Mahinerangi Wind Farm

Economic Assessment

NZIER report to Tararua Wind Power Limited

15 September 2025

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Key points

This report has been prepared by NZEIR for at the request of Tararua Wind Power Limited (TWP). This report provides an economic assessment for the proposed Mahinerangi Wind Farm project which is a Schedule 2 of the Fast-track Approvals Act 2024 (FTAA) Listed Project.

TWP holds a land use consent for the development of the Mahinerangi Wind Farm up to 200MW installed capacity and up to 100 wind turbines. Stage 1 of the wind farm was completed in 2011 and involved the commissioning of 12 Vestas V90 turbines generating 36MW.

This economic assessment has been prepared in accordance with the purpose of the FTAA and sections 5, 6 and 7 of the Resource Management Act 1991 (RMA). Section 3 of the FTAA sets out its purpose which is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits. The RMA's purpose as set out in section 5 is to promote the sustainable management of natural and physical resources.

Stage 2 is proposed to be the final stage of the Mahinerangi Wind Farm and consists of 44 4.3MW turbines providing a total 190MW capacity. Stage 2 will generate around 549 GWh per year implying a utilisation factor of 33 percent. TWP is also seeking consent for a new transmission line connecting a new substation to the National Grid, and a Battery Energy Storage System (BESS) with capacity of 60 MW for two hours.

The wind farm site is approximately 1723 ha and is located on the eastern foothills of Lammermoor Range, situated approximately 5km north of Lake Mahinerangi and approximately 50km west of Dunedin. The west and north-western boundary of the wind farm is bounded by the Te Papanui Conservation Park and Black Rock Scientific Reserve.

The location is within Transpower's Southland Otago region which is the relevant area for consideration of regional electricity demand that could be met by Mahinerangi Wind Farm Stage 2 with any surplus exported to the rest of the country.

Construction of new wind farm capacity contributes to the increase of renewable electricity capacity that is required to meet the expected increase in electricity demand from the electrification of light vehicle transport and industrial process heat. This is the primary route for reduction of greenhouse gas (GHG) emissions in transport and industry identified by the Climate Change Commission and reflected in the Government Emissions Reduction plan.

The Climate Change Commission Advice to the Government on the direction of policy for its second emissions reduction plan (2026-30) stated:

"*To meet anticipated demand, we estimate that each year from 2025, generation that can supply over 1 TWh per year will need to be built.*" [1]

1 He Pou a Rangi Climate Change Commission | 2023 Advice on the direction of policy for the Government's second emissions reduction plan, page 53.

A mix of wind, solar and geothermal are expected to meet this generation target. However, if the target was met solely from wind, it would require the construction of 286 MW[2] of wind farm capacity each year. The scale of the proposed Mahinerangi Wind Farm Stage 2 addition to capacity (190 MW) and its annual output (549 GWh) would be meet almost 55 percent of one year's increment of new renewable generation output, and makes a significant contribution to meeting the national renewable capacity increases implied by the Government's emission reduction targets.

While the Southland Otago region is currently a net exporter of electricity, it is anticipated that this will change in time with the proposed construction of a data centre and electrification of industrial process heat will reduce the electricity available for export to the rest of the country.

The impact of the Wind Farm on the local or regional economy is most pronounced in the building and construction stage. Over its operating life, labour time on operations and maintenance may accumulate to approach the construction stage labour, but that is spread out over a long period so the expected impact on labour and incomes per year is small.

In NZEIR's experience with previous wind farms, it is estimated that the main significant regional and national benefits of the Mahinerangi Wind Farm Stage 2 will be:

- A large increase in wind generated electricity equivalent to almost one year of additional capacity requirements estimated by the Climate Change Commission.
- Contribution to the increase in renewable energy generation and overall electricity supply to meet expected growth in demand.
- Injection of around $220 million expenditure during wind farm construction (in total over three years), of which about $73 million would be economic value added for the region
- Up to an additional 200 full time equivalent (FTE) during peak construction and on average 75 FTE per year for two years during construction and 8 to 10 FTE per year for operation of the completed wind farm.
- BESS which will allow controlled supply of electricity during peak periods - up to 60 MWh for two hours at a time. The construction activity for the BESS adds a further 10 percent to the expenditure and employment.
- Reduction in greenhouse gas (GHG) emissions of 303,171 tCO2-e if displacing gas-fired generation, or 600,161 tCO2-e if displacing coal fired generation. The value of these emission reductions at $59.82 per tCO2-e would be $18.1 million or $35.9 million respectively.
- Supporting electrification of the economy which is a key element of the Climate Change Commission advice on reducing greenhouse gas emissions.

Construction and operation of wind farms requires specialised skilled labour, many of which will be found already within the Otago and Southland regions engaged in servicing wind farms. It is expected that most of the direct expenditure associated with construction and

[2] This construction estimate assumes a capacity utilisation factor of 40 percent. The projected capacity utilisation factor for Mahinerangi Wind Farm Stage 2 is 33 percent. If the capacity factor of all new wind farms was 33 percent, the estimated construction requirement to meet the Climate Change Commission annual target from wind generation would be 346 MW per year.

operation of Stage 2 of the Mahinerangi Wind Farm will impact the Otago and Southland region.

The Mahinerangi Wind Farm Stage 2 provides significant national benefits through its substantial contribution to increasing renewable the generation of electricity from renewable resources that is necessary to meet expected increase in electricity demand from the electrification of the economy including light vehicle transport and industrial process heat.

Contents

1 Assessment approach 1
  1.1 Economics in the Fast-track Approvals Act and Resource Management Act 1
  1.2 Economic assessments 4
  1.3 Costs and benefits and the reasons for investments 5
2 The existing environment around Lammermoor Range 6
  2.1 Building Mahinerangi Wind Farm Stage 2 will have impacts across regional boundaries 6
3 The economic impact of consenting the Mahinerangi Wind Farm Stage 2 17
  3.1 Direct expenditures and employment from the wind farm and BESS 17
  3.2 Indirect flow-on effects from the wind farm's construction and operation 18
4 Economic benefits from provision of new wind generation 20
  4.1 Contribution to climate change 20
  4.2 Generation in the Southland and Otago regions 22
  4.3 Consistency with Government and Local Policies towards renewable electricity generation 23
  4.4 Reduction of baseload thermal generation greenhouse gas emission 23
  4.5 Other matters of economic consequence 25
  4.6 Summing up 25
5 Conclusions 27

Appendices

Appendix A Data sources 29

Figures

Figure 1 Electricity consumption by sector 1974-2024 10
Figure 2 Electricity generation by energy source 1974 to 2024 11
Figure 3 Demand (GWh) by price band ($ per MWh) 13
Figure 4 Transpower Southland Otago region grid 30

Tables

Table 1 Economic characteristics of the Southern region 7
Table 2 New Zealand electricity generation capacity and annual output 12
Table 3 Wholesale spot price fluctuations over 2023 and 2024 13
Table 4 Network-connected Electricity Generation in Otago and Southland 15
Table 5 Employment impacts of the proposed Mahinerangi Wind Farm Stage 2 19
Table 6 GDP impacts of the proposed Mahinerangi Wind Farm Stage 2 19
Table 7 Summary of Wind Farm economic impacts and energy benefits 27
Table 8 Electricity generation Southland and Otago 32
Table 9 Existing Wind Farm capacity factors 33
Table 10 Prospective wind farm capacity factors 34
Table 11 Electricity demand Southland and Otago 35

1 Assessment approach

This Economic Assessment has been prepared by NZIER on behalf of TWP for the resource consent applications for Mahinerangi Wind Farm Stage 2.

TWP holds a land use consent for the construction, operation, and maintenance of the Mahinerangi Wind Farm. The resource consents were granted by the Environment Court in 2009 and authorise up to 200MW of installed capacity and up to 100 wind turbines. Stage 1 of the wind farm was completed in 2011 and involved 12 Vestas V90 turbines generating 36MW.

Stage 2 is proposed to be the final stage and will consist of 44 4.34MW turbines, providing an additional 190 MW of installed capacity, which is expected to generate around 549 GWh per year.

Stage 2 also includes a new includes a new 110kV transmission line, substation and a BESS.

The wind farm Site is approximately 1723 ha. It is located on the eastern foothills of Lammermoor Range, situated approximately 5km north of Lake Mahinerangi and approximately 50km west of Dunedin. The west and north-western boundary of the wind farm is bounded by the Te Papanui Conservation Park and Black Rock Scientific Reserve.

The proposal will not proceed unless the applicant, TWP, considers it viable and likely to provide a return on its private investment which is competitive with other investment opportunities. Stage 2 of the wind farm will connect to the national grid through the new transmission line so the electricity it produces can contribute to national electricity supply.

The revenues of selling electricity, net of the cost of producing it, are a private benefit for the company, but wind farms also bring benefits to the wider communities of the district, the region and New Zealand at large. The construction of wind farms injects spending, jobs and incomes into local economies. Depending on how the new generation fits with the regional and national electricity system and with the wider economy, it also has wider effects that accumulate over much longer timeframes and may be much more significant than construction impact.

This report proceeds through the following steps:

- Outline of economic considerations in the FTAA and RMA and the analytical processes used to assess them.
- The existing environment around the site of the proposed wind farm.
- The economic impacts of the Mahinerangi Wind Farm Stage 2.
- Economic benefits from provision of low emission electricity generation.

1.1 Economics in the Fast-track Approvals Act and Resource Management Act

This economic assessment has been prepared with consideration to the purpose of the FTAA (section 3) and RMA (sections 5 and 7).

The purpose of the FTAA is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits. Clause 17(1) Schedule 5 to the FTAA provides that when considering a consent application and setting conditions, the Expert Panel must take into account giving the greatest weight to the purpose of the FTAA, then the provisions of Parts 2 (excluding section 8), 3, 6, and 8 to 10 of the RMA (excluding section 104D), and relevant provisions of any other legislation that directs decision making under the RMA.

The FTAA provides an alternative consenting regime to the RMA, although as noted earlier various parts of the RMA remain relevant considerations.

1.1.1 FTAA criteria – infrastructure with significant national or regional benefits

New Zealand needs more renewable energy to meet current and projected growth in electricity demand. Government expectations for the development of renewable energy were described recently in its Electricity Policy Statement 2024[3] (EPS) as follows:

> 4. *Over the coming 30 years, electrification of transport and process heating across the economy, combined with underlying growth, is expected to result in a major increase in electricity.*
>
> 5. *To meet this huge increase in demand, New Zealand's renewable generation is expected to double, and this will be a major contributor to achieving our Net Zero 2050 target.*

Paragraph 4 of the EPS referred to Transpower's base case estimate of a 68 percent increase in electricity demand by 2050. The Ministry of Business Innovation and Employment (MBIE) forecasts '*Electricity Demand and Generation Scenarios: Results Summary*' (EDGS 2024) 'Reference' and 'Growth' scenarios forecast an increase in electricity demand between 2025 and 2050 of 49 percent and 72 percent respectively. The Climate Change Commission (CCC) also publishes models of the increase in electricity generation required to meet commitments to the reduction in greenhouse gas (GHG) emissions.

The Mahinerangi Wind Farm Stage 2 is a significant piece of generation infrastructure as its 190 MW will increase current wind farm capacity by 15percent[4]. The Mahinerangi Wind Farm Stage 2 delivers significant regional and national benefits by making a material contribution (equivalent to about 55 percent of one year of the required 1 TWh per year increase in renewable generation output recommended by the Climate Change Commission). The increase in generation is required to achieve the Government plan for decarbonisation of the economy through electrification of light vehicle transport and industrial process heat.

