three reasons:

1) it is relatively low cost to build
2) it delivers more consistent output than solar
3) it has a much larger developable resource than geothermal.

With regards to cost, wind has enjoyed steady reductions in cost as global wind technology improves. This has made it a cheaper option than building new gas-fired power stations to meet increases in demand, even without a cost of carbon.

This reduction in cost is projected to continue. However, as illustrated in Figure 5, solar PV is also projected to fall in price to an extent that, on a levelised cost of energy (LCOE) basis it will become cheaper than wind.[7] While Figure 5 shows a global average projection, this changing cost dynamic also holds true for New Zealand.

Figure 5: Global benchmark levelised cost of electricity (LCOE)



Source: https://about.bnef.com/blog/global-cost-of-renewables-to-continue-falling-in-2025-as-china-extends-manufacturing-lead-bloombergnef/

The reason why wind is projected to continue to be the most important new generation technology even when solar is ostensibly cheaper to build is because of the second key factor: wind delivers a more consistent output than solar.

In this respect, both wind and solar are variable renewable technologies, with output varying depending on whether the wind is blowing or the sun shining. At times when the wind is not blowing, or the sun not shining, it is

[7] The levelised cost of energy (LCOE) of a technology is simply its annual cost (including the amortisation of any capital costs) divided by the annual MWh it can generate.

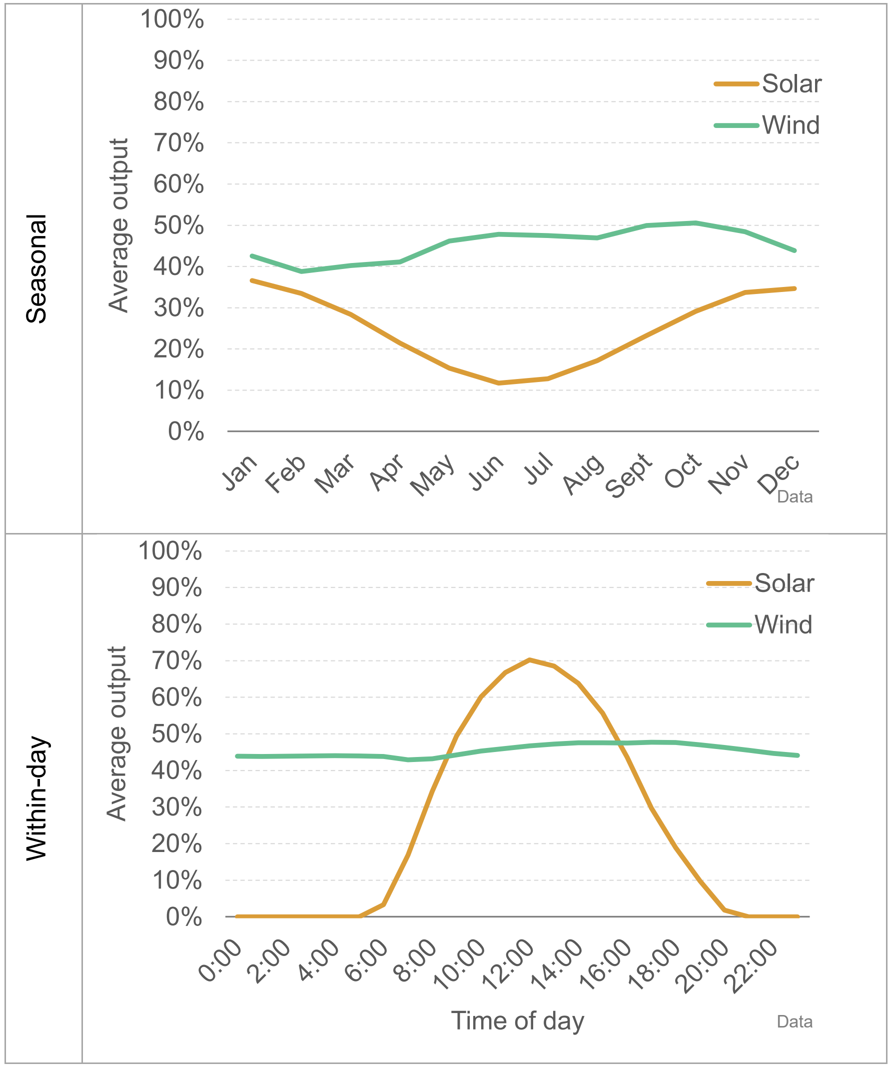
necessary to procure generation from alternative generation sources that can be turned on to 'firm' these variable renewable technologies. This may be from hydro schemes with storage lakes, but it may also be from thermal generation technologies such as coal- or gas-fired power stations, or from batteries. Procuring such power to 'firm' these variable renewable technologies is costly. Accordingly, the total cost of a renewable technology is its LCOE plus the cost of firming.

