BEFORE AN EXPERT PANEL
SOUTHLAND WIND FARM PROJECT

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

SOUTHLAND WIND FARM TECHNICAL ASSESSMENT #2: ECONOMIC FRAMING AND IMPACTS

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EXECUTIVE SUMMARY

1. This evidence presents an economic assessment of the proposed Southland Wind Farm (the **Project**), focusing primarily on its secondary benefits – that is, those derived from stimulation of economic activity in the region and nation – and also touching on the Project's primary benefits. It uses a framework of analysis that recognises the primary benefits from generating valuable electricity from a free resource – wind - (including by reference to the report prepared by Concept Consulting (Report 1 in Part H of the application documents)); the secondary benefits of the Project arising from stimulating regionally significant economic and other activity and contributions to Gross Domestic Product (the main focus of this report), and lastly other effects on the environment that are external to the Project proponent's monetary calculus.

2. The Project as currently planned would be the largest wind farm to be built in New Zealand and would substantially increase the total capacity of wind generation in New Zealand's electricity generation infrastructure.

3. The economic consequences of the primary benefits of the Project are positive, including contributing to the generation capacity required to meet rising demands for electricity, both from growth in economic activity and population, and from electrification of fossil-fuelled transport, and process and space heating equipment, in accord with New Zealand's national greenhouse gas emission targets. As described in more detail in the Concept Consulting Report, this would make a significant contribution to meeting national goals for renewable energy and emissions reductions.

4. Secondary benefits arising from increased spending, employment and incomes are also positive, concentrated in the southern region and largest in the construction period than in on-going operation phase. By adding a source of low-cost generation to the Southern region, the electricity generated by the Project could also attract new industries to the area, extending the range of future secondary benefits.

5. As further described in the Concept Consulting Report, the Project would also displace some emissions from fossil fuelled generation, having a positive impact on New Zealand's pursuit of emission reduction targets. Other external effects on the natural environment may also be weighed up in estimating the overall benefits of the Project. Economic valuation of these environmental effects is challenging given the absence of market prices for

many of them, but their combined value would have to be very large to eclipse the positive value of the Project.

INTRODUCTION

6. My full name is Peter William John Clough.

7. I am a Senior Economist at the New Zealand Institute of Economic Research (**NZIER**) in Wellington, an incorporated society that provides economics research and consultancy services for a range of public and private sector organisations, in New Zealand and overseas.

Qualifications and experience

8. I have the following qualifications and experience relevant to this assessment:

    (a) Bachelor of Arts in Geography and Land Economy from Cambridge University, a Master of Science in Recreational Land Management from the University of Reading, and Post-Graduate Diploma in Agricultural Economics from Massey University. I have previously held positions on the committee of the New Zealand Agricultural and Natural Resource Economics Society.

    (b) I have over 35 years' experience of applied economic research and consultancy, during which time I have specialised in applying economics to the natural environment and public sector issues such as regulation of third party effects and "externalities", provision of public goods, and appraisal of projects and policies in fields such as biosecurity, environmental regulation, energy, transport, public health and safety.

    (c) I have prepared technical reports and presented expert evidence to the Environment Court and council-level hearings in various resource management settings, including:

        preparing and presenting hearing evidence and economic reports for inclusion in Assessments of Environmental Effects with respect to consenting other wind generation projects, including Mahinerangi Wind Farm Stage 1, Kaiwera Downs Wind Farm, Waipipi Wind Farm and Turitea Wind Farm, all of which have since been built and several others that have yet to be constructed;

(i) preparing and presenting evidence on the re-consenting of the Lake Kaniere, McKay's and Patea hydro-electric power schemes, the variation to the Rakaia National Water Conservation Order to enable operational changes in the Lake Coleridge Hydro-electric Scheme to benefit both generation and irrigation; and

(ii) preparing and presenting evidence on the economic consequences of environmental policy proposals under the Resource Management Act 1991 (**RMA**), such as appropriate offsets for new activities creating greenhouse gas emissions.[1] restricting land clearance for biodiversity conservation and the use of biodiversity offsets.

(d) I have advised government agencies and other public clients on the economic methods used and values attached to environmental conditions, including the Treasury,[2] New Zealand Transport Agency,[3] and Hauraki Gulf Forum.[4]

Code of conduct

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

Purpose and scope of assessment

10. The purpose of this assessment is to assess the potential economic effects of the Project to inform the applications under the Fast-track Approvals Act 2024 (**FTAA**).

11. The scope of the assessment includes:

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[1] See *Environmental Defence Society v Taranaki Regional Council* A184/2002 ENC.
[22] https://www.treasury.govt.nz/publications/commissioned-report/capturing-natural-capital-decision-making
[3] https://www.nzta.govt.nz/assets/resources/research/reports/571/docs/571.pdf
[4] https://www.nzier.org.nz/publications/valuing-the-hauraki-gulf-an-ecosystem-services-and-natural-capital-approach

(a) An outline of relevant considerations for economic assessments in the FTAA and relevant sections of the RMA (sections 5, 6 and 7).

(b) A comprehensive framework for economic assessment of a new wind farm, including:

(i) The primary benefits of generating electricity by harnessing a hitherto unused and 'free' resource, wind. This includes both the impacts on the electricity system and contribution to national goals for electricity infrastructure in meeting future growth in demand; and assisting reduction in greenhouse gas emissions. In this regard, I have reviewed the report prepared by Concept Consulting which assesses and values these benefits. I find its approach to be reasonable and rely on its estimates, subject to the caveat that I am not familiar with Concept's models and all inputs and assumptions used in preparing their estimates.