1.1.2 Economic assessment framework for FTAA approval applications

As noted above, the purpose of the FTTA is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits. The purpose of the RMA is to promote the sustainable management of natural and physical resources. Section 5 defines sustainable management as managing the use, development and protection of

[3] 'October 2024, *'Statement of Government Policy to the Electricity Authority under section 17 of the Electricity Industry Act 2010.'* Pages 1 to 2. The EPS was downloaded from https://www.beehive.govt.nz/sites/default/files/2024-10/Government%20Policy%20Statement%20on%20Electricity%20-%20October%202024.pdf

[4] Total installed windfarm capacity at the time of writing is 1,265 MW.

natural and physical resources in a manner that enables people and communities to provide for their social, economic and cultural wellbeing while:

- sustaining natural and physical resources to meet reasonably foreseeable needs
- safeguarding life-supporting capacities of air, water, soil and ecosystems; and
- avoiding, remedying or mitigating adverse effects of activities on the environment.

The RMA defines environment broadly to include people and communities and the social, economic and cultural conditions which affect them.

Explicit recognition of economic considerations under the Act include section 5 of the RMA references to enabling communities to provide for their economic wellbeing, and section 7(b)'s requirement to have regard to efficient use and development of natural and physical resources. In economic terms, a benefit is any gain in wellbeing, and a loss in wellbeing is a cost.

Increasing access to renewable electricity that is not derived from burning fossil fuels has value in avoiding future costs that increased greenhouse gas emissions will cause, which is a value not completely captured by current efforts to create a market for emissions. Similarly, there is a value in improving security of electricity supply that is not necessarily fully covered in the cost of electricity, given the different parties involved in generation, distribution and retailing and the limited means they have in capturing all aspects of security their involvement adds to the system.

Efficiency is a condition achieved by maximising the value of outputs from a given quantum of inputs, or minimising the cost of inputs to obtain a given quantum of outputs. Economics further distinguishes:

- technical or productive efficiency, achieved by employing the best or most cost effective method to obtain a single output
- allocative efficiency, achieved from the combination of inputs that maximises the value of a range of outputs across an economy, allowing for the movement of resources from less valuable to more valuable uses
- dynamic or innovative efficiency, achieved by the combination of inputs across different uses and time periods which maximises the value of outputs over time.

Efficiency can also be pursued through the avoidance of waste and through improvement in production outputs from existing assets. Improving the value obtained from a set of resources available to a community, and reducing impediments to resources being allocated to their most valuable uses, are practical means of achieving efficiency.

The proponents of a new development are best placed to assess the likely return from their investment and the risks around it being realised. A prominent function of the RMA is to manage adverse effects on the environment.

In economic terms, the adverse environmental effects that the RMA is intended to manage are examples of negative "externalities", effects of actions that fall on third parties without invitation or compensation for those bearing the effects, and without the causers of those effects facing the full costs of their actions. Externalities may have impacts that are predominantly local (e.g. around a development's neighbourhood), regional (e.g. affecting whole river catchments) or national (e.g. greenhouse gas emissions, which have global effects but are managed under international agreements signed by national governments).

The externalities of different scale have different impacts on matters of interest to local, regional and national government. Hence, an economic assessment of a project seeking consent will need to consider effects at local, regional and national level, to the extent that they impact on community wellbeing and efficient use of resources.

1.2 Economic assessments

Economics in its broadest sense is the study of how limited resources are used in satisfaction of potentially unlimited needs and wants. This is relevant to operational and regulatory powers under the FTAA, such as allocating land space and water to different activities, and consenting used to allocate discharge capacity into different environmental media of air, soil and water. Economics can inform the choices made under the Act about the likely consequences of proposed resource use changes.

The FTAA does not specify a method for economic assessment, so various approaches may be used to inform decisions around consent approval, including:

- Economic impact analysis (EIA) which examines how an activity impacts on its receiving "economic" environment, through changes in spending, production, labour and incomes.
- Cost benefit analysis (CBA) which compares the stream of value gained from a given investment to the counterfactual situation without the investment, which may be cast broadly to include matters that are covered by economic impact measures (such as emissions of greenhouse gases and other pollutants) and provides a measure of societal return on investment in a new project
- Other complementary measures that broaden the analysis to consider other effects on community wellbeing that are difficult to directly value and include in economic analysis, including ways in which effects on the environment can be attributed to economic harm borne by people (such as losing access to traditional recreation or food gathering areas).

1.2.1 Economic impact assessment

Economic impact analysis (EIA) examines how an activity impacts on its surrounding area and stimulates business in other firms that either supply the new development or meet the new consumption demand induced by enhanced incomes and spending from the development. The impact may be expressed as changes in the host region's economic value added or Gross Domestic Product (GDP), on its incomes to employees or on the number of jobs or annual equivalents created, covering both direct and flow-on effects. More specifically:

- Direct impacts are those emanating from the development project itself, and they arise from the spending and job creation on its construction and operation.
- Indirect impacts are those emanating from stimulation of other businesses that either supply the project with inputs or further process its outputs.
- Induced impacts are those emanating from additional demands for consumption goods from people with increased incomes arising from direct or indirect impacts.

Indirect and induced impacts can be difficult to estimate. A common method used for this estimation is economic multiplier coefficients, which are derived from input-output models of a national or regional economy that show the inter-industry supply and use of inputs in supporting industrial outputs. While these give apparent precision in their estimates of economy-wide effects of a new project, they have drawbacks in that Input-output tables are static depictions of economic activity at a point in time and do not allow for the effect of constraints in the availability of inputs on growth in outputs.

The scale of direct impacts is the most critical information for impact analysis. The flow-on effects can be inferred with reference to previous experience elsewhere. The direct impact depends on the amount of "leakage" of expenditure and jobs from the local economy. In building wind farms in New Zealand, a large share of the headline value of the project – estimated up to 61 percent [5] - is spent on importing components for the wind farm installation, so stimulating local economic activity is largely confined to the remainder spent on building and installation services and planning processes.

This framework has been used primarily to estimate the economic impact of the construction of the wind farm (but also estimate the impact of operational spending).

1.3 Costs and benefits and the reasons for investments

Cost benefit analysis (CBA) is a form of investment appraisal that compares the stream of value gained from a given investment. The scope of costs and benefits spans a wide range of parties in the economy, the businesses making investments to produce goods and services, the consumers who benefit from augmented supply, and other parties who are affected, such as existing residents facing local effects from new production sites. CBA may include the value of environmental effects such as greenhouse gas emissions avoided and the cost of mitigation measures that suppress adverse effects of climate. The results of CBA are expressed as a Net Present Value or Societal Rate of Return over a defined period.

Beyond local economic impacts on spending and jobs, a more enduring and sustainable economic effect of a wind farm is harnessing of a previously unused wind resource, to produce a service of value: electricity. This is better able to serve the demand for electricity in the regional market than more distant generation that would incur more transmission losses in serving that market.

As described below, the Mahinerangi Wind Farm Stage 2 is located in the Southland Otago region of the national electricity transmission grid. The generation plant in that transmission region currently produces electricity in excess of local demand, which is exported to other centres of demand.[6] However, this surplus will be reduced by proposed construction of data centres and electrification of process heat in the region. Any new wind farm capacity broadens the choices of generation that can alleviate temporary shortfalls in regional supply, or export energy to other regions at other times.

The Mahinerangi Wind Farm Stage 2 will improve electricity supply in the region by generating when it can and helping to conserve water in hydro dams that can be used to respond to peak demand periods when electricity supply is more scarce. The Mahinerangi

5 This estimate is from TWP

6 National Grid operator Transpower defines the Southland Otago region as stretching from Naseby, Cromwell and Frankton in the north to Invercargill in the south. The generation in the region includes large hydro schemes at Clyde, Roxburgh, Manapouri and Berwick and wind generation at White Hill, Kaiwera Downs and Mahinerangi. Its principal demand centres are the aluminum smelter at Tiwai and the cities of Dunedin and Invercargill.

Wind Farm Stage 2 output would not be highly-correlated[7] with the main concentration of wind farms in the lower North Island. This means the Mahinerangi Wind Farm Stage 2 output could help to 'smooth' national wind generation output. Although less tangible than the spending on construction and equipment in building a new power station, harnessing the wind provides a significant benefit (increased generation) which continues year after year for all electricity users, be they residential households, commercial or industrial enterprises. This increase in capacity enables electrification of transport and industrial process heat that is a key element of the Government's Emissions Reduction Plan.

2 The existing environment around Lammermoor Range

When undertaking economic assessments for a wind farm, the existing environment consists of the economy in which it will impact and the wider electricity system to which it contributes.

The economic environment is primarily that of the region which will be most affected by a new development, as any project has a much smaller proportional impact on the national economy. For the electricity system the perspective is more that of contribution to national issues such as the security of electricity supply and its emissions profile, as the new wind farm will be operating in and contributing to a nationwide market.

2.1 Building Mahinerangi Wind Farm Stage 2 will have impacts across regional boundaries

Mahinerangi Wind Farm is in Clutha District which is the smallest territorial authority by population size in the Otago region, and second smallest (after Dunedin) in area. It borders onto Dunedin City and Central Otago districts in Otago, and with Southland region's Gore and Southland District.

Due to the higher concentration of wind farm activity in the Southland region, the construction of Mahinerangi Wind Farm Stage 2 is likely to draw on suppliers of inputs and labour services from both regions. The Mahinerangi Wind Farm is (by road) around 70 kilometres from Dunedin and 80 kilometres from Balclutha in Otago; and 115 kilometres from Gore in Southland. All these locations are potentially in range to supply a wind farm construction project at Mahinerangi .

Clutha District is the second smallest district by population (after Gore) of the five coterminous districts plus Invercargill in what is labelled the southern region in Table 1 below. It is at the lower end of the distribution across most of the economic measures reported in Table 1. It had the second lowest average household income of the 6 districts and second lowest aggregate GDP, but it had the third highest per capita GDP.

7 Data on the correlation between wind generation in Tararua and the foothills of the Lammermoor Range is not available but a study by Concept Consulting in 2022 does estimate correlations for Tararua and Dunedin and Southland. The daily correlation coefficient between Tararua and Dunedin and Southland is 0.43 while the yearly correlation is 0.58 for Dunedin and 0.65 for Southland. The winter correlation with Tararua is also low at 0.35 for Dunedin and 0.49 for Southland. See Concept Consulting (2022) *'New Zealand Renewable Generation Diversity Investigation, 27 July 2022'* page 30 – Figure 34, page 32 – Figure 42 and page 33 – Figure 44. The report is available at https://www.windenergy.org.nz/wp-content/uploads/2024/07/Renewable-Generation-Diversity-Investigation-FINAL-1-1.pdf

Table 1 Economic characteristics of the Southern region

Year ending March 2023 for GDP and year ending June 2024 for other data

	Invercargill City	Southland District	Gore District	Clutha District	Dunedin City	Central Otago
Area Sq km	390	29,552	12,583	6,334	3,314	9,968
Population	58,600	34,300	13,200	19,300	136,000	26,500
GDP $m	4,613	3,172	959	1,343	8,338	1,908
GDP/capita ($)	79,669	96,111	73,520	71,079	61,946	73,368
Mean weekly rent ($)	415	414	414	395	509	558

Source: MBIE Regional Economic and Modelled TLA datasets

2.1.1 Economic characteristics of Clutha District and neighbouring regions

Dunedin has the largest population and highest aggregate GDP but it also has the highest mean weekly rent (alongside Central Otago) and lowest GDP per capita. Gore District has the smallest population, lowest aggregate GDP and lowest mean weekly rents, but it also has the fifth highest GDP per capita (around $30 lower than Invercargill's).

The biggest contributors to economic growth in Clutha District over the 10 years to 2023 were Construction (19% of total growth), Agriculture Forestry and Fishing (10%), Professional, Scientific and Technical services (10%), Electricity, Gas, Water and Waste (12%), and Rental, hiring and real estate services (9%).[8] Around 42% of growth was contributed by 16 other sectors, averaging less than 3% per sector.