This firming cost is significantly greater for solar than wind for two reasons:

- Per MW of installed capacity, solar generates roughly half the amount of generation as wind. This means that roughly twice as much firming is required for solar than for wind.
- Solar's output is low or zero at times of greatest demand when the need for generation is greatest, and the associated firming costs are highest. Specifically:
  - its output is much lower in winter than summer.
  - its output is low (zero in winter) at the times of the morning and evening peaks.

In contrast, wind's output is – on average – more consistent throughout the day and year. In fact, being slightly greater in winter than in summer. This variation in output profiles between the two technologies is illustrated in Figure 6 below.

Figure 6: Average generation profiles for wind and solar



This firming cost dynamic means that, even though solar is moving to become the lowest cost on an LCOE basis, onshore wind is still cost-competitive on a total-cost basis.

The reason why wind won't completely dominate the demand for new generation is because firming costs per GWh of output grow as the technology's share of total generation grows. This creates a dynamic where a mix of technologies becomes the least-cost option – albeit with wind projected to contribute a greater proportion of that mix.[8]

As the proportion of generation from wind and solar grows, their firming costs will also grow. This will tend to make geothermal, with its firm generation profile, progressively more attractive. However, the reason that geothermal doesn't dominate is because, as indicated by Figure 3 previously, there is much less of a projected resource that can be developed compared to wind – ie, the third of the three reasons why wind is projected to be the most important technology to meet the need for new renewable generation.

These dynamics explain why the various projections of generation development in New Zealand from the likes of MBIE, the big generators, and Concept's own projections, all show a *mix* of generation technologies being developed – principally wind, utility solar, plus geothermal – even though on an LCOE basis the future cost of utility solar is projected to be cheaper than wind which, in turn, is projected to be cheaper than geothermal.

Even though the majority of New Zealand's generation is currently from hydro, the prospects for significant additional hydro developments are limited. This is partly because of environmental consenting constraints associated with flooding valleys, but also because the costs of other renewable technologies have fallen below that of new hydro development.

The prospects for the economic development of rooftop solar are limited because it is a significantly higher cost option than utility solar and other utility scale renewable technologies such as wind and geothermal.

Developing a more balanced mix of generation materially lowers the firming costs associated with renewable generation. This is because it is generally the case that there is little correlation between periods of high/low sunshine and corresponding periods of high/low wind or high/low precipitation. Indeed, there is actually a *negative* correlation between sunshine and precipitation and (to a lesser extent) wind. Accordingly, this significantly lessens the extent to which output will concurrently be low across all types of variable renewable generation.

Were it to be the case that onshore wind was not an option to meet New Zealand's growing electricity needs, greater amounts of other sources of generation – particularly utility solar, geothermal, and *offshore* wind – would need to be developed.

These other sources of generation will be more costly for a variety of reasons:

- the greater amount of solar generation that will need to be developed will result in higher firming costs
- there will be a need to move further up the cost-supply curve of available renewable projects.

This last point reflects the fact that not all renewable energy projects of a particular technology are of equal cost. Variations in the following factors result in material differences in the cost of power from the best project compared to the worst project:

- quality of the renewable resource (eg, wind or geothermal fluid),
- local geophysical characteristics and the subsequent civil engineering costs to access the resource (principally applies to wind and geothermal), and
- costs of connecting to the electricity network, driven by variations in the proximity to the network and extent of spare capacity on that part of the network (applies to all renewable projects).

[8] As an aside, it is worth noting that wind is expected to be proportionally more valuable than solar in New Zealand compared to Australia, because New Zealand's electricity demand is greatest in winter – when solar's output is least – whereas Australia's demand is greatest in summer – when solar's output is greatest.

