Date: 05/01/2026

To: B Belgrave
F McNutt
Barker and Associates

Ashbourne Development Fast Track Approvals Act

High level economic commentary re the Approach and Solar Component

With reference to the Ashbourne Development Fast Track Application, I have been asked to provide a response to the economic review prepare by Mr Denne (28 November 2025) with a particular focus on the economic benefits of the solar farm component[1] of the Ashbourne Development (Project), as set out in Minute 8 from the Panel. My credentials are presented in Appendix 1. While this is not an Environment Court hearing, I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court's 2023 Practice Note.

The memorandum starts with a short commentary regarding a selection of points raised by Mr Denne regarding his preferred approach to assessing the economic effects i.e., a full Cost-Benefit Analysis (CBA). The intent is not to address or respond to M Denne's review but to provide my perspective regarding which economic assessment tool to use when assessing benefits. I provide this because in my view the economic assessment of whether any particular project has regionally significant benefits is nuanced.

The second part of the memorandum provides additional information regarding the anticipated economic effects of the proposed solar farm component of the Project. Importantly, this memorandum was prepared under tight time constraints. Regardless, assessing any solar farm's potential regional or national benefits is highly complex, requiring inputs and analysis from multiple experts (e.g., engineers) and liaison with the national grid and distribution network operators. Detailed information about several matters is unavailable. Therefore, a range of referenced proxies and assumptions are used to illustrate the anticipated benefits (and costs considerations). Using these proxies and assumptions are reasonable and give an indication of the likely scale and direction of effects (benefits and costs).

Economic Impact Assessment vs Cost-benefit Analysis

Mr Denne reviewed Mr Colegrave (Insight Economics, IE) and Mr Heath (Property Economics, PE) respective reports and memorandums. I have not undertaken a further detailed review of the IE or PE reports, but I did read them – my focus was on the solar farm component and Mr Denne's comments on this matter.

Mr Denne identifies four key themes from the discussion between IE and PE[2] and I summarise his position regarding these themes (see Table 1). With reference to the approach to follow, Mr Denne's position that a

[1] The memorandum relates to both solar farms.
[2] Heading 1.2.1 in Mr Denne's review.

CBA is needed and that the Economic Impact Assessment (EIA) should be disregarded. I have a more nuanced perspective regarding the approach to follow.

Economists can use different tools when assessing proposals, projects of policies and all tools have strengths and weaknesses. Using only one approach risks missing useful insights about a proposed project and using multiple approaches mitigate this risk.

Table 1: Key themes and Mr Denne's commentary

Theme	Comment and Mr Denne's position*
1. The approach to analysis which both (IE and PE) considered appropriate	An Input-Output based modelling approach has been used by IE to estimate the economic impact. Mr Denne disagrees with the methodology and asserts that a CBA is required.
2. Whether there is a sufficient housing supply shortfall to justify the size of the development, particularly when the proposal is for a development outside of the land currently anticipated or zoned for development in the District Plan	The discussion about sufficiency does not account for market dynamics. Regardless, the market will find new equilibrium prices over the medium term.
3. The costs of displacing agricultural use of highly productive and (HPL) surrounding Matamata, and whether there should be physical limits on its use; and	The land is HPL and value is reflected in the land prices. The activity is not nationally significant and does not have any public good attributes. The environmental effects of dairy activity are not reflected in the land prices
4. The costs and funding of infrastructure to service the development, and whether it poses a financial risk to the council.	The economic issue is not about who-pays, but if the development would be viable if the developer did pay the full cost of infrastructure.
* - interpreted from the information under heading 1.2.2 in Mr Denne's review	

EIA and CBA are both partial equilibrium approaches and they tend to use the same types of base data. In very basic terms, the key differences are:

- An EIA traces how changes resulting from a new project (the economic shock) flow through an economy (i.e., the supply chain effects across multiple sectors) based on existing production patterns. It then estimates the GDP and employment effects. However, an EIA only captures actual transactions (goods and services that are bought and sold) and the GDP and employment levels associated with delivering the business activity underpinning those transactions and their supply chains. An EIA does not capture non-market effects such as emissions, eco-system services, health effects, emissions and amenity effects. An EIA reports the change in economic activity using GDP, employment, and/or income. An EIA can be used to assess changes in energy, waste and other inputs (such as water). An EIA does not classify transactions as a cost or a benefit. The analyst must interpret the results to identify the overall change and then express his/her opinion regarding the cost/benefits accordingly.
- A CBA excludes supply chain effects but includes market and non-market effects. A CBA classifies transactions into costs or benefits. For example, capital expenditure is classified as a cost but a lift in sales to new visitors would be treated as a gross benefit. The value of an asset at the end of an assessment period (terminal value) is normally included as a benefit. A CBA tends to be more explicit about opportunity costs, transfers and the net (additional) position.

An essential part of any economic assessment is to consider the initial effect (shock) of the proposed project appropriately. **Only change that can be directly linked or attributed to the proposed project should be**

assessed. If something would have happened regardless of project, then it should be excluded from the assessment. If something would happen sooner (or later) than under a do-nothing situation then the temporal shifts should be included in the assessment. The same holds for spatial changes but care is needed to accurately reflect the effects of spatial changes to avoid attributing a spatial transfer to the proposed project A transfer is where an activity that would have occurred in one location is simply relocated elsewhere.

When using an EIA approach, there is an opportunity to mitigate against some of the critique levelled against the Input-Output (IO) approach when framing the economic shock to assess. Being explicit to only modelling transactions associated with the **net additional change**, and accounting for displacement effects, spatial transfers, as well as opportunity costs[3] is appropriate. Simply modelling the entire proposal without the necessary adjustments is inappropriate.