The biggest sources of employment in Clutha District are Agriculture, Forestry and Fishing (30% of District total), Manufacturing (18%) and Construction (10%), with a number of middle order sectors each with around 6% of District employment (Retailing, Education and Training, Public administration and Health care) and a number of lower middling sectors with 3-4% each (Accommodation and Food, Other services, Transport and postal and Professional, scientific and technical services).

At a more disaggregated (54-sector level), building and construction services in Clutha District accounted for just over 900 jobs, slightly below the totals employed in dairy farming, sheep and beef farming and in meat product manufacturing. Employment in electricity and gas supply in the district amounted to 33 filled jobs. A new wind farm project in Clutha District will have more impact on the local economy at the construction stage than the operational and maintenance stages.

2.1.2 The prospects for Mahinerangi Wind Farm Stage 2

The picture that emerges of the Otago Southland region is of relatively prosperous communities built on agriculture and related industries, including growth in dairy farming, and with pockets of tourism activity providing both spending in the region and a source of labour in tourists with working visas. The populations of the districts are slightly older than the national average, and the region faces constraints in appropriately skilled labour. Those districts with relatively low exposure to tourism and higher involvement in food production

8 Infometrics (2022) "Clutha District at a Glance"

and other essential services have come through the COVID-19 pandemic with less disruption than districts more dependent on international visitors for tourism customers and seasonal labour in local industries.

Consenting a project does not necessarily mean it will be built immediately afterwards. A consent provides an option to build within a period before it lapses, allowing the developer to schedule the building to a time when it is most propitious to do so.

Labour shortages in key skill areas have been identified as a constraint in the southern regions since before the COVID-19 pandemic and, as in the rest of New Zealand, are likely to have been accentuated after the relaxation of pandemic restrictions on activity. Under such conditions, immediate commencement of construction after consents are granted could be inefficient, necessitating delays in obtaining key skilled labour at higher cost than would be required at a later time when labour constraints are less intense. Consenting that allows the developer flexibility to choose when to schedule the various stages of construction enables more efficient use and development of resources.

2.1.3 Electricity supply and demand in New Zealand and the southern South Island

There are regional variations in supply and demand for electricity, with most of New Zealand's generation in the South Island and most of its large demand centres in the North Island. The South Island has more generation capacity (mostly hydro) than it needs to meet South Island demand so its electricity can be exported to the North Island via the HVDC cable. The North Island has more mixed generation with hydro, wind, geothermal and fossil-fuelled thermal plant, the latter being used to cover short term peaks and some base load.

Access to markets is provided by the national grid for cross-country transmission and local lines networks for distribution to consumers. The grid system operator, Transpower, has procedures for continually monitoring the grid to identify where improvements to reduce capacity constraints and ensure options exist for alternative routing of transmitted power around grid bottlenecks. It applies a grid investment test to prioritise its selection of improvements to obtain maximum benefit from additional investments it makes.

Demand trends

Figure 1 shows there was consistent annual growth in electricity consumption over the years 1974 to 2007 across the four consumer categories of agricultural, commercial, industrial and residential[9], but following the Global Financial Crisis (GFC) in 2008 growth flattened across all sectors apart from agriculture and there was shrinkage in industrial demand. Combined consumption across the four sectors grew from 17,306 GWh in 1974 to 38,737 GWh in 2007, equivalent to an average annual growth rate of 2.5%nearly three times the annual average annual growth in population of 1% over that period.

In the years since 2008 total consumption has experienced near to zero growth, fluctuating around an average of 38,925 GWh per year and in 2024 it was almost identical to that in

[9] A fifth electricity consumer sector recorded by MBIE data is transport. It is excluded here because reliable data only goes back to 1990 and because in 2022 it accounted for 0.5% of electricity consumption, primarily comprising electric rail transport and road vehicle charge up. That share is expected to increase with electrification of land transport to achieve emission reductions.

2007. That contrasts with population growth that increased at an annual average rate of 1.4% over the years 2008 to 2024[10].

The flattening in demand has been partially attributed to some 'shake-out' of electricity use caused by the GFC and improvement in energy efficiency, particularly in commercial and industrial applications. However since its peak in 2019[11] industrial demand has declined and at the end of 2024 was 16 percent below 2019 levels. Some industrial users have either:

- Closed, partly in response to high wholesale electricity prices for example Oji Fibre's shutdown of paper recycling at Penrose. (Oji Fibre intends to halt paper production at Kinleith, Tokoroa by June 2025[12].)
- Reduced output as generators invoke contract provisions to divert generation to the residential market when supply is short for example:
  - Methanex idling of it is plant in winter 2024 and 2025 enabling sale of the gas it would have used for methanol production to electricity generators[13].
  - NZAS curtailment of its output in 2024.

This decline in industrial demand is an indication of a lack of sufficient generation capacity that can deliver electricity at affordable prices. The following sections describe long run trends in demand and generation and the recent fluctuations in spot wholesale prices.

Residential demand was flat between 2008 and 2017 and then started to increase and exceeded industrial demand in 2023 and 2024 (the first time since 1982). The slow growth in demand over 2020-2022 contrasts with the expected increase in demand due to electrification of transport and industrial process heat modelled by the Climate Change Commission Advice to the Government on the direction of policy for its second emissions reduction plan (2026-30). [14]

10 The estimated population of New Zealand at 31 December 2024 is 5.35 million compared with 4.28 million at 31 December 2008. See 'Estimated resident population of New Zealand: At 31 December 2024' downloaded from https://www.stats.govt.nz/topics/population on 14 March 2025.

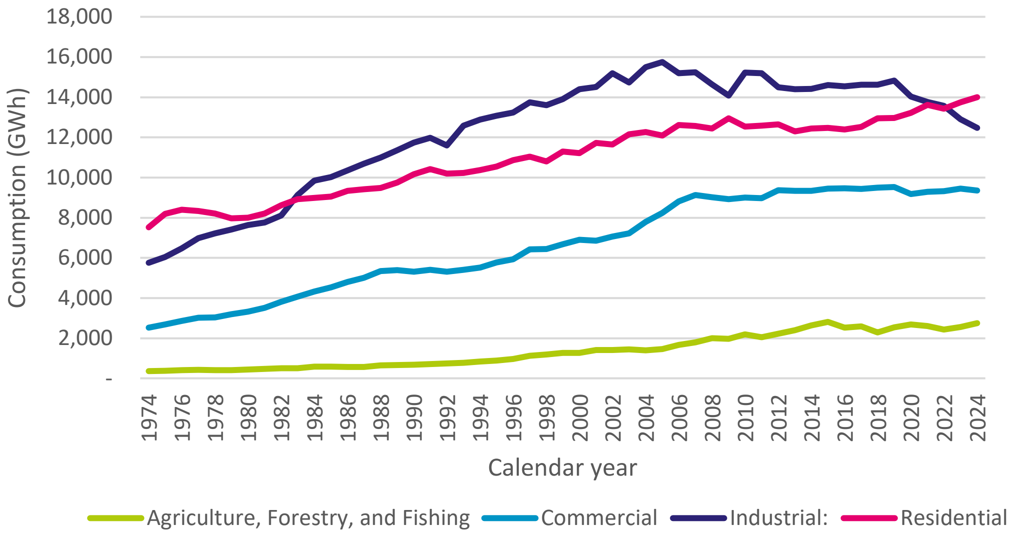
11 Industrial consumption in 2019 was 14,827 GWh, the highest level since 2011. The all-time peak for industrial consumption was 15,756 GWh in 2005. Over the period 1975 to 2024, industrial consumption has been above 2019 levels over 2004 to 2007 (pre GFC) and over 2010 to 2011.The closures of Kawerau Pulp and Paper Mil in 2021 Marsden Point Oil Refinery in 2022 were due to a range of factors including rising electricity costs and contributed to the initial decline in demand.

12 See 'OjiFS Confirms Kinleith Mill Decision, Media Statement - 14 February 2025'downlaoded from https://ojifs.com/ojifs-confirms-kinleith-mill-decision .

13 Over August 2024 to October 2024 Methanex made available 3.5 PJ of gas to Contact Energy and 3.2 PJ of gas to Genesis Energy. In May 2025 Methanex has agreed to sell up to 2.8 PJ of gas to Contact Energy and 1.7 PJ of gas to Genesis Energy. Genesis Energy can generate up to 127 GWh per PJ of gas. Contact Energy's maximum output per PJ of gas is slightly lower.

14 He Pou a Rangi Climate Change Commission | 2023 Advice on the direction of policy for the Government's second emissions reduction plan, page 278.

Figure 1 Electricity consumption by sector 1974-2024



Source: MBIE Energy Statistics

Supply trends

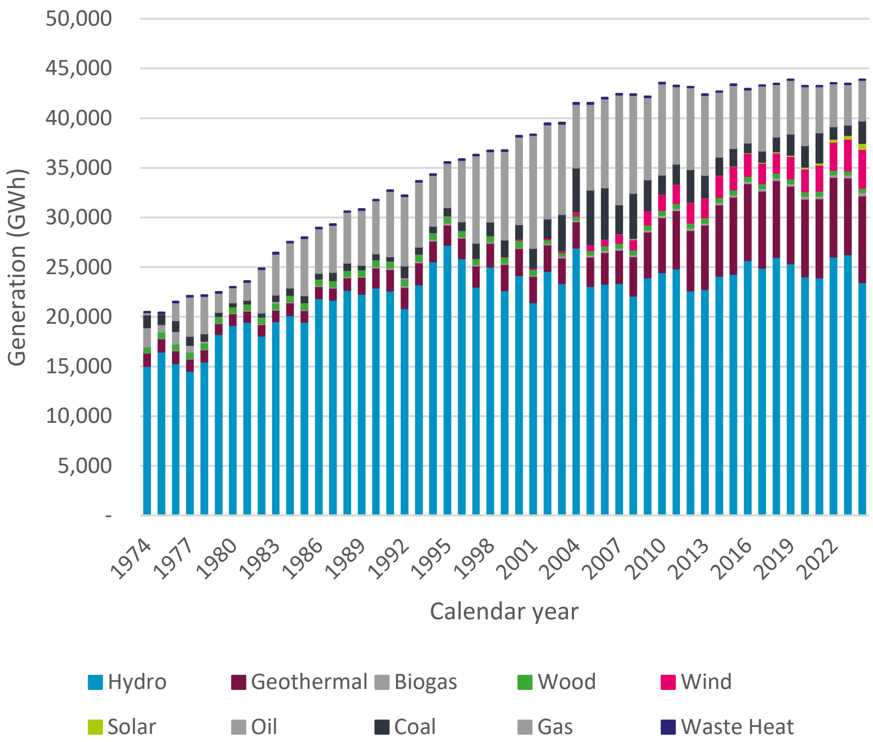
Figure 2 shows the corresponding trajectory of total generation in New Zealand, showing consistent growth averaging 2.2%per annum over the years 1974-2007. But generation growth flattened after the GFC in 2008, to a yearly average of about 0.3%per year from 2009 to 2024. Net generation dropped for two years from its pre-GFC high of 42,423 GWh in 2007, recovered to 43,571 GWh in 2010 and has since fluctuated around an average of around 43,277 GWh in the years to 2024, however growth appears to be accelerating. Net generation increased sharply in 2024 to 43,872 GWh about 1.0%higher than the average for the previous three years (2021 to 2023).

The priority for investment in generation has shifted from meeting expected population-driven consumption growth to reducing fossil fuelled electricity generation in response to New Zealand's international obligations for emissions reduction under the 2016 Paris Agreement, the Climate Response Act 2002 and Climate Change Response (Zero Carbon) Amendment Act 2019, and the Second Emissions Reduction Plan. These in turn are expected to stimulate electricity demand, to charge up increasing numbers of electric vehicles and power electric heating and boilers installed to replace fossil fuelled equipment.