3.3 Onshore wind generation could provide a $16bn benefit to New Zealand consumers

To estimate the scale of benefit from onshore wind generation development, Concept undertook market projections using its ENZ model. This model has been used extensively to produce projections for government and private sector parties in support of a wide range of projects ranging from policy development, through to investment cases for major energy projects. In brief, ENZ's key characteristics are:

- It is a whole-economy model that models the different parts of New Zealand's energy-using and emissions-producing economy.
- It has specific modules that model individual sectors, including a detailed electricity market model.
- It captures the inter-linkages between different economic sectors. For example, increased uptake of EVs will increase electricity demand which, in turn, will increase electricity prices which, in turn, will affect the rate of uptake of EVs. Resolving this circularity is achieved through an optimisation approach within the model.
- A key feature of the electricity module is that it progressively builds and retires generation plant to meet demand in a way that achieves a balanced system taking account of the key constraints and characteristics of demand, the different generation technologies, and the different fuel options. In particular,
  - the variability of both demand and some renewable energy technologies (hydro, wind, solar)
  - the cost and capital structure (ie, balance between capital costs, fixed costs, and variable costs) of the different generation technologies
  - the availability and cost of thermal fuels, including the ability and cost of providing 'flexible' low-capacity factor fuel to meet infrequent requirements such as meeting periods of low renewable generation during 'dry-year' or 'dunkelflaute' periods.[9]

To estimate the scale of benefit from wind generation, ENZ was run to produce market projections for two different 'worlds':

1) a world where there were no constraints on the ability of onshore wind generation to be developed – to the extent it is cost-effective to do so
2) a world where there is no ability to develop onshore wind generation, beyond that which is already committed.

Without the ability to develop onshore wind generation in the second world, ENZ must call upon other, higher-cost sources of generation to meet demand. This higher-cost generation leads to higher electricity prices which, in turn, will affect the rate of electrification for the rest of the economy.

Figure 7 and Figure 8 show the projected generation for the 'with' and 'without' onshore wind generation scenarios, respectively.

Box 1: Explaining 'Spill'

It is worth noting that in a high-renewable future, a significant amount of the renewable generation is likely to be 'spilled' during periods where the amount of uncontrolled renewable generation is greater than the amount of demand on the system and greater than the ability of storage devices (batteries or hydro reservoirs) to store such excess.

It is hard to attribute causality to which type of renewable generation is causing spill, noting that all forms will be contributing to surplus to varying extents. Accordingly, Figure 7 and Figure 8 show the output of all renewable generation on an unconstrained basis, plus show the quantity of generation that would be spilled as the dashed line below the x-axis plus shows an additional line showing the total 'useful' generation that is required to meet demand.

The reality of what renewable generation would actually be spilled during surplus is most likely to be a combination of (in order of likely eventuality due to the hierarchy of short-run marginal costs (SRMCs) of operation and

[9] Dry-year periods are shorthand for situations of low hydro inflows. Dunkelflaute is a German word that literally means 'dark doldrums' and refers to periods of low sun and wind generation.

practicality of turning generation down): wind turbines being feathered, water being spilled over the top of reservoirs, and (less likely) geothermal plant being turned down. However, despite this hierarchy of what is spilled, *all* renewable generation, including wind, will have contributed to the need to spill.

Figure 7: Projected 'with onshore wind' generation[10]

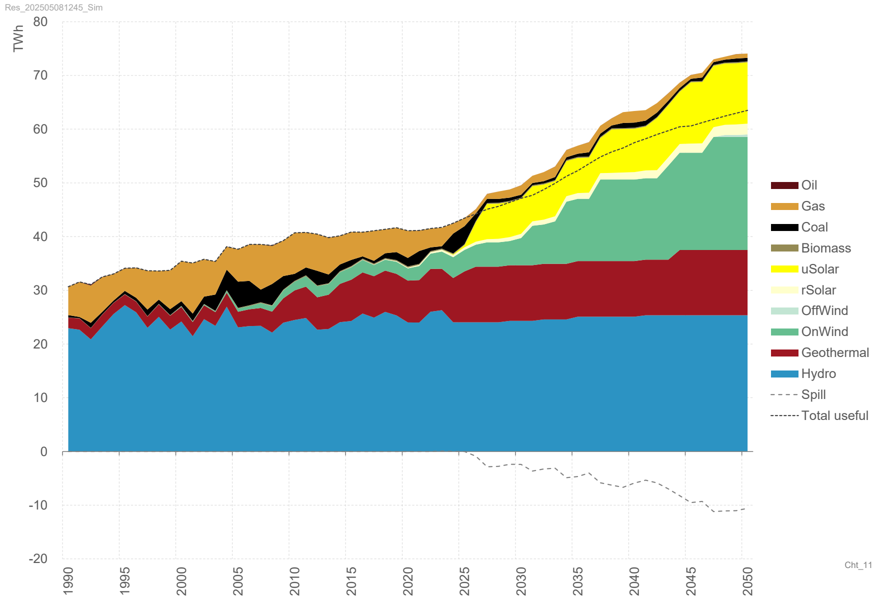
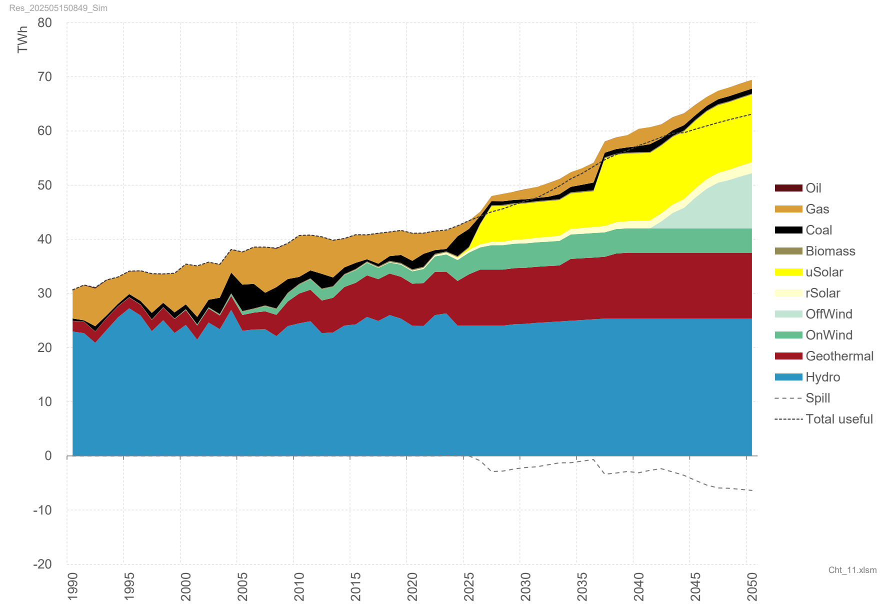