(ii) The secondary benefits of the Project in stimulating economic activity in its vicinity and wider impacts on the economy, including contributions to GDP, employment and incomes. These benefits are the primary focus of my assessment.

(iii) The external effects of the Project that fall outside of the monetary valuations of primary and secondary benefits, but which can still have economic consequences. This includes the value of effects on the environment (which can be adverse or positive, such as the offsetting and compensation measures offered by Contact as part of the Project), and the consequences of avoiding them by restricting new developments.

(c) Qualitative estimates of the impacts of the Project and qualitative outline of some broad effects of national goals for the electricity system.

12. Complementing this evidence is a separate report on quantified estimates of effects on the electricity system provided by Concept Consulting using their proprietary model of the electricity system, focussing on the Project's primary benefits.

THE SOUTHLAND WIND FARM PROJECT

13. Contact Energy Limited (**Contact**) is seeking various approvals necessary for the construction, operation and maintenance of the Southland Wind Farm in

Slopedown, Southland. The Project includes up to 55 wind turbines and associated infrastructure.

14. The proposed Project would have installed capacity of between **230 to 380** megawatts (MW), capable of generating respectively **850 to 1,400** gigawatt hours (GWh) per year, assuming a capacity utilisation factor of 42.3%. The full project description for the Project is provided in Part A of the substantive application documents, which I have read. I do not repeat it in my assessment.

METHODOLOGY

Introduction and considerations under the FTAA and RMA

15. The approach of this assessment is to estimate the economic consequences of the proposed wind farm against a situation in which it does not proceed. There are various layers that can be applied to such assessment and tailored to fit the requirements of the legislation under which the assessment is being conducted.

16. Section 3 of the FTAA sets out the purpose of the Act, namely to facilitate the delivery of infrastructure and development projects with significant regional or national benefits.

17. In economic terms, facilitating delivery of infrastructure and development projects is largely about reducing the transaction costs that protracted approval processes can create, so that worthwhile projects can not only be approved but implemented sooner than would be the case without the FTAA, thus avoiding the opportunity costs of delay in realisation of the projects. The economic test of a "worthwhile" project is that it delivers benefits in excess of costs over time, where both benefits and costs are measured in commensurate dollar values and are not confined to those incurred by the project developers but also include "externalities", those borne by third parties external to the developers' investment return calculations.

18. The reference to significant regional or economic benefits in section 3 also highlights the importance of specifically considering a project's economic benefits.

19. The usual RMA considerations also apply under the FTAA. The RMA's purpose as set out in section 5 is to promote the sustainable management of natural and physical resources. Explicit recognition of economic

considerations under the RMA include references in section 5 to enabling communities to provide for their economic wellbeing, and the requirement in section 7(b) to have regard to efficient use and development of natural and physical resources.

20. The economic environment in which a new wind farm is constructed and operated includes the people and communities and the social, economic and cultural conditions which affect them in the vicinity of the development. In economic terms, the well-being references in section 5 of the RMA are usually addressed by examining a project's economic impact in stimulating new business, jobs and employment, and some effects on electricity supply and security. The efficiency references in section 7(b) apply more generally but are largely focused on comparative cost of wind farms and other forms of generation, and the consequences for the electricity market and electricity users.

21. The RMA does not define efficiency, but the Environment Court has noted that all aspects of efficiency are "*economic*" by definition, because economics is about the use of resources generally.[5] 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.

22. Efficiency can be further divided into **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.

Primary benefits of wind farms

23. The primary benefit of wind farms is their ability to generate a valuable product, electricity, by harnessing a hitherto untapped natural resource. Without a sufficient wind resource there would be no reason to build a wind farm. Not all locations are equally windy, so all other things being equal, efficiency encourages sites with the most consistently productive wind resources to be investigated and utilised first.

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[5] *Marlborough Ridge Ltd v Marlborough District Council* [1998] NZRMA 73 (EnvC).

24. Electricity can be distributed through the national transmission grid and local lines networks to link generation sources with points of demand. So, wind farms form part of the infrastructure meeting national and regional electricity demands. Contact, as an entity that operates plants that generate electricity, is defined as a ‘lifeline utility’ under the Civil Defence Emergency Management Act 2002. The contribution of a new wind farm on national and regional electricity markets is a matter the panel should consider when taking into account the purpose of the FTAA.

25. New Zealand has a competitive wholesale electricity market in which diverse generators offer to supply power at specific times of the day and the system operator selects the least cost supply from these offerings for dispatch across the grid to meet market demands. Because their fuel is 'free', wind farms can supply electricity to the market at lower cost than many other forms of generation, helping to suppress the cost of electricity across the market from what it would be in the absence of wind farms, consistent with the efficiency referred to in RMA section 7(b).

26. The primary benefits of the Project are assessed further and described in the report prepared by Concept Consulting, [***Electricity system benefits of the Southland Wind project, 25 July 2025***].

Secondary benefits of wind farms

27. The focus of this assessment is in relation to the secondary benefits of the Project, as described below. The FTAA has new and additional focus about ‘national and regional benefits’ but does not give much detail on how such benefits are to be assessed. However the RMA’s guidance can be adapted to address the FTAA’s purpose as well.