Figure 2 shows hydro is the major source of generation in New Zealand, but its proportional share of total generation has diminished since the 1970s, and the prospect for new large hydro generation projects being built have become increasingly challenging with respect to cost, consenting hurdles, and the risks of adding to dry year risk for electricity supply. Major increase in hydro generation capacity seems unlikely and some existing schemes are at risk of additional generation constraints imposed during reconsenting processes. Geothermal generation has increased to meet base load demands, but expansion of this capacity is limited by the size of accessible geothermal resources found only in some North Island regions. Wind generation is a more ubiquitous resource, and generation has grown from small beginnings in the 1990s, with significant concentrations in generation in the

Tararua/Ruahine[15] ranges around the Manawatu Gorge, the Maungaharuru range in Hawkes Bay and other clusters in the Southland and Otago regions. There has been some recent interest in developing offshore wind farms, but none has yet been realised as they await implementation of the consenting regime[16]. Current utility scale solar capacity is modest but a sharp increase is expected over the next five years.

Figure 2 Electricity generation by energy source 1974 to 2024



Source: MBIE Energy Statistics

Figure 2 shows the renewables share of annual generation exceeded 90% in 1975, 1980 and 1981, but had dropped to less than 66% in 2001, 2005 and 2008 (a 'dry' year). Since 2009 the renewables share of generation has grown from 73 percent to above 85 percent mostly due to new geothermal and wind farm capacity. (Most of the variation in the share of renewable generation is caused by fluctuation in hydro generation due to fluctuation in lake inflows). In 2022 the renewable share of annual generation reached 87% and in 2023 it reached 88%. However, in 2024 it fell to 86 percent due to below average lake inflows which reduced hydro generation by 11 percent compared to 2023.

Table 2 shows the current New Zealand-wide portfolio of large grid-connected power generation and annual output in 2024, distinguished by types of generation. In 2024, the

15 Approximately 58 percent (735 MW) of the total installed capacity(1,263 MW) is located in the Manawatu region.

16 The Offshore Energy Bill is currently in the Select Committee stage and is expected to be passed into law by mid-2025. The bill creates a two-stage permitting process. The first stage is a feasibility permit which will give the holder certainty that no other developer will be approved to develop the same site. The indicative timing for granting of the first feasibility permits is 2026. The second stage is a commercial permit which will be required before construction begins. See https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-generation-and-markets/offshore-renewable-energy and https://disclosure.legislation.govt.nz/bill/government/2024/102/ .

renewable electricity categories of hydro, geothermal, biogas, wind and solar had a combined share of 79% of national generation capacity, and 85% of annual generation.

Table 2 New Zealand electricity generation capacity and annual output

Year ending 31 December 2024

Generation capacity estimate[1]			Generation output[2]		
Fuel	**MW**	**Share**	**Fuel**	**GWh**	**Share**
Hydro	5,581	50.6%	Hydro	23,490	53.5%
Geothermal	1,275	11.6%	Geothermal	8,741	19.9%
Biogas	40	0.4%	Biogas	310	0.7%
Wind	1,265	11.5%	Wind	3,919	8.9%
Solar	567	5.1%	Solar	595	1.4%
Oil	198	1.8%	Oil	25	0.1%
Coal	500	4.5%	Coal	2,243	5.1%
Gas	1,236	11.2%	Gas	4,082	9.3%
Co-generation	364	3.3%			
			Wood	442	1.0%
			Waste Heat	27	0.1%
Total	**11,025**		**Net Generation**	43,872	

Notes:

1 The capacity numbers in this table are from MBIE Electricity data tables - Plant type (MW) for the year ended 31 December 2024

2 Generation and co-generation output are combined for each fuel and are not reported separately.

Source: MBIE Electricity data tables: Annual GWh, Electricity Balance and Plant type (MW Downloaded from https://www.mbie.govt.nz/assets/Data-Files/Energy/nz-energy-quarterly-and-energy-in-nz/electricity-june-2025-q2.xlsx on 15 September 2025

Recent wholesale spot electricity price rises

Increased uncertainty about the reliability of gas supply for thermal generation since 2018 has both increased the average level of spot wholesale price and left the market vulnerable to sharp surges in prices when hydro lake levels are low. Prior to 2018 annual wholesale spot prices averaged below $100 per MWh. Since the end of 2018 average annual wholesale spot prices have generally varied between $100 per MWh and $250 per MWh with the highest annual average set in 2024. The system has become more vulnerable to price spikes in high demand period when hydro lake levels are low. These factors drove the price spikes in the June and September quarters of 2024 with large volumes of electricity trading at very high prices as shown in Table 3 and Figure 3

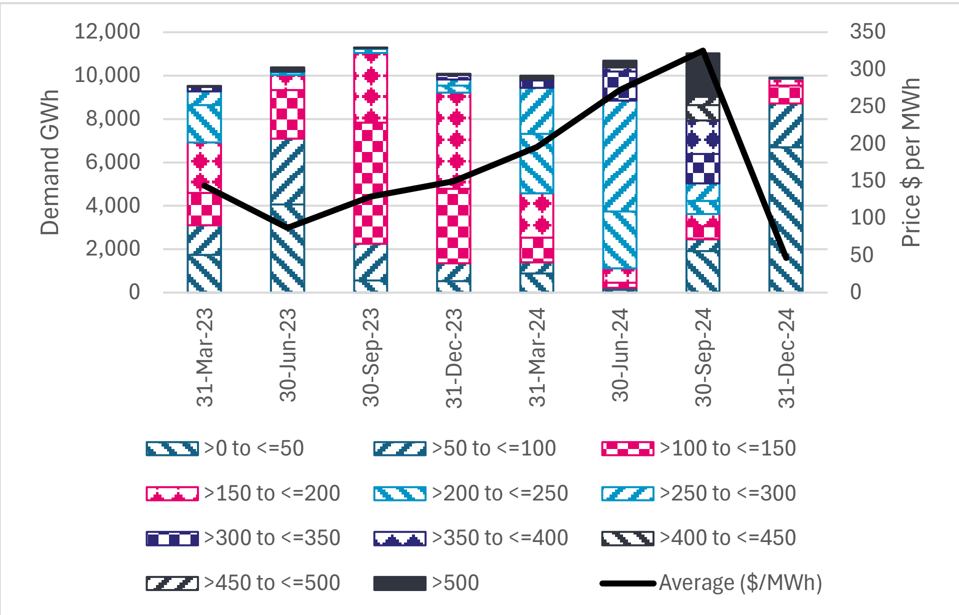
Table 3 Wholesale spot price fluctuations over 2023 and 2024

Quarterly demand (GWh) by price ($ per MWh) band and demand volume weighted average.

Price Band	Mar-23	Jun-23	Sep-23	Dec-23	Mar-24	Jun-24	Sep-24	Dec-24
>0 to <=50	1,738	4,070	555	524	881	139	1,921	6,696
>50 to <=100	1,365	3,030	1,704	825	524	86	538	2,029
>100 to <=150	1,498	2,235	5,569	3,431	1,133	235	598	825
>150 to <=200	2,322	690	3,222	4,443	2,042	658	570	299
>200 to <=250	1,723	118	180	314	2,745	2,620	597	30
>250 to <=300	638	47	30	289	2,117	5,120	815	0
>300 to <=350	206	14	14	208	336	1,334	1,347	0
>350 to <=400	10	24	7	29	59	198	1,549	0
>400 to <=450	5	19	4	3	94	80	715	0
>450 to <=500	3	12	0	3	36	46	379	0
>500	5	118	18	8	28	178	2,004	35
Total demand	**9,514**	**10,377**	**11,302**	**10,077**	**9,994**	**10,693**	**11,033**	**9,915**
Average price	**143.56**	**86.89**	**129.08**	**149.53**	**195.72**	**272.68**	**325.50**	**46.64**

Source: NZIER analysis of Electricity Authority data

Figure 3 Demand (GWh) by price band ($ per MWh)



Source: NZIER analysis of Electricity Authority data

To limit price spikes the system needs both more dispatchable generation and the capability to store and shift wind and solar generation from periods of lower demand to higher demand. Assuming a single charging cycle[17], the Mahinerangi BESS output could contribute 120 MWh (60 MWh per hour for two hours) to the output sold in high price periods. The benefit of BESS is that it relieves some of the price pressure in periods of scarce supply by displacing the last most expensive 'dispatched' tranche of generation (which sets the price received by all generation in the period). Quantification of the size of this price reduction is not practical at this stage, but the BESS will divert output from lower price periods and uses energy in the charging and discharging cycle[18] and is expected to apply a net downward influence on spot prices.

To put the potential contribution of the Mahinerangi BESS in context, over the:

- June quarter of 2024, 1,836 GWh of electricity was priced above $300 per MWh for a total of 323.5 hours which is a daily average of about 20.2 GWh supplied over 3.6 hours.
- September quarter of 2024, 2,004 GWh of electricity was priced above $500 per MWh for a total of 371.5 hours which is a daily average of about 21.8 GWh supplied over 4.0 hours.

In both cases, the Mahinerangi BESS could have met 0.6 percent of that demand over 2 hours each day.

Southland and Otago electricity generation

Table 4 outlines the existing electricity generation plant connected to the national grid or distribution networks in the Southland and Otago regions. Of the total installed capacity of 1,870 MW, 95% is hydroelectric and 5% is wind generation. Southland has high generation capacity in the Manapouri Hydro-electric power scheme, most of which is currently committed to supplying the aluminium smelter at Tiwai Point. Other demands in the southern districts can be met by existing large hydro schemes at Clyde, Roxburgh and Waipori along with large wind farms.

There are three large operational wind farms at White Hill, Mahinerangi Stage 1, and Kaiwera Downs Stage 1. Kaiwera Downs Stage 2 - 155 MW - is under construction and is expected to be completed by March 2027. Consent applications are in progress for a further 567 MW as follows:

- Contact Energy is appealing the expert panel decision to decline its consent application for Southland Wind Farm (capacity of up to 330 MW) near Wyndham under the COVID-19 (Fast-track consenting) Recovery Act and may apply for consent under the FTAA.
- TPW is applying for consent under the FTAA for Mahinerangi (Stage 2) – 190 MW capacity which is the subject of this report.
- Lochindorb Wind Limited Partnership [19] is applying for consent under the FTAA for Kaihiku – 300 MW capacity.

17 The typical 'stylised' daily shape of demand in the New Zealand market is lowest demand /prices over midnight to 6:00 am, ramp-up of demand prices to a morning peak between 7:00 am and 9:00 am, plateau at or below the morning peak during the day, ramp up from about 4:00 pm to the evening peak between 6:00 pm and 8:00 pm, plateau util about 10:00 pm and then a run down to overnight lows. This pattern means that while two discharge cycles may be feasible on some days, in most cases the optimum is likely to be overnight charging of for discharge during the evening peak.

18 The estimated round-trip efficiency is 80 to 90 percent. In other words, an output of 120 MWh will require an input of 150 MWh to 133 MWh.

19 Lochindorb Wind Limited Partnership is a 50/50 partnership between Pioneer Energy Limited and Manawa Energy Limited.

- Pioneer Energy has applied for consent under Natural Built Environment Act 2023 for Jericho Wind Farm in the Waiau Valley – 35 MW capacity.
- Calder Stewart has applied for consent under the FTAA for Awarua Quadrant just south of Invercargill – 42 MW capacity.