Figure 8: Projected 'without onshore wind' generation

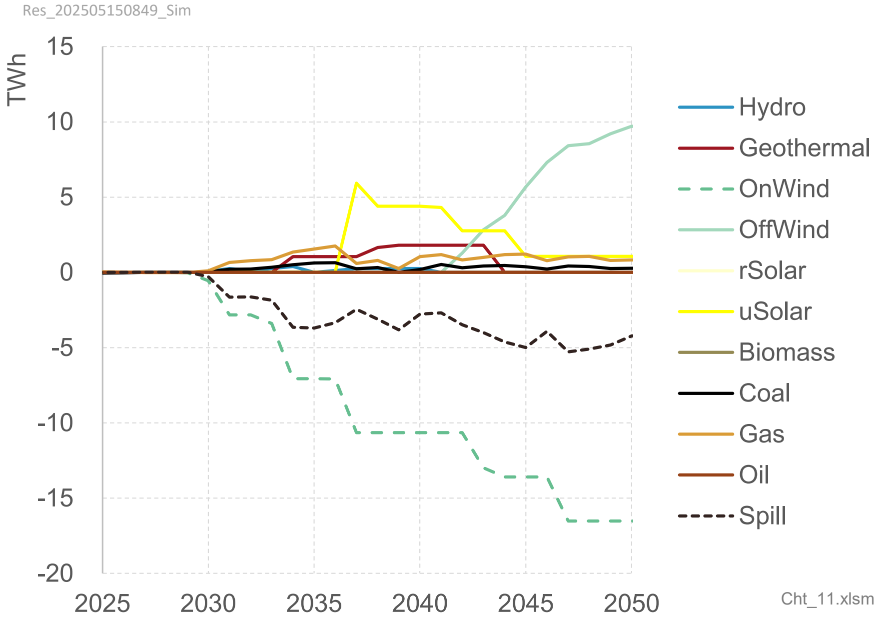


As can be seen, the low cost of onshore wind generation means that, if there are no constraints on its development, it is projected to meet a significant share of the renewable generation required to meet the growth in electricity demand and displace existing thermals from their high-capacity factor roles.

Figure 9 shows the difference between the two scenarios. The lines above the x-axis show what has increased in the world without onshore wind, the lines below the axis show what has decreased in the world without onshore wind (ie, onshore wind itself, but also spill).