28. A new project’s impacts on community wellbeing under the RMA’s section 5 are usually assessed by looking at the stimulus to new economic activity created by the project, both its (a) direct impact from spending, jobs and incomes associated with project, and (b) indirect and induced impacts stimulated in the rest of the economy, among suppliers to the project and those who benefit from increased consumption enabled by enhanced incomes. These are known as secondary benefits as they would not arise without there being a primary benefit being sought from the project. They also largely comprise resource costs that are used up in realising the primary benefits, such as costs of capital installations and operations.

29. Nevertheless, the injection of new activity in an economy is beneficial for GDP, employment and income. As a proportion of total expenditure, a single project is more significant for a regional economy than the national economy. In the case of large projects like wind farms, these impacts tend to be highest and concentrated in a project's early years of construction and drop to much lower levels in the operational and maintenance years.

External effects of wind farms

30. While the proponents of a new development are best placed to assess the market costs and likely return from their investment and the risks around it being realised, they can less easily assess the value of both beneficial and adverse environmental effects that the RMA is intended to manage (noting again the different statutory context for the FTAA) and for which market prices are often not available. These consist of both negative and positive 'externalities', effects of actions that fall on or benefit third parties. They may be local (e.g. around a development's neighbourhood), regional (e.g. affecting biodiversity or ecosystem health) or national (e.g. greenhouse gas emissions, which have global effects but are managed under international agreements signed by national governments).

31. Past practice in RMA hearings has been to rely on diverse subject matter specialists to assess the scale and impact of adverse environmental effects of new developments for adjudication panels to weigh up in their own way, largely due to the absence of dependable market prices for the effects identified. Even if environmental impacts are not explicitly valued, there is an economic consequence if decisions are made to restrict or reject a proposed development in the form of an opportunity cost of benefits forgone from not proceeding with the development. To be efficient, a decision to reject or restrict a project under the RMA, and by implication also the FTAA with its purpose of enabling projects with significant regional or national benefits, must be based on the principle that the environmental benefits of avoiding the project's impacts outweigh the opportunity costs of not proceeding with it. That raises the question of what evidence is there that society values avoidance of such adverse effects as highly as that implied value.

32. There are some reliable market-relevant prices for environmental effects, such as carbon emissions that can now be valued with reference to the carbon price in the emissions trading scheme. In other cases a development's environmental effects may be valued by estimating costs of

alternative or replacement means of obtaining the ecosystem services lost or gained due to development, or other methods for inferring the public's "willingness to pay" for environmental improvements. As bespoke valuation studies are costly and time-consuming to prepare, "benefit or value transfer" is sometimes used to apply values estimated in previous studies to analogous new policy cases, but with all these methods it can be challenging to verify that the values obtained are reliable expressions of public value.

33. In all cases the market valuations do not supplant the assessments of bio-physical experts about intrinsic ecological or environmental effects, but rather supplement them with indications of the societal value of avoiding adverse or generating positive environmental effects. This is more readily done for effects that are uniform at the national level (such as greenhouse gas emissions), as a single value can be used everywhere across the country. For more localised adverse effects, such as impacts affecting for example, local water quality, wetlands, significant habitats for indigenous fauna, indigenous vegetation, and biodiversity, values will vary across regions with the relative abundance and scarcity of environmental components which must be allowed for in localised valuations.

Summary of economic assessment components

34. A comprehensive economic assessment of a new wind farm needs to cover the change in economic conditions caused by its construction and operation compared to the situation in which it does not proceed. This includes:

    (a) Primary benefits of generation of electricity from a clean, renewable, low-cost fuel (wind) and consequences, which is primarily the subject of the Concept Consulting report, such as:

        (i) Suppression of potential rises in cost of electricity supply, by increasing supply relative to demand using a free but hitherto untapped wind resource and in some cases avoiding transmission losses by reducing import of electricity from more distance sources;

        (ii) Contribution to the increase in electricity generation required to meet rising demand, both from population growth and changes in electricity use, such as electrification of vehicles and industrial process and space heat in pursuit of emission reduction targets;

(iii) Displacement of greenhouse gas emissions from thermal generation, either directly or indirectly by conserving hydro storage for use in replacing thermal generation at peak periods; and

(iv) Adding to the security of generation by adding to the diversity of the portfolio of renewable electricity generation.

(b) Secondary benefits from stimulation of economic activity in the region and nation more generally, which is the subject of this evidence.

EXISTING ENVIRONMENT: THE SOUTHLAND ECONOMY AND SUPPLY OF ELECTRICITY

35. For economic assessments of a wind farm, the environment consists of the economy in which it will impact and the wider electricity system to which it contributes.

36. The economic environment of secondary benefits is that of the region(s) which will be most affected by a new development as any project has a much smaller proportional impact on the national economy.[6]

37. Southland already has substantial renewable electricity generation, mostly hydro generation but including some wind. Much of that generation capacity is committed to supplying New Zealand Aluminium Smelter (**NZAS**) aluminium smelting operations. After some years of uncertain future with the possibility of closure freeing up a large tranche of local supply, NZAS now appears likely to continue using electricity for years ahead since reaching a new 20-year supply agreement in 2024. Having previously scaled back output to make electricity available to the market, NZAS has suggested restarting its 4th pot line to meet unmet demand for its product.[7]

38. Southland region uses more electricity than it generates. Over the calendar years 2020 to 2024 the excess of demand over generation has varied between 446 GWh (8 percent of regional generation) and 1,830 GWh (42 percent of regional generation) and averaged 1,036 GWh (21 percent of regional generation).[8] The output of the Southland Wind Farm would cover

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[6] Our description of the economic environment includes the Clutha District in Otago region in close proximity to the wind farm's location.
[7] https://www.thepress.co.nz/nz-news/360501276/nzas-looking-new-energy-sources-reopen-fourth-potline
[8] These estimates are based on daily totals by grid connection point published by the Electricity Authority as 'Generation trends' and 'Demand trends' downloaded from https://www.emi.ea.govt.nz/Wholesale/Reports.

most of this excess in aggregate but demand in the region is forecast to grow as described below.