Table 4 Network-connected Electricity Generation in Otago and Southland

Capacity (MW) and generation output (GWh)

Otago & Southland	MW	GWh/yr[1]	Utilisation
Manapouri	820	4,662	65%
Clyde	464	2,098	52%
Roxburgh	320	1,680	60%
Waipori	87	189	25%
Paerau	10	57	62%
Teviot	11	55	57%
Small generators (<10MW)	45	105	58%
Hydro total	**1,757**	**8,846**	
White Hill (Mossburn)	58	124	24%
Mahinerangi Stage 1	36	130	41%
Kaiwera Downs Stage 1[1]	43	153	40%
Small generators (<10MW)	17	42	28.2
Wind total	**154**	**336**	
Combined wind & Hydro total	**1,911**	**9,182**	
Large wind farms in prospect			
Kaiwera Downs (Stage 2) construction	155	525	39%
Mahinerangi Stage 2	190	595	36%
Southland (Wyndham) (lower estimate)	230	900	45%
Southland (Wyndham) (upper estimate)	350	1,200	40%
Kaihiku	300	1,180	45%

Notes:

1 All measures of output for existing generation (except Kaiwera Downs Stage 1)are based on averages over 2020 to 2024. Kaiwera Downs Stage 1output is for 2024 only.

Source: Transpower Annual Planning Report 2023; company websites

Generation capacity in Southland Otago region exceeds current local demands, with surplus generation exported via the national grid to other South Island demand centres and via the High Voltage Direct Current Link from Benmore to the North Island. New or expanded wind farms are being proposed for the Southern regions not primarily to address local supply deficiencies but because of the quality of the wind resource: the existing Kaiwera Downs wind farm has an estimated capacity factors around 40 percent (see Table 9) while

Contact's proposed Southland wind farm has a projected capacity factor of 40 percent to 45 percent.

As well as providing private benefits to their developers and operators, the provision of additional generation capacity provides system-wide benefits in assisting conservation of hydro storage and adding diversity and resilience to national generation capacity, as described later in this report.

Although there is one wind farm extension under construction, and four more seeking consents, there is no economic reason to suppose that the southern regions have enough wind farms and do not need any more. Based on current levels of electricity demand in the region, their output will be mostly exported to other regions to serve the national task of powering the country. To the extent that they compete with each other in the same market, this will encourage efficiency in operation. As renewable generation they contribute to New Zealand meeting its international commitments to reducing greenhouse gas emissions for climate change mitigation.

However, demand for electricity in the Southland Otago region could increase dramatically if Datagrid proceeds with its plans to build a datacentre at North Marakewa. The first phase of the datacentre (planned to be operational from 2028) would have a capacity of up to 240 MW equivalent to a volume demand[20] of at least 1,890 GWh - enough to absorb the existing generation surplus. If Datagrid achieves its objective to increase capacity to 1,000 MW demand would increase by a further 5,834 GWh which would more than absorb the planned additional wind farm capacity.

In addition, Fonterra has an estimated demand of about 1,100 GWh of energy for industrial process heat which was met from coal-fuelled boilers with a capacity of 180 MW[21]. Approximately 11 percent (20 MW) of this capacity is being replaced[22] by electrically powered boilers. Fonterra intends to reduce process heat emissions by 50 percent by 2030 and cease using coal by 2037 which suggests most of this process heat energy will be supplied by electricity within the next 12 years. (Any remainder would be met by energy efficiency gains in milk processing.)

Because renewable generation is fuelled by natural resources of wind, solar, water and geothermal heat which are all distributed unevenly around the country, a characteristic of renewable generation is that efficient harnessing of such resources needs to be built where the natural resources are best for generation, rather than near the market demand. The ability to connect to the national grid and export power to other regions enables the concentration of wind farms in regions with good wind resource. The proposed Mahinerangi Wind Farm Stage 2would add up to 190 MW capacity to the 154MW already built and a further 155 MW under construction in the Southland Otago region, creating significant capacity in the region with wind patterns that may vary from and complement the wind farms in the lower North Island.

20 Datacentres generate continuous load while the operate. Theoretically, a datacentre volume demand (GWh) would equal its capacity (MW) multiplied by the number of hours per year – 8,760. For this estimate have followed the MBIE approach of assuming actual demand is 90 percent of the theoretical demand – see MBIE, (2024) 'Electricity Demand and Generation Scenarios: Results summary, JULY 2024', page 18.

21 See EECA Regional Heat Demand Database, Measuring the primary energy demand for heat to enable decarbonisation. Available at https://www.eeca.govt.nz/insights/data-tools/regional-heat-demand-database/

22 See 'It's electrifying! Fonterra to install its first electrode boiler at Edendale to reduce emissions January 25, 2024' downloaded from www.fonterra.com/nz/en/our-stories/media/fonterra-to-install-its-first-electrode-boiler-at-edendale-to-reduce-emissions.html

3 The economic impact of consenting the Mahinerangi Wind Farm Stage 2

Mahinerangi Wind Farm is by road around 70 kilometres from Dunedin and 80 kilometres from Balclutha in Otago; and 115 kilometres from Gore in Southand. All these locations are potentially in range to supply the Mahinerangi Wind Farm Stage 2 construction project.

3.1 Direct expenditures and employment from the wind farm and BESS

The key data inputs needed to estimate the economic impact are:

- Construction cost that will be spent in New Zealand and related employment and the duration of the construction. Usually this accounts for about 30% to 35% of the total project costs.
- Operating cost that will be spent in New Zealand and associated employment over the life of the wind farm.

TWP estimates the project construction cost will be $560 million over a period of 3 years with employment during construction of up to 200 FTE during peak construction and on average 75 FTE per year for three years followed by 8 – 10 FTE per year for operation. Mercury estimates operating expenditure will be about $14 million per year.

However, these headline figures of project cost will overstate the amount of spending in the local economy to the extent that they include imports of components from outside the region or New Zealand at large. TWP estimates that the New Zealand component of the wind farm construction spend will be about $220 million plus another $22.5 million for the BESS construction[23].

The main components of expenditure in the local economy in the construction stage are:

- construction of roads, hardstands and wind turbine foundations, electrical balance of plant installation, BESS installation and transmission line installation;
- electrical engineering to design and complete quality controls on the electrical infrastructure install generators and connect to the grid including construction of the new transmission line and BESS;
- civil engineering to design and complete quality controls on the civil infrastructure; and
- planning and other activities e.g. transportation, aggregate and concrete supply.

3.1.1 Direct employment on the wind farm

Wind farms require a variety of jobs and skills. Most of these jobs will occur in the construction stage of the project. The completion Mahinerangi Wind Farm Stage 2 is expected to require a workforce of 75 FTE on average over three years with a peak workforce of 200 FTE. The construction of the BESS would increase the workforce requirements by 10 percent.

23 The estimate local BESS construction expenditure is calculated as the TWP estimate for the battery of $150 million multiplied by 15 percent. The 15 percent is based on GHD Advisory 'Benchmark Reserve, Capacity Price costs, 2027/28 Capacity Year, Economic Regulation Authority', 29 November 2024, The Power of Commitment' pages 19 and 23.

Once the wind farm is commissioned, there will be direct employment of 8 - 10 FTE operational staff, which is in line with the average operational FTE requirements per MW installed from the previous wind farms. In addition, there will be contractor roles to support activities like site security, ongoing maintenance, cleaning and transportation of supplies. Wages to local staff and payments for contract services will be the principal means of continued injection of funding into the local economy. The BESS will require one FTE of operational staff.

Providing jobs and incomes to any community in the regions provides social as well as economic benefits. A report commissioned by the Ministry for Primary Industries[24] found that creating and sustaining jobs in the regions:

- provides money, boosts living standards and wards off poverty
- improves health and access to health care for workers and their families
- provides social contact and contributes to social cohesion
- contributes to people's life satisfaction and sense of identity.

In the absence of new business creation and jobs, community wellbeing would be reduced, increasing the risk that more people leave in search of better jobs. New business can counter depopulation and the corresponding affordability challenge of funding public services on a shrinking ratepayer base.[25]

3.2 Indirect flow-on effects from the wind farm's construction and operation

The direct construction and operation activity associated with wind farms has a flow-on impact to the local economy through:

- Indirect effects: flow-on effects of spending by the industries that supply inputs for wind farm construction/operation or add value to its outputs (e.g. retailers)
- Induced effects: spending on consumption goods and services by people with enhanced incomes derived from wind farm construction/operation and suppliers.

The indirect and induced effects can be estimated using economic multipliers derived from input output matrices. To illustrate the potential size of these impacts we have calculated the multipliers used in an analysis by BERL of the economic benefits of wind farms:

> *Over this period [2010 to 2011], the industry has directly contributed 380 FTEs to national employment and added $36 million to the national GDP. A further 140 FTEs and $52 million in GDP were generated from indirect activities. The total benefit from the wind energy industry is 649 FTEs in employment and $65 million in GDP, with induced effects from consumption spending of those working in the wind energy industry.* [26]

This statement implies the following employment multiplier values:

24 Quigley, R. and Baines, J. (2014) *The social value of a job*. Wellington: Ministry for Primary Industries.

25 As rates are collected off immobile property, liability for rates does not diminish with depopulation. But that is a financial issue, not an economic one. Depopulation results in the reduction in people with income to pay the rates on property, and councils will be mindful of the affordability of their rates demands for their constituents, particularly if the fittest move away leaving the retired or other income constrained groups as increasing proportions of the ratepayer base.

26 Leung-Wai, J and Generosa, A (2012) *Economic Benefits of wind farms in New Zealand*. Wellington: BERL, prepared for the New Zealand Wind Energy Association, page 24

- indirect employment multiplier of 1.37: an additional 0.37 FTE of indirect employment per 1 FTE of additional direct employment
- induced (and indirect) employment multiplier of 1.71: an additional 0.71 FTE of induced (and indirect) employment per 1 FTE of additional direct employment.

Applying these multipliers to the low and high configurations for the proposed Mahinerangi Wind Farm Stage 2provides the results in Table 5 below.

The statement above also implies the following GDP multiplier values:

- indirect GDP multiplier of 1.44: an additional $0.44 million of indirect GDP per additional $1 million GDP.
- induced (and indirect) GDP multiplier of 1.81: an additional $0.81 million of induced (and indirect) GDP per $1 million of additional direct GDP.

Table 5 Employment impacts of the proposed Mahinerangi Wind Farm Stage 2

FTE per year

Activity	Direct	Indirect	Induced	Total
Construction	75	28	26	128
Operation				
• Low	8	3	3	14
• High	10	4	3	17

Source: NZIER

In national accounting, GDP contribution, or economic value added, is the difference between the value of outputs and the cost of inputs incurred in achieving them. For the construction of a wind farm, output is roughly equated to the expenditure on construction, and value added arises after deducting all consumable inputs into the construction. Value added can also be viewed as a return to factors of production: compensation of employees (salaries and wages), fixed capital consumption (depreciation of assets used), operating surplus to the project or business owners, and a small return to government from net indirect taxes received which are embedded in market prices and cannot practically be removed.

NZEIR's estimate value added using ratios of value added to total output in Statistics New Zealand's Input Output Tables for 2023: 0.33 for heavy construction and civil engineering in construction, 0.17 for electricity generation. If these national ratios apply to the region around Mahinerangi Wind Farm Stage 2, the direct value added contribution would be as set out in Table 6 below, which also applies multipliers from the BERL report above.

Table 6 GDP impacts of the proposed Mahinerangi Wind Farm Stage 2

$m per year for three years for construction and the life of the wind farm for operation

Activity	Direct	Indirect	Induced	Total
Construction	24.2	10.6	9.0	43.8

Activity	Direct	Indirect	Induced	Total
Operation	3.8	1.7	1.4	6.9

Source: NZIER

As indicated in section 1.2.1 above, economic multipliers should be interpreted conservatively. Other things held constant they represent upper values of likely flow on effects, because they do not account for any change in demand for inputs or price changes that can create adverse effects for existing users of resource inputs that partially offset the gain from the new project. The multiplier estimates give some indication of the scale of flow on effects, but the figures will be at the high end of what is likely based on the information available.