[10] 'rSolar' = rooftop Solar, 'uSolar' = Utility-scale solar, 'OnWind' = Onshore wind, 'OffWind' = Offshore wind

Figure 9: Difference in projected generation moving from the 'with onshore wind' to 'without onshore wind' scenarios

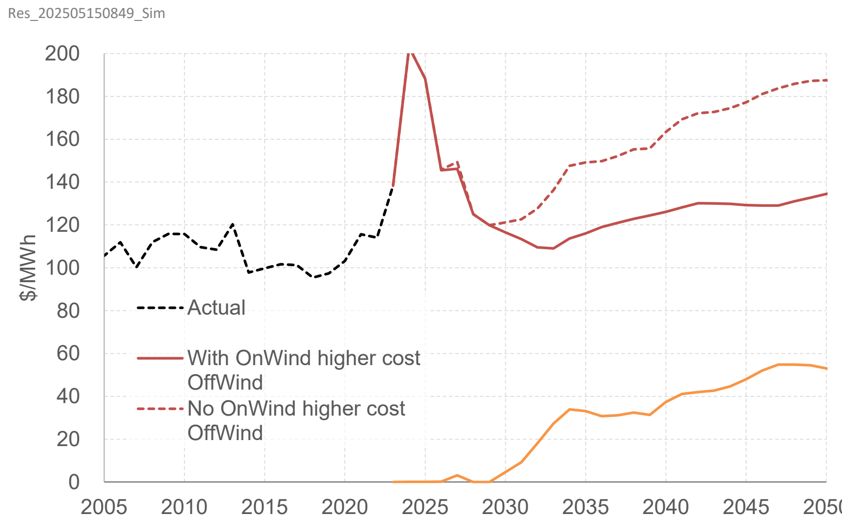


This shows that the main technologies to fill the gap if no further onshore wind is developed are solar, geothermal, and *offshore* wind – plus some additional gas and coal-fired generation in the near term.

Interestingly, it also shows that there will be slightly less spill. This reflects the fact that, although relatively low cost, onshore wind generation has lower capacity factors than offshore wind and geothermal, and thus is slightly harder to balance than offshore wind and geothermal (ie, the firming costs of onshore wind generation are greater than these other renewable options).[11] It also reflects marginally less electricity demand due to the higher electricity prices slowing the rate of electrification of industrial process heat. However, this is a relatively second-order effect in terms of spill.

From a consumer perspective, the principal consequence of a world where onshore wind is not able to be developed, is the effect on electricity prices. This is shown in Figure 10.

Figure 10: Wholesale electricity price projections in 'with' and 'without' onshore wind scenarios (Real $2024)[12]



As can be seen, not being able to develop onshore wind would likely increase New Zealand's electricity prices, due to needing to access other, higher-cost forms of generation to meet demand growth and displace fossil generation.

The average increase in wholesale electricity prices over the period 2025 to 2050 is approximately $30/MWh. When multiplied by total consumer

[11] The capacity factor of a generator is equal to the expected annual output of the generator, divided by its annual output if it were operating at its maximum potential output for every hour of the year. We assume the following average capacity factors: Utility solar projects ≈ 20%, onshore wind of ≈ 40%, offshore wind ≈ 50%, geothermal ≈ 90%.

[12] The 'Actual' prices are observed hedge prices traded a year in advance of the year in question – ie, removing the effects of any hydrology. This is to enable comparison with the projected prices which are based on the average across all possible weather situations.

demand, the total increase in consumer bills over the period 2025 to 2050 is approximately $16 billion on a present value basis.[13]

Onshore wind delivers significant emissions savings

The 'without onshore wind' world results in an extra 15.2 MtCO_2e emissions out to 2050 than the 'with onshore wind' world. Approximately 96% of this increase is due to increased fossil generation and (to a much lesser extent) increased geothermal emissions. However, another 4% is due to the reduced rate of electrification of fossil heating and transport in the rest of the economy due to the higher electricity prices.

15.2 MtCO_2e is significant: equivalent to over half of New Zealand's Energy-related emissions (including transport) for 2022.

4 Specific electricity benefits of Southland Wind project

Section 3.3 set out that development of wind generation, nationally, can deliver significant economic benefits to New Zealand.

However, there are likely to be benefits specific to the Southland Wind project that would be lost were it not to proceed and be replaced by another renewable energy project (utility solar or otherwise).