Table 1 Estimated electricity generation and demand for Southland
Volume in GWh

Calendar Year	Generation	Load	Excess load	
			Volume	Share of generation
2020	5,414	6,145	731	14%
2021	5,486	6,115	629	11%
2022	4,359	6,189	1,830	42%
2023	4,665	6,211	1,546	33%
2024	5,299	5,745	446	8%
Average (simple)	**5,045**	**6,081**	**1,036**	**21%**

Notes:

1. The estimate of Southland generation includes Manapouri and Monowai hydroelectric schemes and wind farms at Kaiwera Downs, Flat Hill and White Hill.
2. The estimate for Southland load includes Brydone, Edendale, Gore, Invercargill, North Makarewa and Tiwai GXP.

Source: Electricity Authority emi dataset reports ‘Generation trends’ and ‘Demand trends’ downloaded from https://www.emi.ea.govt.nz/Wholesale/Reports

39. A new wind farm in Southland that achieves the high utilisation found in other existing wind farms in the southern regions will be an efficient source of electricity. Adding to the electricity generated in the southern regions will assist in meeting new local demands caused by electrification of existing activities and investment in new industries involved in transitioning the local economy away from fossil fuels and towards low carbon renewable energy. A good example is Fonterra which has:

(a) installed a 20 MW electrode boiler at its Edendale site which will ‘*reduce emissions by around 20% or 47,500 tonnes of CO_2e per annum*’[9] at the site.

(b) announced it will install another two 30 MW boilers [10] at the site which are expected to reduce emissions 72,800[11] tonnes of CO_2e per year.

Working back from the emissions reduction to calculate the volume of coal used and multiplying by the energy content of coal we estimate that the conversion means an energy requirement of 361 GWh (142.4 GWh from the

[9] https://www.fonterra.com/nz/en/our-stories/media/fonterra-to-install-its-first-electrode-boiler-at-edendale-to-reduce-emissions.html

[10] https://www.eeca.govt.nz/about/news-and-corporate/news/fonterras-edendale-site-moves-towards-a-renewable-energy-future/

[11] www.fonterra.com/nz/en/our-stories/media/fonterra-announces-next-steps-in-move-out-of-coal.html

20 MW boiler and 218.3 from the two 30 MW boilers) that was provided by coal will now be provided by electricity[12]. 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.) In terms of potential new demand, a green hydrogen venture was "paused" in August 2024, and the proposed Datagrid data processing centre and associated trans-Tasman data cable are seeking consent in Southland. But the ability to transmit electricity out of the region to other regions means such a wind farm is not dependent on the extent or timing of new demand arising in Southern regions.

40. At time of preparing this statement, the most up to date information with which to describe the local economy around the Southland Wind Farm site and the existing economic environment in which secondary benefits will be felt is Statistics New Zealand's Regional GDP tables describing GDP, GDP per capita and population up to year ending March 2024. Information on GDP by territorial authority area, for which estimates from modelling results are provided on MBIE's website, is available for March year 2025 for regional and territorial council areas in total but its information on employment by industry sector by region and district is for March Year 2023.

41. Summarising results from Statistics New Zealand's regional statistics for March year 2024 for the Southland Region:

(a) Southland had a population of 105,200, 2% of the national population (4th smallest region) with had grown by 0.9% per year on average between 2019 and 2024 (2nd lowest growth rate of all NZ regions)

(b) Southland's annual GDP was $8,839 million, 2.1% of the national total (10th largest region) but it had grown on average by 6.3% per year between 2019 and 2024 (6th highest growth rate among NZ regions).

(c) Southland's GDP per capita was $83,620, 5th highest among NZ regions and more than 7% higher than the national average, and it annual average growth rate at 5.4% was 3rd highest among NZ regions.

42. Southland's economy therefore appears fairly robust, but suffers from low population and widely reported perception that labour supply is rather tight.

[12] This calculation is only indicative of the change in electricity demand is sonly indicative because ti doe not allow for differences in efficiency between the coal and electrode boliers.

Its economy suffered less during the COVID disruptions than Otago and some other small regions further north (such as Queenstown Lakes, West Coast and Tasman districts), largely due to lower exposure and dependence on international tourist trade. It has a solid base of primary industries of agriculture, fishing, forestry, mining, plus manufacturing and utilities industries that together comprised 33% of regional GDP. The addition of new capacity of low-cost electricity to the region creates the prospect of attracting new clean energy-hungry industries (such as data processing centres) new jobs and attraction for population growth.

43. Regarding the existing environment of the electricity market, Table 1 shows the generation capacity and annual output of large, grid connected power stations in New Zealand in mid-2024, by energy source. At that time wind accounted for 10% of installed generation capacity and 8.3% annual output. The lower proportional share of output to share of capacity is due to wind power's intermittency, which in year ending June 2024 achieved a utilisation factor of 35% across all the country's wind farms.[13]

[13] This statistic is derived from generation and capacity figures in Table 2 below, and is corroborated in the Ministry of Business Innovation and Employment's Electricity Statistics average over the previous 5 years.