However, it is clear that a project of the scale of Mahinerangi Wind Farm Stage 2 will have positive economic impact on the districts and regions it affects, by injecting spending into the local economies which enhances incomes and wellbeing through both direct and flow on effects. At present it is not possible to say exactly by how much it will boost regional wellbeing, or how the impact will be distributed between districts within and beyond Otago and Southland regions.

4 Economic benefits from provision of new wind generation

The addition of new wind generation to New Zealand has a number of positive economic effects, which can be divided between:

- Contributing to the increase in electricity generation capacity required to support the electrification of the economy including light vehicle transport and industrial process heat to deliver the greenhouse gas emissions reduction objectives in the Emission Reduction Plans (ERP) and Climate Change Commission (CCC) forecasts.
- Generating electricity to meet demand in the region and elsewhere in New Zealand.
- BESS which will allow controlled supply of electricity during peak periods - up to 60 MWh for two hours at a time.
- Aligning with Government policy towards energy and environment.
- Displacement of emissions from baseload thermal generation.
- Other effects on the wider environment having consequences for economic wellbeing and efficiency, including avoiding transmission losses to the extent it supplies South Island demand and displaces dispatch from more distant generation suppressing long term electricity market price rises to the extent it adds low cost energy to the dispatch stack and reduces use of higher cost generation sources.

4.1 Contribution to climate change

In 2019 New Zealand passed the Climate Change Response (Zero Carbon) Act to set the framework for New Zealand to meet its Nationally Determined Contribution target in line with the 2015 Paris Agreement. It adopted a split gas approach, seeking by 2050 to reduce biogenic methane emissions by 24% to 47% below 2017 levels, whereas other long-lived gases (CO_2, N_2O and synthetic gases) were required to meet Net Zero Carbon, i.e. Gross Emissions would be matched by removals by new forest growth.

Principal implications for electricity generation arising from emission reductions include:

- Reduced availability of fossil fuelled generation to meet peak time demands and cover the intermittency of wind and solar generation and dry-year risk as:
  - Existing fossil fuel generation assets are retired due to asset age, rising fuel cost and inability to meet flexibility requirements of wind and solar generation.
  - New replacement thermal assets are not constructed due to uncertainty about future commercial viability and fuel availability.
- New generation required for meeting increasing electricity demand in pursuit of zero carbon[27], because of both general economic growth and new demands for electricity from the electrification of the light vehicle fleet and replacement of fossil-fuelled industrial boilers by electrical options, as indicated in the Government's Emissions Reduction Plan is substantial compared to the size of the proposed windfarm.

The additional wind generation capacity required to meet the electrification targets in the CCC advice are:

- CCC advice 2022[28,29] (assuming continuation of the aluminium smelter beyond 2024) forecast wind generation capacity of:
  - 1,314 MW by the end of 2025 compared to a start point of 1,002 MW in 2022.
  - additional capacity of 780 MW over 2026 to 2030, reaching 2,094 MW in 2030
  - additional capacity of 581 MW over 2031 to 2035 reaching 2,675 MW in 2035
- CCC advice 2023[30] estimated that to meet anticipated growth in electricity demand from 2025 new renewable generation able to supply over 1 TWh per year[31] will need to be built. (Meeting this increase only with new wind farms would require at least 285 MW of new capacity each year, assuming a wind farm capacity factor of 40 percent). Other CCC documents[32] which allocate the expected increase in supply over

27 Transpower's future modelling suggests in three of its five scenarios that new generation capacity in excess of New Zealand's current total capacity will need to be built by 2050 to meet increased demand https://www.transpower.co.nz/sites/default/files/uncontrolled_docs/Transpower_NZGP_Scenarios%20Update_Dec2021.pdf

28 Climate Change Commission (2022). '*Advice on NZ ETS unit limits and price control settings for 2023-2027, Technical Annex 3: Electricity market modelling and retail price estimates August 2022,*' available at www.climatecommission.govt.nz/public/ETS-advice-July-22/Technical-annexes-and-supplementary-documents/Technical-Annex-3-Electricity-modelling.pdf

29 Climate Change Commission (2022*). 'Technical-annex-3-Electricity-market-modelling-and-retail-price-estimates-results-dataset.xlsx, Demonstration path scenarios'* Available at https://www.climatecommission.govt.nz/public/ETS-advice-July-22/Technical-annexes-and-supplementary-documents/Technical-annex-3-Electricity-market-modelling-and-retail-price-estimates-results-dataset.xlsx

30 Climate Change Commission (2023). 2023 Advice on the direction of policy for the Government's second emissions reduction plan' page 53 available at https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/advice-for-preparation-of-emissions-reduction-plans/2023-advice-to-inform-the-strategic-direction-of-the-governments-second-emissions-reduction-plan-april-2023/

31 Climate Change Commission (2023). 2023 Advice on the direction of policy for the Government's second emissions reduction plan' page 278- 279 available at www.climatecommission.govt.nz/our-work/advice-to-government-topic/advice-for-preparation-of-emissions-reduction-plans/2023-advice-to-inform-the-strategic-direction-of-the-governments-second-emissions-reduction-plan-april-2023/

32 Climate Change Commission (2023).'*FOR_PUBLICATION-Electricity-market-modelling-results-dataset-ERP2023.xlsx, Build sequence-Demonstration path*' available at www.climatecommission.govt.nz/public/Advice-to-govt-docs/ERP2/draft-erp2/FOR_PUBLICATION-Electricity-market-modelling-results-dataset-ERP2023.xlsx

different types of renewable generation, forecast wind generation capacity construction of:

- 421 MW over the period 2024 to 2025
- 1,130 MW over 2026 to 2030.

The Mahinerangi Wind Farm Stage 2 capacity of 190 MW capacity and 549 GWh of annual generation can provide a significant contribution to meeting those targets. Mahinerangi Wind Farm Stage 2's annual generation of 549 GWh could displace, directly or indirectly, 279,861 tCO2-e if displacing gas-fired generation, or 554,016 tCO2-e if displacing coal fired generation.

4.2 Generation in the Southland and Otago regions

The Southland and Otago regions have substantial renewable generation capacity. Much of the time the existing generation exceeds the region's current demand so the region exports electricity to the rest of the country. But there may still be times when lake levels are lower than normal or the wind stops blowing so local generation is insufficient, and demand must be met by importing power from other regions. In addition, demand for electricity in the Southland Otago region could increase dramatically if Datagrid proceeds with its plans to build a datacentre at North Marakewa and as Fonterra replaces coal with electricity as its energy source for process heat.

Mahinerangi Wind Farm Stage 2 will increase the power available to export and reduce the periods when local generation is insufficient to meet demand. It will:

- Increase of renewable electricity capacity to help meet the expected increase in electricity demand from the electrification of light vehicle transport and industrial process heat.
- Provide added security for power supply both locally and nationally by increasing renewable generation when it can and conserving stored hydro capacity for use in covering peak demands and periods when the wind isn't blowing.
- To the extent that the new generation is located nearer to areas of high demand than alternative sources of electricity supply, it will reduce transmission losses and improve efficiency in supply across the electricity system, a benefit that will be realised both nationally and locally as a reduction in the cost of delivered energy.

To the extent that wind generation displaces thermal generation either directly or indirectly by conserving stored hydro, it will contribute to reducing greenhouse gas emissions from what they would otherwise be and help New Zealand meet its international commitments and its national targets articulated in the Climate Change Response (Zero Carbon) Act and the Government's Emission Reduction Plans to reduce greenhouse gas emissions.

The avoidance of transmission losses is a real resource saving and distinct from any change in transmission charges, which include a large component of fixed cost recovery that is covered at set rates per connection rather than in proportion to electricity use. If a district's demand is met by power from distant generators but receives only 97% of that which is dispatched and paid for by the district's customers, there is a tangible cost that can be avoided by sourcing the power closer to demand. Electricity customers may not be aware of such savings in the short term, as many are signed up to supply plans that smooth the price they pay for power, with electricity retailers absorbing the fluctuations in cost of power in the supply chain. However, in the long term, competition among retailers exerts pressure on them to offer lower prices to their customers to retain market share. So the avoidance of transmission losses (3 percent of generation which equates to 17 GWh) from the shift to more local generation will suppress prices for customers relative to what they would be in the absence of local generation, which is a benefit to communities' ability to provide for their wellbeing.

The Southland Otago region, like New Zealand at large, faces the likelihood of increasing electricity demand from both growth in population-driven electricity consumption and new uses for electricity driven by decarbonisation imperatives. New demand for electricity could be created by businesses decarbonising their energy use and by uptake of electric vehicles for transport, and also new electricity-dependent activities such as a proposed data centre or possibly manufacture of hydrogen fuel from electrolysis of water.

Until recently, prospects for new renewable investments were constrained by the expectation that the NZAS Tiwai Point smelter would close after its current contract expires in 2024, releasing its demand for 13% of New Zealand's current electricity generation and increasing the surplus power available. That constraint has been removed by the agreement between NZAS and Meridian Energy, Contact Energy and Mercury NZ on terms for the supply of electricity to Tiwai Point for the next 20 years.

4.3 Consistency with Government and Local Policies towards renewable electricity generation

At national level the National Policy Statement on Renewable Energy Generation (NPSREG) is fully supportive of new wind generation. The objective of this NPS is:

> *"To recognise the national significance of renewable electricity generation activities by providing for the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities, such that the proportion of New Zealand's electricity generated from renewable energy sources increases to a level that meets or exceeds the New Zealand Government's national target for renewable electricity generation."*[33]

Otago Regional Council[34] has supported the development of strategies for decarbonisation in its region which require increased use of electricity to replace the use of fossil fuels in transport, heating and industrial process heat.

4.4 Reduction of baseload thermal generation greenhouse gas emission

Wind farms help displace baseload thermal generation at the margin, either directly if generating at the same time as thermal generation would be dispatched, or indirectly by conserving stored hydro which has more flexibility in responding to short term demands. One consequence of displacing thermal generation is that greenhouse gas emissions in New Zealand are reduced relative to the counterfactual of having less new wind generation. In that context all new renewable generation is beneficial in helping to decarbonise the

33 National Policy Statement for Renewable Electricity Generation 2011, page 4. Available at https://environment.govt.nz/assets/Publications/Files/nps-reg-2011.pdf

34 EECA (2023), 'Regional Energy Transition Accelerator (RETA) Otago – Phase One Report, September 2023'.

electricity generation sector, and large windfarms make a more significant contribution than small ones.

The value of greenhouse gas emission reductions in New Zealand is principally recognised in the price of carbon credits in the Emissions Trading Scheme (ETS). However, ETS carbon prices are not the only way of valuing carbon, and they can be volatile and give mixed incentives for emissions reduction, as they arise from a value of restricted access to the stock of permitted emission capacity that is controlled under the ETS and may be manipulated by governments and others to affect prices.

The ETS New Zealand Unit (NZU) spot price for the calendar years 2023 and 2024 was about \$63 per tonne CO_2-e, and \$60 per tonne CO_2-e, respectively. The baseline modelling for the Government's Emission Reduction Plan 2026-2030 (2024) [35] assumes[36] NZU prices increase to \$75 per tonne CO_2-e by 2030 and then fall back to a long run price of \$50 per tonne CO_2-e by 2035. Arguably all these prices are understated by a structural feature of the ETS which makes it cheaper to meet emissions obligations by creating carbon credits by tree planting than by achieving reductions in greenhouse gas emissions. This has resulted in an accumulation of carbon credits in excess of demand, and makes the New Zealand carbon market price lower than it needs to be to reduce greenhouse gas emissions without becoming increasingly reliant on forest sequestration credits or importing credits from overseas sources, the demand for which and price are likely to increase towards 2050 as other countries enter the market and compete with New Zealand to acquire credits to meet their own net zero obligations.