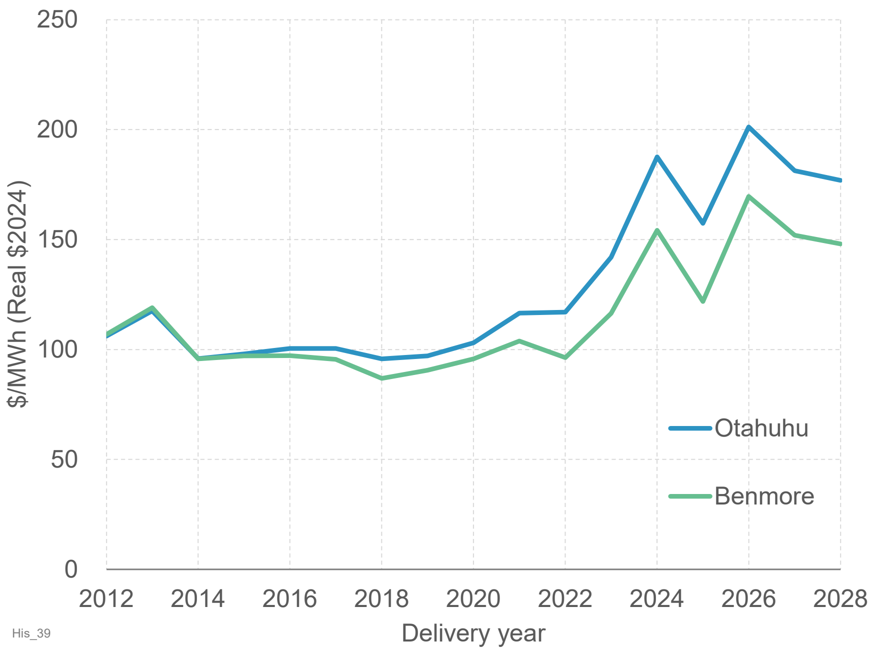
4.1 Reducing the time of market scarcity

As illustrated in Figure 11, the New Zealand electricity market is currently experiencing elevated market prices, and the market is not expecting them to fall back to equilibrium levels (estimated to be approximately $110/MWh, driven by the LRMC of new renewables) by 2028.

This market forward curve is broadly consistent with our modelling shown in Figure 10 (above) which indicates that equilibrium levels won't be achieved until the early 2030s. (Albeit our modelling is indicating that the prices should fall at a faster rate in the earlier years of the projection than the ASX forward curve is currently indicating).

[13] The present value calculation has used a 6% discount rate.

Figure 11: ASX forward curve[14]



If the Southland Wind project doesn't proceed, it will take longer for the market to return to equilibrium levels, depending on how quickly other projects can be accelerated to fill the gap that would be left by Southland Wind not proceeding.

In addition to this price effect, until these other accelerated renewable projects can come on stream, the generation that would have been provided by the Southland Wind project will need to come from fossil generation, increasing emissions.

To explore the potential scale of this effect, Concept undertook modelling which considered the likely outcomes for two scenarios around how quickly other renewable projects can be accelerated to fill the gap left if Southland Wind doesn't proceed[15]:

- A 'Slow catch-up' scenario, where it would take 12 months beyond when Southland Wind would have first started generating for the first of the accelerated projects to come on stream, and then a relatively slow build after that so that it would take a further 24 months before sufficient renewable projects will have been brought forward for the lost Southland Wind generation to have been completely made up.
- A 'Fast catch-up' scenario, where the first of the accelerated projects would come on stream within 6 months of when Southland Wind would otherwise have first started generating, and it only taking 12 months beyond that for sufficient renewables to have been progressively brought forward to the point where all the lost Southland Wind generation would have been made up.

The modelling used the current ASX forward curve as the basis for future price outcomes.

The results of this analysis are shown in Table 1.

Table 1: Short-to-medium term effects of Southland Wind project not proceeding

	Slow catch-up	Fast catch-up
Period of time of elevated prices (yrs)	3.1	1.6
Avg price increase during elevated period ($/MWh)	10	9
NPV of increased costs to consumers ($m)	1,050	501
Increased thermal gen (TWh)	2.18	0.80
Increased emissions (MtCO2e)	1.51	0.56

Southland Wind Misc 03

[14] Source: Concept analysis of ASX contract prices. The prices for 2026+ are based on the prices in the market as at April 2025. The prices for the prior years (2024 and earlier) are based on the traded prices one year in advance of the relevant year. (Eg, the price for 2023 is the price traded in December 2021). This is to remove the near-term effects of hydrology. The reason the 2025 price is so low is because the market outlook in December 2023 was much more benign, in that the major gas supply issues which emerged during 2024 had yet to manifest themselves, and it was not known that 2025 would be as dry as it is turning out to be.
[15] Under advisement from Contact Energy, we have assumed that if the Southland Wind project receives consents by the end of this year, the scheme would progressively come on line over a 12-month period from 1-Dec-28 to 1-Dec-29.

The scale of increased costs to consumers ($500m to $1,050m) is indicative of:

- The extent of the renewable shortage situation that New Zealand currently faces, and the time the market is indicating it will take to build sufficient renewables to bring the market back into balance; and
- The scale of the Southland Wind project, and the consequent significant effect it would have on bringing the market back towards balance.