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	5,501	51.1%	Hydro	23,560	53.8%
Geothermal	1,216	11.3%	Geothermal	8,583	19.6%
Biogas	33	0.3%	Biogas	281	0.6%
Wind	1,263	11.7%	Wind	3,919	9.0%
Solar	403	3.7%	Solar	601	1.4%
Oil	192	1.8%	Oil	24	0.1%
Coal	500	4.6%	Coal	2,243	5.1%
Gas	1,245	11.6%	Gas	4,082	9.3%
Co-generation	417	3.9%			
			Wood	440	1.0%
			Waste Heat	31	0.1%
Total	**10,771**		**Net Generation**	43,764	

Notes:

1 The capacity numbers in this table are from MBIE Electricity data tables - Plant type (MW) for the year ended 31 December 2023 with the following adjustments

a Geothermal capacity was increased by 174 MW for the commissioning of Tauhara over June to November 2024.

b Wind capacity was increased by 219 MW for the commissioning of Kaiwera Downs Stage 1 (43 MW) and Harapaki (176 MW).

c Solar capacity was increased by 32 MW for the completion of Rangitaiki (near Edgecumbe) by Lodestone.

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). Available from https://www.mbie.govt.nz/assets/Data-Files/Energy/nz-energy-quarterly-and-energy-in-nz/electricity.xlsx

44. Table 1 also shows the compositional shift in electricity generation required if New Zealand is to phase out fossil fuel generation: currently the combined renewable technologies of hydro, geothermal, wind, solar, biogas and wood account for just over 85% of annual generation, whereas oil, coal and gas combined accounted for 14.5% in 2024. Renewable capacity needs to increase by more than that required to displace 14.5% of current generation, to cover periodic variations in annual renewable output due to environmental conditions (such as drought), and also to reduce reliance on thermal generation to cover short term peaks in demand. Hydro-electric generation with storage capacity can respond to short term demand peaks more than renewable technologies with variable output such as wind and solar, but the variable technologies can help by generating when they can and conserving stored water for use when it is more valuable at times of peak demand. That

can both improve the efficiency of the use of the hydro resource and help to suppress energy costs and consumer prices, as described in more detail in the Concept Consulting report.

45. The proposed Southland Wind Farm would make a significant addition to the national portfolio. Depending on final configuration it would add between about 18% and 30% to Aotearoa's current wind farm capacity and ***22-36%*** of wind farm annual generation, with a utilisation factor closer to **42%** in line with those achieved in other existing wind farms in Southland and Otago. The total generation portfolio will have changed by the time it is built, but it would still be a significant addition to electricity infrastructure in New Zealand.

ASSESSMENT OF EFFECTS

Primary benefits of additional generation capacity in Southland

46. The primary effects of additional wind generation in Southland have been examined in a separate piece of evidence on the results of modelling of likely scenarios by Concept Consulting. Here for context, I summarise the primary effects in qualitative terms before examining secondary benefits in more detail below.

47. The principal economic benefit of the proposed Southland Wind Farm is in harnessing energy in the wind to create a valuable product, renewable, zero-emission electricity. While the revenues from power sales benefit the generating company, other effects of benefit to the wider economy include:

    (a) Contributing to the increase in electricity generation capacity required to meet new electricity demand from population growth and potential new demands from the likes of data centres, and also to support the electrification of fossil-fuel reliant sectors such as 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.

    (b) Adding to the portfolio of renewable energy generation and improving security of generation to meet demands, in line with the National Policy Statement on Renewable Electricity Generation and the Government Policy Statement on Electricity Generation.

    (c) Avoiding transmission losses by reducing import of electricity from further away.

(d) Displacing greenhouse gas emissions from thermal generation, both directly by substituting a portion of its generation output in place of thermal and indirectly by conserving hydro storage to use in displacing peak thermal use, thus helping New Zealand meet emission reduction targets expressed in the Climate Change Response (Zero Carbon) Act 2019 and Government's Emissions Reduction Plans.

(e) Increasing the proportion of renewable generation in the national generation portfolio and contributing to carbon emission reductions makes Southland Wind Farm aligned to both national emission policies aimed at net zero by 2050, and with New Zealand's international obligations made under the Paris agreement.

Secondary benefits of expenditures and employment from the proposed wind farm

48. The proposed Southland Wind Farm is expected to cost around **$782-$1,292** million to construct, concentrated over a two-year period. Around two thirds of this total cost is expected to be spent on imported equipment – being the wind turbines and substation transformers, leaving about **$258-$426** million of capital investment injected into the New Zealand economy. Much of this will go to local suppliers of materials, services and labour for civil engineering and road construction. This will support business and wellbeing in the local economy.

49. A wind farm is a component of energy infrastructure, and the value of the business it facilitates over its operating life far exceeds the business of building and operating it. By increasing electricity generation in the region and reducing the frequency, volume and associated transmission losses of electricity being imported into the region, it will increase the availability of low-cost electricity in the region. This will increase the confidence for businesses considering investing in electrical applications to limit their carbon emissions and exposure to carbon pricing risks. It will also increase confidence in investing to pursue opportunities to provide new services to support the transition to a lower carbon emitting economy, such as production of green hydrogen through electrolysis, establishment of data centres or the electrification of existing fossil-fuel plant.