Wind generation that can supply electricity to the market at low cost and earn a surplus in receiving higher cost of marginal generation dispatched provides a source of emission reduction that largely circumvents this structural issue in the ETS. But estimates of the value of windfarms in reducing emissions that use the ETS price will be understated compared to what the carbon price would need to be to reduce gross emissions to meet the net emissions target in 2050 with less reliance on imported credits, the availability and price of which at that time is uncertain.

As noted above, the Mahinerangi Wind Farm Stage 2's annual generation of 549 GWh could displace, directly or indirectly, 279,861 tCO2-e if displacing gas-fired generation, or 554,016 tCO2-e if displacing coal fired generation. The value of these emission reductions at \$59.82 per tCO2-e would be \$16.7 million or \$33.1 million respectively. These estimates are annual figures and would recur each year, other things held constant.

4.4.1 The national and international dimensions of greenhouse gas emissions

As emission costs are paid by thermal generators when burning fossil fuels, they will be reflected in the marginal price of power that is paid to all generation dispatched into the market at such times. The thermal generators' cost is renewable generators gain, as the value of carbon is reflected in the price generators receive for their electricity. That is an internalised value that incentivises renewable generators to participate in the market. But

35 Ministry for the Environment, (2024), '*New Zealand's second emissions reduction plan 2026–30, December 2024'* downloaded from https://environment.govt.nz/publications/new-zealands-second-emissions-reduction-plan/

36 Ministry for the Environment, (2024), 'New Zealand's second emissions reduction plan 2026–30: Technical annex', page 64, Table A1.1: List of baseline assumptions downloaded from https://environment.govt.nz/publications/second-emissions-reduction-plan-technical-annex/

there is also an externalised value for New Zealand at large in reducing the future cost of acquiring carbon credits to meet New Zealand's international emission obligations.

International carbon accounting arrangements confer on New Zealand and all other participating countries a share of a stock of annual total greenhouse gas emissions which needs to diminish in successive years in line with internationally agreed emission reduction targets. Within New Zealand, the government controls access to this diminishing stock. Private companies and industries with emission reporting obligations can find the least costly way of meeting their obligations by a combination of real emission reductions (e.g. substituting renewable electricity for fossil fuelled heat and power), purchasing carbon credits created in New Zealand (e.g. from new afforestation) or purchasing carbon credits from accredited sources overseas.

The Climate Change Response (Zero Carbon) Amendment Act 2019 explicitly aims at net zero carbon by 2050, which implies a need to offset emissions above target reductions in New Zealand with credits for emission reductions created elsewhere. There is a risk that if other countries adopt the same approach and they all miss their reduction targets and need to find credits in international markets at the same time, this will increase the price of carbon credits and create a very large liability to be met in future.

Building new wind farms anywhere in New Zealand helps reduce the risk of that liability. Substituting fossil energy with renewable energy is a real emission reduction, not just a financial gain. As electricity cannot be exported from New Zealand (other than embedded in products such as NZ-smelted aluminium), renewable electricity contributes to reductions in New Zealand's greenhouse gas inventory that count towards the country's obligations. Financial instruments like carbon credits may be traded offshore to achieve higher prices and this may occur with some credits earned by New Zealand generators. But there are accreditation and verification challenges in using domestic credits overseas, and most are likely to remain within New Zealand offsetting its excess emissions.

4.5 Other matters of economic consequence

There are various other effects of wind farms being built that may have adverse consequences for community wellbeing or efficiency. Many of these effects are not traded in markets so the economic consequences are not readily apparent and need to be inferred through non-market valuation.

Such effects could be valued in economic terms using methods such as estimating the cost of making good an environmental loss in other locations, or running market research type surveys to identify people's willingness to pay for improving the environmental outcome (i.e. the value placed by the taxpaying public of what better environment means to them). Such methods are rarely used in RMA processes because of questions over their reliability and the results they provide. The usual consenting process is for subject matter specialists other than economists to assess the scale and significance of adverse effects on different aspects of the environment, and what conditions may be suitable to avoid, remedy or mitigate effects rather than attempting to assign put a dollar value to those externalities.

4.6 Summing up

Table 7 presents estimates of potential wind farm generation capacity and expected annual output. Reading down the table the figures proceed from the Headline spending (total cost of project), deduct 66.0% of the cost as imported components with payments made to overseas parties to identify spending available in New Zealand. It then applies ratios from Statistics New Zealand's input output tables for 2023 to estimate the sector's share of construction spending that is likely to be economic value added.

The middle rows in Table 7 identify the likely full time equivalent employment during construction in the three year construction period. They also identify likely annual employment per year during the operational phase of the wind farm.

The value of electricity depends on market prices which can fluctuate widely for a variety of factors. Over the past five years the annual average wholesale electricity prices have ranged between $107 per MWh (2020) and $201 per MWh (2024) so the annual output has been valued here at $142 per MWh (the average wholesale price of electricity over the five years ended 31 December 2024).[37] The table presents estimates for averted annual tonnes of CO2-e emissions (including carbon dioxide, methane and nitrous oxide) for both gas-fired and coal-fired generation, and values these at a recent price for carbon credits in the Emissions Trading Scheme of $60/tCO2-e, the recent market price.

As there are numerous variable factors that could change between the time when consent is granted and the wind farm is built, the estimates are of necessity approximate, as an illustration of the possible scale of effect, not a prediction.

[37] Based on Electricity Authority data. Annual average wholesale electricity prices in $/MWh were, 106.88 in 2020, 168.06 in 2021, 115.34 in 2022, 119.48 in 2023 and 201.43 in 2024.

Table 7 Summary of Wind Farm economic impacts and energy benefits

	Units	Estimate
Capacity	MW	190.0
Output	GWh/yr	549.3
Avoided transmission losses	GWh/yr	16.5
Headline spending	$m	560.0
• Import component	$m	340.0
• Construction spending in NZ (over three years)	$m	220.0
• Intermediate consumption	$m	195.8
• Value added (total for three years)	$m	72.6
Employment		
Employment during construction (over 3 years)	1yr FTE	75.0
Employment during operation	FTE/yr	8.0
Value of electricity		
Output	$m/yr	84.6
Avoided transmission losses	$m/yr	2.5
Greenhouse gas emissions averted		
• Gas-fired generation	tCO2-e	279,861
• Coal-fired generation	tCO2-e	554,016
Value of emissions averted		
• Gas-fired generation	$m/yr	16.7
• Coal fired-generation	$m/yr	33.1

Source: NZIER

5 Conclusions

This report provides an economic assessment of the proposed Mahinerangi Wind Farm Stage 2. It assesses a proposed wind farm with capacity expected of 190 MW and generating around 549 GWh per year.

The proposed Mahinerangi Wind Farm Stage 2would be sited in the Clutha District, a predominantly rural area within the Otago Region that has recorded slower economic growth and lower per capita GDP over the past five years than the rest of the region.

The principal economic benefit of the Mahinerangi Wind Farm Stage 2would be in harnessing energy in the wind to create a valuable product, electricity. While the revenues from power sales benefit the generating company, other effects of benefits to the wider economy include:

- Contributing to the increase in electricity generation capacity required to support the electrification of the economy including light vehicle transport and industrial process heat to deliver the greenhouse gas emissions reduction objectives in the Emission Reduction Plans (ERP) and Climate Change Commission (CCC) forecasts.
- Adding to the portfolio of renewable energy generation, improving security of generation to meet demands, in line with the National Policy Statement on Renewable Electricity Generation.
- BESS which will allow controlled supply of electricity during peak periods - up to 60 MWh for two hours at a time.
- Avoiding transmission losses by reducing import of electricity from further away.
- Displacing greenhouse gas emissions from thermal generation, either directly or indirectly by conserving hydro storage to use in displacing peak thermal use, thus helping New Zealand meet its emission reduction targets as expressed in the Climate Change Response (Zero Carbon) Act 2019 and Government's Emissions Reduction Plans.

The wind farm will also provide stimulus to local economic activity in the construction phase and operational phase.

NZEIR estimates the main direct effects of Mahinerangi Wind Farm Stage 2 on the local region would be:

- Injection of around $220 million expenditure during wind farm construction (in total over three years), of which about $73 million would be economic value added for the region.
- Up to an additional 200 full time equivalent (FTE) during peak construction (on average 75 FTE per year for three years during construction) and 8 to 10 FTE per year for operation of the completed wind farm.
- The construction activity for the BESS adds a further 10 percent to the expenditure and employment.
- Rental income for the owners of land that is used by the wind farm, BESS and transmission line. The Mahinerangi Wind Farm Stage 2 is of a scale and in a location to make a significant contribution to national targets for increasing renewable generation to meet increasing demand for electricity. It also contributes to emission reductions by helping to displace thermal generation, either directly or indirectly by helping to conserve hydro storage that can meet short term demand peaks. These characteristics make it a nationally significant development of infrastructure.

Appendix A Data sources

A.1 Comparing demand and generation

Overall the Southland and Otago region generating capacity and annual output exceeds peak demand and annual load. However, the expected increase in load from new data centres and electrification of industrial process heat are expected to close this gap over the next five to 10 years.

This section summarises Transpower data on peak demand and generation capacity (measured in MW) and the annual volumes of load and generation output (measured in GWh). About 44 percent of the peak load and about 61 percent of the annual load volume for the region are attributable to the New Zealand Aluminium Smelter (NZAS) at Tiwai Point. Most of the generation capacity and output for the region are provided by a small number of large hydroelectric power schemes (HEPS) – Manapouri, Clyde and Roxburgh. The remaining output is provided by small scale run of river HEPS and wind generation. Most of the new generation capacity is from the construction of windfarms aside from an upgrade to Roxburgh[38]

The summary of load peak and generation capacity in this section starts with the structure used in Transpower 'Transmission Planning Report 2023' supplemented by owner data. A map of the Transpower Southland and Otago region with the location of the main grid exit points (GXP) and grid injection points (GIP) is shown in Figure 4. The map does not include all the generations sites but the names of the GIP and the schemes that are connected to either directly or through the lines company network are:

- Naseby - NSY0331; Falls Dam, Paerau Gorge and Patearoa.
- Frankton - FKN0331; Wye Creek & Glenorchy.
- Cromwell - CML0331; Roaring Meg.
- Clyde - CYD0331; Horseshoe Bend (wind and hydro), Lower Fraser, Upper Fraser, Kowhai, Talla Burn, Teviot and Clyde (at CYD2201).
- Roxburgh - ROX1101; Roxburgh.
- Manapouri - MAN2201; Manapouri.
- Halfway Bush - HWB0331; Mahinerangi (Waipori B) and Deep Stream (Waipori A).
- Berwick - BWK1101; Waipori (2A/3/4).
- Gore - GOR0331; Kaiwera Downs.
- Balclutha - BAL0331; Mount Stuart.
- North Makarewa - NMA0331; Monowai and White Hill.
- Invercargill - INV0331; Flat Hill.

Load and generation volume data was extracted from Electricity Authority (EA) data and generation volume is supplemented by information from owner websites. The locations are

[38] Contact is upgrading the turbines at Roxburgh and expects this will increase output by 44 GWh per year see https://contact.co.nz/investor-centre/news/2024/new-turbines-at-contacts-roxburgh-dam .

presented with the most north-easterly location first and the most south-westerly location last.

Figure 4 Transpower Southland Otago region grid

Source: Transpower 'Transmission Planning Report 2023', page 354

A.2 Generation capacity and output

The generation capacity and output information presented in Table 8 which reports:

- Generating plant capacity from two sources: Transpower[39] and the generation owner (where stated).
- Generation output from Electricity Authority (EA) wholesale market generation data[40] for the calendar years 2020 to 2024. The EA generation data is grouped by grid

39 Transpower 'Transmission Planning Report 2023, Table 19-2: Existing and committed generation capacity at Otago-Southland grid injection points', page 358.