Significant emissions saving from Southland wind

- During the period of prolonged generation scarcity, most of the generation that Southland Wind would have provided will need to come from fossil generation.
- The extra emissions (between 0.6 to 1.5 $MtCO_2e$) are significant: equivalent to between 22% and 60% of New Zealand's combined domestic *and international* aviation emissions for 2022.

4.2 Displacing more expensive renewable projects

As set out previously on page 11, variations in factors such as renewable resource quality, civil engineering costs, and grid connection costs, mean there is an upward-sloping cost-supply curve for renewable projects.

Accordingly, another benefit specific to the Southland Wind project is that, were the project not to proceed, New Zealand will need to move incrementally up the cost-supply curve of available renewable generation projects to meet the demand that the Southland Wind project would otherwise have met.

Table 2 shows the results of the calculations of the effect of needing to move up the cost-supply curve of potential wind and solar projects if the Southland Wind project were not to proceed. The two columns relate to two scenarios relating to the steepness of the cost-supply curve, as set out in Appendix A:

- Based on observations of wind-farms built to-date
- Based on an MBIE estimate

This calculation is for the period beyond the time when the market is assumed to move into equilibrium – noting that the calculations set out in section 4.1 above address the period prior to the market reaching equilibrium, and it would be double-counting to also ascribe the effect of moving up the renewable cost-supply-curve to the pre-equilibrium period.

Table 2: Estimated effect of moving up renewable cost-supply curve by amount equivalent to output of Southland Wind project[16]

	Observed	MBIE-estimated
Wind cost-supply curve slope ($/MWh/GW)	11	4.8
Estimated relative slope of solar	15%	15%
Effect of not proceeding w. Southland wind project		
Avg increase in NZ electricity prices ($/MWh)	3.0	1.3
Aggregate cost increase for NZ consumers ($m/yr)	174	76
Present value of cost increases over life of project ($m)	1,625	715

Southland Wind Misc 01

The calculations presented in Table 2 indicate that, were the project not to proceed, the present value of the cost to consumers from the higher electricity prices that would likely eventuate is most-likely $715m (using the MBIE-estimated renewable cost-supply-curve) but could be higher. This is additional to the $500m to $1,000m calculated in the previous section related to the project not proceeding while the market is still short of generation.

The fact that the Southland Wind project has some significant advantages compared to other wind projects – economies of scale, good wind resource – means that it is highly likely that the project is at the low end of the wind cost-supply curve. As such, there is a high degree of confidence

[16] Aggregate cost to consumers based on an estimated average 58 TWh total NZ average annual electricity consumption over the project's life. Present value calculated assuming a 25-year project life using a 6% discount rate, but not counting the years where the market is assumed to be short of capacity, as this would be double-counting with the effect calculated in section 4.1.

that, were the project not to proceed, the consumer cost impacts detailed above would eventuate.

4.3 What if a similar project were to replace it?

The proposed Southland Wind Farm is not the only potential wind farm in the Lower South Island. For example, the proposed Kaihiku wind farm near Balclutha is of a very similar scale.

The effects detailed in 4.1 and 4.2 above would still occur if the Southland Wind project wasn't to proceed, yet Kaihiku did proceed, except if the two projects were mutually exclusive. Ie, if Kaihiku could only proceed if Southland Wind could not.

As the two projects are approximately 65 km distant from each other, there does not appear to be a fundamental reason why both could not proceed.

5 Summary conclusions

Because of the scale and quality of the Southland Wind project, were it not to proceed it is estimated it would materially increase costs to consumers by between $1.2 and $2.6bn in present value terms. This is for two reasons:

- It would prolong the time of New Zealand being short of renewable generation. Estimated cost: $0.5bn to $1bn
- It would require New Zealand to incrementally move up the cost-supply-curve of available renewable generation projects. Estimated cost (additional to the above): $0.7bn to $1.6bn.

Furthermore, during the period of prolonged generation scarcity, a significant proportion of the generation that Southland Wind would have provided will need to come from fossil generation. The extra emissions are estimated to be between 0.6 to 1.5 MtCO_2e. This is equivalent to between 22% and 60% of the combined domestic and international aviation emissions for 2022.

Appendix A. Estimation of wind and solar cost-supply curve

Not all renewable energy projects of a particular technology are of equal cost. Variations in the following factors result in material differences in the cost of power from the best project compared to the worst project:

- quality of the renewable resource (eg, wind or geothermal fluid),
- local geophysical characteristics and the subsequent civil engineering costs to access the resource (principally applies to wind and geothermal), and
- costs of connecting to the electricity network, driven by variations in the proximity to the network and extent of spare capacity on that part of the network (applies to all renewable projects).