50. Table 3 allows comparison of the potential scale of the proposed Southland Wind Farm (230-380MW capacity with annual generation between 850-1400 GWh) with summarised characteristics of previous wind farms of varying size

(installed capacity), cost and date of consent application. These previous wind farm figures are based on expected two years of power station construction, after (and excluding) preliminary work on design and consenting. The relationship between scale, cost and labour requirements varies across wind farm developments according to differences in site characteristics, technologies, and installation challenges. Labour requirements for the operational phase can also vary, depending on whether the wind farm is a stand-alone operation or a marginal addition to other wind farms operating nearby.

Table 3 Recent New Zealand wind farm construction costs

Wind farms completed between 2021 and 2023 and under construction

Project	Start year[1]	Capacity (MW)	Output (GWh per year)	Capacity factor (%)	Capital cost ($m)	Capital cost ($ per kW)[2]
Operating						
Waipipi	2021	133	455	39.1%	277	2,083
Turitea[3]	2023	221	840	43.4%	450	2,036
Kaiwera Downs (Stage 1)	2023	43	147	39.0%	115	2,674
Harapaki	2024	176	542	35.2%	395	2,244
Under construction						
Kaiwaikawe	2026	77	221	32.8%	287	3,727
Kaiwera Downs (Ph 2)	2027	155	525	38.7%	486	3,135

Note:

1 Start year for 'Operating' wind farms is the year construction was completed but for 'Under construction' wind farms is the year construction is expected to be completed. '

2 Capacity weighted average capital cost ($ per kW) is the sum of the cost of projects in each group divided by the sum of capacity, For the 'Operating' wind farms completed over 2021 to 2024 the capacity weighted average capacity cost is $2,159 per kW and for the two wind farms 'Under construction' is $3,332 per kW.

3 Turitea Wind Farm was built in two stages: Turitea North was completed in 2022 and Turitea South was completed in 2023.

Source: NZIER

51. Wind farms require a variety of jobs and skills through both the operational and construction phases. Most of these jobs will occur in the construction stage of the project. From assessing previous experiences of consenting wind farms in New Zealand, wind farm construction requires about 0.8 full-time equivalent (**FTE**) jobs per MW installed. For the Southland Wind Farm, this would imply approximately 184 to 304 jobs during construction, depending on whether the smaller or larger configuration of turbines were installed. Assuming construction takes two years, this would equate to an

average of 92 to 152 jobs per year, although may exceed 200 over shorter peak periods.

52. These construction jobs are the equivalent of 0.3%-0.4% of the combined total employment in the three territorial authorities in Southland (being Gore, Southland, and Invercargill), depending on whether a smaller or larger configuration of turbines is built. They appear more significant relative to the workforces of the individual districts, including Clutha District across the regional boundary in Otago. Construction jobs are equivalent to 2.2% to 3.3% of the current employment in Gore, the smallest of the territorial authorities but closest town to the wind farm site and potentially most affected by new activity there.

53. Once the wind farm is commissioned, there will be direct employment of between 10-14 FTE operational staff. This is in line with the average operational FTE requirements per MW installed from the previous wind farms. In addition, there will be some contractor roles to support activities like site security, ongoing maintenance and minor upgrades (ie civil and electrical), pest and predator control, cleaning, and the 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. Based on the total operation and maintenance cost for the previously consented wind farms, the Southland Wind Farm would spend $8 million to $12 million per year on operations, of which over half would be spent locally on resident staff, contractors and other suppliers. More recent estimates of operating expenditures from Aurecon of $15-$20 per MWh would imply rather higher annual spending of $13.5-to 28 million.

54. Providing jobs and incomes to the Southland region provides social as well as economic benefits. A report commissioned by the Ministry for Primary Industries[14] found that creating and sustaining jobs in the regions:

(a) provides money, boosts living standards and wards off poverty;

(b) improves health and access to health care for workers and their families;

(c) provides social contact and contributes to social cohesion;

(d) contributes to people's life satisfaction and sense of identity; and

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

(e) reduces the likelihood of local depopulation from people leaving in search of better jobs.

55. The timelines in fast track consenting under the FTAA should also help shift the main employment period forward to provide an earlier addition to New Zealand's renewable generation infrastructure. This is significant to both the national goals of electrification and also in increasing the dispersion of wind generation across New Zealand; reducing the concentration of capacity around the Manawatu region, and increasing the resilience and diversity of wind generation against localised lulls in wind strength.

Composition of direct expenditure

56. The economic impact on regions is largely attributable to on-site activities during construction and operation. The main components of expenditure in the local economy in the construction stage[15] are:

(a) construction of roads and tower foundations;

(b) electrical engineering to connect the wind farm to the grid and planning; and

(c) other activities.

57. We have not been able to find estimates of the share of these components for New Zealand wind farms, but two overseas sources provide an indication of the makeup of wind farm costs.

[15] As this is focusing on expenditure impacts in the local economy, project costs on imported components such as turbines and other equipment are excluded from construction costs.

Table 4 Overseas wind farm cost composition

Share of total cost

Activity	USA[1]	IRENA[2]
Turbine total	**69.0%**	**64.0%**
• Tower	15.0%	
• Nacelle	34.0%	
• Rotor	20.0%	
• Electrical	10.1%	11.0%
• Construction	10.2%	16.0%
• Other[3]	10.7%	9.0%

Note:

1 Stehly, T Beiter, P and Duffy, P (2019) *2019 Cost of Wind Energy Review.* National Renewable Energy Laboratory, page 7

2 IRENA Secretariat (2012) *Wind Power* International Renewable Energy Agency (IRENA*)*, page 18

Source: NZIER drawing on Stehly et al (2019) and IRENA (2012)

Indirect economic impacts of new wind farm

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

(a) 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)

(b) Induced effects: spending on consumption goods and services by people with enhanced incomes derived from wind farm construction/operation and suppliers.