40 'Generation trends, Date range: 01 Jan 2020 - 31 Dec 2024, Region type: Node, Timescale: Day' downloaded from www.emi.ea.govt.nz on 13 March 2025.

injection point (GIP). All the wind and the run of river HEPS are listed by Transpower as 'embedded' – connected to the local lines company network.

The generation data highlights some variation in the calculation of capacity factors for some wind farms as follows:

- Mahinerangi Stage 1 – 31.7 percent based on an output of 100 GWh and capacity of 36 MW as stated on the Mercury website[41]. The average electricity injection at Halfway Bush (HWB0331) over the period 2020 to 2024 was 153 GWh. Deducting 'owner stated' injection from the Deep Stream HEPS of 23 GWh suggests the average output from Mahinerangi Stage 1 was about 130 GWh which would imply a capacity factor of 41.2 percent.
- White Hill – 34.6 percent based on maximum expected output of 176 GWh. This output is slightly lower than Meridian's[42] description that the wind farm generates '*enough electricity for about 22,000 average New Zealand homes*.' which suggests a maximum estimate of annual output of 185 GWh[43]. However, the average electricity injection at North Makarewa (NMA0331) over the period 2020 to 2024 was 159.6 GWh. Deducting the 'owner' stated injection from the Monowai HEPS of 36 GWh suggests the average output from White Hill was about 124 GWh which would imply a capacity factor of 24.3 percent.

41 See https://www.mercury.co.nz/about-us/renewable-energy/wind-generation/mahinerangi-wind-farm

42 See https://www.meridianenergy.co.nz/power-stations/wind/white-hill .

43 The EA reported the average residential consumption was 8.4 MWh per year in Southland see EMI Dataset Retail category / Reports / Tag: all tags Residential consumption league table for the calendar year 2024.

Table 8 Electricity generation Southland and Otago

Capacity (MW) and output (GWh). Generation plant names in *italics* are embedded in local networks.

Generation plant	GIP	Fuel	Trans-power capacity (MW)	Owner capacity (MW)	Owner output (MW)	EA annual output over 2020 to 2024 (GWh)		
						Min	Max	Average
Falls Dam	NSY0331	Hydro	1.0		8.6			
Paerau Gorge	NSY0331	Hydro	10.0		62.0	37.5	69.1	57.0
Patearoa	NSY0331	Hydro	2.0					
Wye Creek & Glenorchy	FKN0331	Hydro	2.0		10.5	14.6	15.9	17.2
Roaring Meg	CML0331	Hydro	6.0		27.9	31.8	37.5	33.7
Horseshoe Bend	CYD0331	Hydro	4.0	4.3	33.0			
Horseshoe Bend	CYD0331	Wind	2.0	2.3	1.9			
Lower Fraser	CYD0331	Hydro	3.0		22.0			
Upper Fraser	CYD0331	Hydro	8.0	8.0	33.0	123.9	150.1	138.0
Kowhai	CYD0331	Hydro	2.0		7.5			
Talla Burn	CYD0331	Hydro	2.0	2.3	13.0			
Teviot	CYD0331	Hydro	11.0		55.0			
Clyde	CYD2201	Hydro"	464.0	432.0	2,100.0	2,008.1	2,248.4	2,098.2
Roxburgh	ROX1101	Hydro	320.0	320.0	1,615.0	1,298.9	1,910.2	1,679.6
Manapouri	MAN2201	Hydro	820.0	0.0	0.0	4,108.1	5,141.1	4,662.4
Mahinerangi (Waipori B)	HWB0331	Wind	36.0	36.0	100.0	124.5	174.6	153.1
Deep Stream (Waipori A)	HWB0331	Hydro	6.0	6.0	23.0			
Waipori (2A/3/4)	BWK1101	Hydro	90.0	87.0	189.0	63.4	145.8	102.1
Kaiwera Downs	GOR0331	Wind	43.0	43.0	147.0	0.3	153.1	39.9
Mount Stuart	BAL0331	Wind	8.0	7.7	21.0	16.3	19.3	21.3
Monowai	NMA0331	Hydro	6.0		36.0	114.3	190.2	159.6
White Hill	NMA0331	Wind	58.0	58.0	184.4			
Flat Hill	INV0331	Wind	7.0	6.8	25.2	16.3	19.3	21.3
Total			**1,911.0**				**9,182.0**	

Source: NZIER

A.2.1 Wind farm capacity factors – historic and prospective

Reported wind farm capacity varies widely across existing wind farms in the Southland Otago region and is difficult to establish for some wind farms because they share grid injection points with other forms of generation.

Historic

There are three large and three small wind farms currently operating in the Southland Otago region. Their nominal capacity and estimates of their output are provided in Table 9 below.

Table 9 Existing Wind Farm capacity factors

Capacity (MW), generation output (GWh) and capacity factor (percentage)

Owner	Project	Capacity (MW)	Owner		Estimated from EA data	
			Output (GWh)	Capacity factor	Output (GWh)[1]	Capacity factor
Meridian	White Hill[2]	58	185	36.37%	124	24.33%
Mercury	Kaiwera Downs(Stage 1)	43	147	39.03%	153	40.63%
	Mahinerangi (Stage 1)[2]	36	100	31.71%	130	41.24%
Pioneer	Mount Stuart	8	21	29.97%	19	27.52%
	Flat Hill	7	25	41.10%	23	38.16%
	Horseshoe Bend	2				

Notes:

1. Output estimated from EA data is the average injection over the five years ended 31 Dec 2024 at the relevant grid connection point for the wind farms at White Hill, Mahinerangi, Mount Stuart and Flat Hill less the owner reported generation for any other generation point linked to the same connection. As Kaiwera Downs (Stage 1) was completed in November 2023, the output estimated form the EA data is the is the average injection over the year ended 31 Dec 2024.
2. White Hill Owner output of 185 GWh is estimated from Meridian's description that White Hill can supply 22,000 average homes multiplied by the average annual residential energy use in Southland of 8.4 MWh. The estimate from EA data is based on the average annual injection into NMA0331 of 160 GWh less the owner reported annual output of Monowai HEPS of 36 GWh.
3. Mahinerangi (Stage 1) annual output is reported by Mercury as 100 GWh (see https://www.mercury.co.nz/about-us/renewable-energy/wind-generation/mahinerangi-wind-farm). The estimate from EA data is based on the average annual injection into HWB0331 of 153 GWh less the owner reported annual output of Deep Stream HEPS of 23 GWh.

Source: NZIER

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Prospective

There are five prospective (either under construction or in the process of applying for consent) wind farms in the Southland Otago region. The expected capacity factors for the projects shown in are used as a comparator in support of the capacity factor estimate for the Mahinerangi Wind Farm Stage 2.

Table 10 Prospective wind farm capacity factors

Capacity (MW), generation output (GWh) and capacity factor (percentage)

Owner	Project	Status	Capacity (MW)	Output (GWh)	Capacity factor
Contact	Southland[1]	Under appeal	300	1,200	45.66%
Mercury	Kaiwera Downs (Ph 2)[2]	Under construction	155	525	38.67%
Mercury	Mahinerangi (Ph 2)[3]	FTAA application	190	595	35.75%
Pioneer/Manawa	Kaihiku[4]	FTAA application	300	1,180	44.90
Pioneer Energy	Jericho Station[5]	Fast track application	35	140	45.66%
Calder Stewart	Awarua Wind Farm[6]	FTAA application	42		

Notes:

1 Located approximately 30km southeast of Gore. Contact intends to appeal the Environmental Protection Authority's expert consenting panel decision declining its application for consent under the COVID-19 Recovery (Fast-track Consenting) Act 2020 and may reapply for consent under the FTAA. (See 'Contact to appeal Southland Wind Farm decision and re-apply under new Fast-Track consent process, 27 March 2025' available from https://contact.co.nz/investor-centre/news)

2 Located 15km south-east of Gore. Construction started in June 2024 and is expected to be completed by March 2027. (See 'kaiwera-downs-stage-2-fact-sheet.pdf' available from https://www.mercury.co.nz/about-us/renewable-energy/wind-generation/kaiwera-downs-wind-farm

3 Located 50 km directly west of Dunedin. FTAA application in progress. (See https://environment.govt.nz/acts-and-regulations/acts/fast-track-approvals/fast-track-projects/mahinerangi-wind-farm/)

4 Located on private farmland approximately 8 km from Clinton and 12 km from Balclutha in the Kaihiku Range of South Otago. FTAA application in progress. See https://environment.govt.nz/acts-and-regulations/acts/fast-track-approvals/fast-track-projects/kaihiku-wind-farm/

5 Located approximately 122km north of Blackmount in the Waiau Valley. Application made under the Natural and Built Environment Act 2023. (See https://www.epa.govt.nz/assets/Uploads/Documents/Fast-track-consenting/NBEA-process/NBEA-Jericho-Wind-Farm/Notice-of-Decision-Jericho-Wind-Farm.pdf)

6 Located 12 km southeast of Invercargill. FTAA application in progress, (See https://environment.govt.nz/assets/what-government-is-doing/Fast-Track-Unlisted/Awarua-Quadrant-Windfarm/064.06-Awarua-Quadrant-Windfarm-Sch-2B-MfE-assessment-form-Stage-1_Redacted.pdf)

Source: NZIER

A.3 Electricity demand

The electricity demand data in Table 11 is extracted from an EA electricity demand[44] dataset and the peak demand was extracted from Transpower's Transmission Planning

[44] ' 'Demand trends, Date range: 01 Jan 2020 - 31 Dec 2024, Region type: Node, Timescale: Day' downloaded from www.emi.ea.govt.nz on 9 April 2025.

Report[45]. The grid exit points (GXPs) listed in Table 11 are a subset of the GXPs listed in the Transpower report[46] as some of the GXPs listed in the Transpower report are embedded in other GXP for load measurement.

Table 11 Electricity demand Southland and Otago

Peak demand 2024(MW)[1] and output (GWh)[2]

Grid exit point	GXP	Peak demand 2024 (MW)	2020 (GWh)	2021 (GWh)	2022 (GWh)	2023 (GWh)	2024 (GWh)	Average 2020 to 2024 (GWH)
Naseby	NSY0331	32	226	216	234	217	234	225
Frankton	FKN0331	84	281	287	309	336	355	314
Cromwell	CML0331	56	216	215	234	246	256	233
Clyde	CYD0331	12	102	97	100	104	107	102
Halfway Bush	HWB0331	132	495	536	538	534	538	528
South Dunedin	SDN0331	79	333	328	324	325	342	330
Gore	GOR0331	65	172	173	174	180	227	185
Balclutha	BAL0331	32	173	173	176	180	182	177
Brydone	BDE0111	11	57	58	56	56	60	57
Edendale	EDN0331	40	150	152	158	160	184	161
North Makarewa	NMA0331	77	284	276	277	287	298	284
Invercargill	INV0331	125	486	499	509	515	544	511
Tiwai	TWI2201	580	4,997	4,956	5,014	5,012	4,432	4,882
Total		**1,325**	**7,972**	**7,967**	**8,105**	**8,152**	**7,759**	**7,991**

Notes:

1 Transpower, Transmission Planning Report 2023', Table 19-1: Forecast prudent annual peak demand (MW) at Otago-Southland grid exit points to 2038, page 359:

2 Demand trends, Date range: 01 Jan 2020 - 31 Dec 2024, Region type: Node, Timescale: Day' downloaded from www.emi.ea.govt.nz on 9 April 2025 .

Source: NZIER

A.4 Regional economy datasets

The data used to describe the regional economy comes from two sources:

- Statistics New Zealand for regional GDP.
- MBIE modelled Territorial Local Authority (TLA) data for TLA GDP and population.

45 Transpower, 'Transmission Planning Report 2023', Table 19-1: Forecast prudent annual peak demand (MW) at Otago-Southland grid exit points to 2038, page 359

46 Transpower, 'Transmission Planning Report 2023', Table D-2: South Island Grid Exit and Injection Points, page 412.