We have estimated the size of this effect for wind by looking at how non-turbine costs for built and committed projects (and which have been disclosed publicly) have developed over time.

Figure 12 – Non-turbine cost trends over time

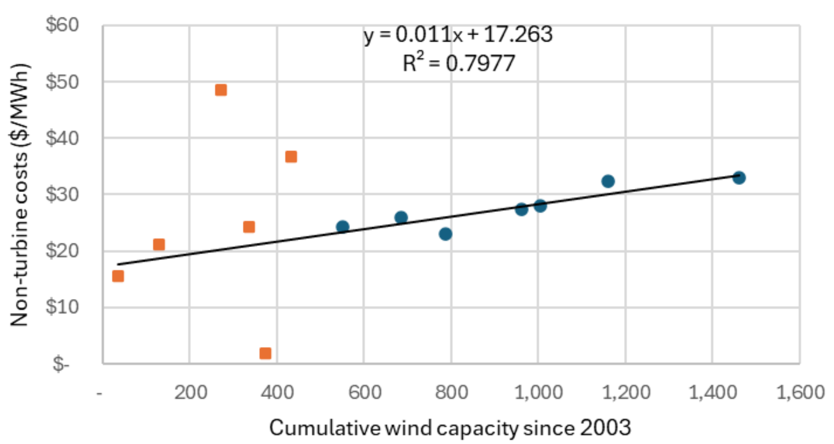
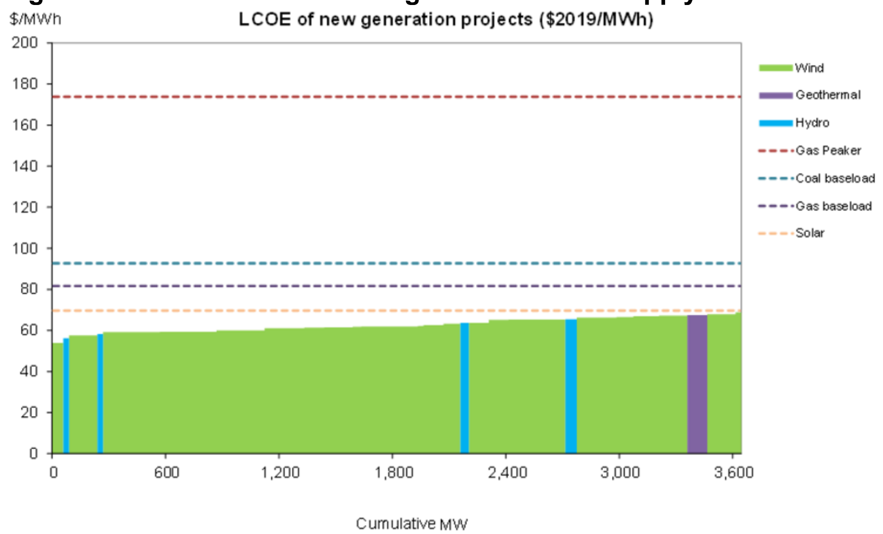


Figure 12 shows our calculation of “local” costs and how they have changed as more wind capacity (expressed in MW) is developed. There is a clear upwards trend over time. We have excluded the points in orange when estimating the slope of the relationship, as these were for early on in the development of wind generation in New Zealand, which may be less relevant for determining current trends. The slope of the line is about 11 $/MWh/GW.

We note that this is higher than the slope estimated by MBIE in its tool which estimates the LCOE’s of potential new generation projects, the graphical output from which is shown in Figure 13. When the MBIE values are inflated to $2024, the slope of the curve for wind is 4.8 $/MWh/GW – 44% of the value of the slope observed for projects that have been implemented.

Figure 13: MBIE estimated new generation cost-supply curve



Source: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-modelling/interactive-levelised-cost-of-electricity-comparison-tool

Feedback we have received from some wind developers is that they think our ‘observed’ cost-supply curve increase only partially reflects the dynamic of some sites being better than others and is also likely to reflect other unrelated factors from which it is not reasonable to infer a correlation. Accordingly, we give greater weight to the lower MBIE projected cost-supply curve estimate.

Due to lack of available data, we have not been able to empirically develop an equivalent cost-supply curve for solar projects. Although variations in civil engineering costs are likely to be substantially less than for wind projects, variations in factors such as proximity to the grid, and within-island variations in insolation, will inevitably result in a variation in LCOEs between potential solar projects. For our analysis on the likely benefit of the Southland Wind Farm project we have estimated that the slope of the solar cost-supply curve is only 15% of that of the wind cost-supply curve on a $/MWh/GW basis.