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

(a) 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 16 in GDP, with induced effects

from consumption spending of those working in the wind energy industry.[16]

60. This statement implies the following employment multiplier values:

(a) indirect employment multiplier of 1.37: an additional 0.37 FTE of indirect employment per 1 FTE of additional direct employment

(b) 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.

61. These 'economic impact' multipliers are applied to the low and high estimates for the proposed Southland Wind Farm in Table 4 below. These are expressed as FTE per year, so construction figures would be doubled over two years of construction.

Table 5 Employment impacts of the proposed wind farm

FTE per year – two year construction period

Activity	Direct	Indirect	Induced	Total
Construction				
• Low	92	34	31	157
• High	152	56	52	260
Operation				
• Low	10	4	3	**17**
• High	14	5	5	**24**

Source: NZIER

62. The statement above also implies the following GDP multiplier values:

(a) indirect GDP multiplier of 1.44: an additional $0.44 million of indirect GDP per additional $1 million GDP.

(b) 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.

63. 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. In construction of a wind farm, output is roughly equated to

[16] 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.

the expenditure on construction, and value added arises after deducting all consumable inputs into the construction. Value added can also be viewed as a source of income and returns to factors of production, of which there are three main items:

(a) Fixed capital consumption, essentially the economic depreciation on physical assets used in the construction or operation of the wind farm, which is equivalent to the amount required to repair wear and tear on those assets required for their capacity and value to be the same at the end of the period as they are at the beginning;

(b) Employee compensation, the wages and salaries and other benefits received by labour in return for their work on the project; and

(c) Operating surplus, a profit measure, from which firms can allocate funds for reserves accumulation, investment projects, or distribution of dividends to shareholders.

64. We estimate value added using ratios of value added to total output in Statistics New Zealand's Input Output Tables for 2020: for the construction phase 0.33 (heavy construction and civil engineering); for the operation phase, 0.17 (electricity generation). If these national ratios apply to the Southland Wind Farm, the direct value-added contribution would be as appears in Table 6 below, which also applies multipliers from the BERL report above.

Table 6 GDP impacts of the proposed wind farm

$m per year

Activity	Direct	Indirect	Induced	Total
Construction				
• Low $m	42.6	18.7	15.8	77.1
• High $m	70.3	31.0	26.0	127.3
Operation				
• Low $m/year	2.9	1.3	1.1	5.2
• High $m/year	4.8	2.1	1.8	8.6

Source: NZIER

65. While economic multipliers are commonly encountered, they must be interpreted with caution. Multipliers are derived from input output models which give a static snapshot of inter-industry transactions at a point in time. It is legitimate to infer that the direct impact of a sector creates indirect and

induced flow on effects of the size implied by the multiplier over the period captured by that static input output model. But it is not legitimate to assume that a new project injecting spending into a region will achieve the same multiplier as in the static snapshot.

66. A new project creates new demand for inputs from the economy, and a large project can create demands that hit constraints in the available supply of inputs in the economy. This can cause prices for those inputs to rise and hence increase costs for other businesses that use those same inputs. Those increasing costs reduce other businesses' operating surpluses and value added, so there is an offsetting adjustment that reduces economic value added from the new economic activity.

67. Multipliers derived from static models always overstate the flow on effects to some extent. There are computable general equilibrium (**CGE**) models that build on the base of the input output tables the ability to estimate input price changes caused by shifts in supply and demand, and reallocation of resource inputs between sectors according to where they are most valuable. These CGE models result in lower implicit multipliers that reflect offsetting impacts, but because of their greater complexity they are less often used.

68. Any quantified modelling gives only estimates based on a set of underlying assumptions that may be changed by events before the wind farm is built. The input-output 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.

69. As indicated above in paragraphs 41 and 42, the Southland region's economy has proven relatively resilient to COVID disruptions. With the exception of tourism-dependent sectors, the economy was buffered by the high proportion of primary production and processing industries which maintained production through the pandemic, and has since achieved better than national average outcomes during the recovery. The labour market is buoyant and job-seeker numbers are down.

70. While constructing a new wind farm will create demand for jobs, it will be competing with other sources of demand within the region and may need to enter a competitive wage bidding process to draw labour from the local market or else bring more workers in from outside the region. This is positive for Southland's economy, but can also cause some reallocation of labour and economic activity across incumbent businesses that partially offset the gains

from new labour. The labour markets in Southland District and Gore appear to be more buoyant than those in Invercargill, and other local labour markets in Clutha District and Dunedin City may also be drawn into the mix.

71. Wind farm construction requires a number of specialist skills which are unlikely to be widely available in the region, increasing the likelihood of contracting with suppliers based outside the region for specific stages of the work. That the project labour is not all drawn from the local labour force does not detract from the objectives of the FTAA in stimulating economic activity: workers on the project, whatever their place of residence, will be spending time and some of their earnings in the Southland region and generating the sort of indirect and induced impacts outlined above.

INFRASTRUCTURE BENEFITS FOR ECONOMY AND ENVIRONMENT

Benefits of the Southland Wind Farm

72. The primary economic benefit of any new wind farm is in harnessing wind energy to produce sustainable renewable electricity. As the wind fuel is essentially 'free' this adds a low-cost generation source to New Zealand's generation portfolio. The electricity benefits of the Southland Wind Farm – including reduced costs of electricity generation in New Zealand, reduced consumer bills, and reduced carbon emissions – have been assessed by Concept Consulting.

73. The Concept Consulting report explains how the need to displace fossil-fuel generation and the projected demand increase from general growth in population and economic activity requires the building of new renewable generation over the next three decades almost seven-times the rate seen over recent decades. New large hydro-electric schemes are costly and difficult to consent, new geothermal plant have a geographically limited range of sites, and on-shore wind generation is the lowest cost option of new generation. The Southland Wind Farm offers the ability to tap a strong wind resource and economies of scale to reinforce that cost advantage.

74. More specifically, the Concept Consulting modelling suggests that if the Southland Wind Farm did not proceed, it would prolong the time that New Zealand experiences elevated electricity prices due to shortage of renewable generation, estimated to be between $0.5 billion and $1 billion in present value terms over the 2025-2050 period. In addition, forgoing a large onshore wind project with economies of scale would push new generation up its

supply cost curve to more expensive options, with a cost additional to the price effects above of between $0.7 billion and $1.6 billion, amounting to a combined economic cost of $1.2 to $2.6 billion in present value terms. Furthermore, the delay in displacing fossil fuel generation would result in an estimated additional 0.6 to 1.5 $MtCO_2e$ emissions. Concept Consulting do not value these emissions because of uncertainty over future carbon values, but avoiding such volumes of emissions would make a contribution to New Zealand's national emission reduction targets. While I cannot vouch for the accuracy of the inputs and models behind these estimates, primary benefits of these sorts of magnitude indicate the Southland Wind Farm would be a significant addition to national infrastructure.

75. I broadly agree with the Concept Consulting assessment and add a few further observations.

76. Wind is an intermittent energy source and cannot be relied upon to meet periodic peaks in demand for electricity. But whilst it does not always directly displace fossil fuels used in coal and gas fired generation which are used to meet peaking demand, wind generation can conserve the capacity of stored hydro generation, increasing its ability to act as a "battery" for fast response to meet peak demands and displace fossil-fired electricity at those times.

77. Another benefit of increasing wind generation in Southland would be in reducing periodic calls on supply from further up the grid with associated transmission losses. Southland has been a net importer of power over the past five years, so adding generation capacity in Southland should reduce the frequency of displacing power from much further north. If the Datagrid project or any other prospective electricity-using project in the region is consented, the recent generation deficit in Southland will increase, so adding any new generation in the region will increase security against the eventuality of calling on more distant sources. This is more of a regional benefit that the Concept Consulting report does not address.

78. A new wind farm would also diversify the sources of wind generation in New Zealand, which are currently concentrated in Manawatu and spread sporadically across the rest of the country. Such diversity reduces the probability of loss of wind generation from localised wind drop.

79. A new wind farm in Southland would only be built if the developers see potential to earn a return on their investment in that location. Much depends on the future of NZAS and its contractual supply arrangement for power from

Manapouri. The smelter accounts for about 13% of New Zealand's electricity consumption, and if it were to close Southland would have a large surplus of electricity generation requiring either new energy-using industries in the region or increased grid capacity to export power from the region to the North Island.

80. At time of writing NZAS has come to a supply agreement with Contact Energy over power from the Manapouri Scheme which will allow it to continue operating for the next 10 years. It has indicated its intention to continue operating beyond that given favourable economic conditions.

Conclusions

81. The proposed Southland Wind Farm as planned would be the largest wind farm yet built in New Zealand. It would substantially increase the total capacity of wind generation in New Zealand, diversify the distribution of wind generation away from the current concentration in the Manawatu and reduce the risk of synchronised lulls in wind farm generation. It would be a significant addition to New Zealand's electricity generation infrastructure.

82. The primary benefit of the Southland Wind Farm is the harnessing of energy from the wind resource to produce a valuable product, electricity. The economic consequences of primary benefits are positive, including contributing to the generation capacity required to meet rising demands for electricity, both from growth in economic activity and population, and from electrification of fossil-fuelled transport and heating equipment in accord with New Zealand's national greenhouse gas emission targets. Some quantified estimates of the value of this energy are provided in other evidence prepared by Concept Consulting from modelling of impacts on the electricity market under a range of scenarios.

83. Secondary benefits arising from increased spending, employment and incomes are also positive, although concentrated in the southern regions and largest in the construction period than in on-going operation phase. Depending on whether it is built in a smaller or larger configuration, we estimate its construction could add between $258 and $426 million of spending on locally supplied goods and services (after removing the cost of imported components) and create between 184 and 304 FTE jobs. During its operational phase it could employ between 10 and 14 FTE staff, and inject $13.5 million and $28 million in operational expenditure into the local economy. By adding a source of low cost generation to the Southern regions

the wind farm could also reduce the periods when power must be imported from other generation sources outside of the region and associated transmission losses, and it can help to suppress power prices and attract new industries to the region, extending the range of secondary benefits into the future.

84. As quantified by Concept Consulting, the wind farm would displace some emissions from fossil fuelled generation, having a positive impact on New Zealand's pursuit of emission reduction targets. Other external effects on the natural environment may detract from net economic benefit but non-economic evidence suggests these can be appropriately mitigated by conditions on consents and will not be significant. Economic valuation of these environmental effects is challenging given the absence of market prices for many of them, but their combined value would have to be very large to eclipse the positive value of the wind farm.

Peter William John Clough