Another critique of IO modelling is that it overstates the impacts. The critique reflects the assumption that sectoral input structures will remain constant and that the required inputs will be available. Keeping the structures constant means that market signals (prices) do not change behaviour and substitution across sectors (and labour and capital being reallocated)[4] does not occur. These limitations of IO are widely recognised, and transparent reporting of the results help decision-makers understand which aspects are at risk being overstated. This is achieved by isolating different impact rounds and reporting the direct, indirect and induced impacts separately[5] (as explained in Appendix 1). IO is widely used in New Zealand and internationally to estimate the economic impacts of projects. With careful design and implementation, many of the areas that are critiqued can be avoided/mitigated.

Like EIAs, CBAs have challenges to overcome. As mentioned, CBAs include both market and non-market values. Quantifying (sizing) and monetising non-market effects are difficult and often highly controversial. Finding usable sources can be challenging and surveys are used to collect information. It is not always viable to undertake surveys and CBA often draw on other studies, use proxies[6] and can be influenced by uncertainties and subjectivities. A recent study[7] found that "…vast majority of cost-benefit forecasts are systematically biased, with underestimation for cost and overestimation for benefits…". Optimism bias is normally dealt through a dedicated adjustment to increase costs and decrease benefits, or by way of a sensitivity analysis that considers downside settings.

In contrast to Mr Denne's position regarding EIA vs CBA, I am of the view that there is value in using multiple approaches, including EIA and CBA, when assessing a project to understand its benefits, and the net position. Acknowledging the weaknesses and using transparent reporting helps decision makers to deal with imperfect approaches by reporting a richer picture of the anticipated effects. Uncertainty is inherent in all modelling and cannot be avoided, although it can be reduced and using multiple perspectives (economic tools).

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[3] These can be expressed as negative transactions (where there are associated transactions or shifts in purchasing patterns).
[4] A more advanced form of economic modelling, Computable General Equilibrium (CGE), is used to model such changes. CGE models use the same foundational data as IO models but are significantly more complex than IO. I am not aware of any Territorial Authority or Regional Council-level CGE model in NZ. CGE models require additional information about substitution elasticities, utility maximisation, profit maximisation, factor mobility, and closure rules.
[5] IE report the different parts for the construction/one-off impacts (Table 10 in the IE report).
[6] The Treasury. (2015). *CBAx Tool User Guidance: October 2015*. New Zealand Treasury. Retrieved from Link
[7] Flyvbjerg, Bent and Bester, Dirk W., The Cost-Benefit Fallacy: Why Cost-Benefit Analysis Is Broken and How to Fix It (September 6, 2021). Journal of Benefit-Cost Analysis, October, pp. 1-25, doi 10.1017/bca.2021.9., Available at SSRN: Link

Ultimately, the economic assessment must be aligned with the purpose of the Fast Track Approvals Act (2024):

"facilitate the delivery of infrastructure and development projects with significant regional or national benefits"

I consider that the two key terms guiding the economic assessment are 'facilitate' and 'benefits". The Act does not define these terms. Facilitate is described[8] as "to make (something) easier", "to help bring (something) about", and "to help (something) run more smoothly and/or effectively". In simple terms, a "benefit" is defined[9] as something that produces good or helpful results, or an effect that promotes wellbeing. With reference to significant[10], this is defined as having, or likely to have influence or effect, it is also defined as large enough to be noticed.

Economic effects of the solar farms

The potential economic effects (costs and benefits) of the proposed solar farms are influenced by the size of the proposed development, specifically how much electricity it generates, as well as the existing electricity market, infrastructure costs and how the infrastructure costs are financed. The solar farms will have capacity to generate 52,000 megawatt-hours per year or 29MW[11]. For context, this is the electricity equivalent of between 6,100 and 8,950 households (nationally) or 6,900 Hamilton/Waikato households[12][13].

Context

New Zealand's net generation capacity is 11,026MW, and solar farms account for 568MW[14] of the capacity. The annual electricity generated varies depending on the business cycle and demand patterns. The total electricity consumed in 2024 is estimated to be in the order of 39,967GWh[15]. Renewable energy as a share of total net generation capacity has been trending up – increasing from a five year average (2009-2014) of 76%, to 85% for the 5-years to 2024.

According to the Electricity Authority Te Mana Hiko, new electricity generation projects are expected to significantly boost New Zealand's energy system over the next two years. There are (November 2025) 290 projects in the pipeline. If delivered, these projects will add total capacity of 44.9GW coming from a range of generation types. Many of these projects are in the early phase of development and there is no indication of how likely these are to be progressed. Of the 290 known projects, 14 are classified[16] as "committed" meaning

[8] Merriam-Webster. (n.d.). *Facilitate*. In *Merriam-Webster.com dictionary*. Retrieved from https://www.merriam-webster.com/dictionary

[9] Merriam-Webster. (n.d.). *Benefit*. In *Merriam-Webster.com dictionary*. Retrieved from https://www.merriam-webster.com/

[10] 10 Merriam-Webster. (n.d.). *Benefit*. In *Merriam-Webster.com dictionary*. Retrieved from: https://www.merriam-webster.com/dictionary/significant

[11] Ashbourne Fast Track Substantive Application. Volume 1. 14 July 2025.

[12] Sapere Research Group. (2021). *Cost-benefit analysis of distributed energy resources in New Zealand*. New Zealand Electricity Authority. Link

[13] Level. (2025). *Energy*. Link — The average New Zealand household uses about 7,100 kWh of electricity per year.

[14] Ministry of Business, Innovation & Employment. (2025). *New Zealand Energy Quarterly*. MBIE. Retrieved from link

[15] Ministry of Business, Innovation & Employment. (2025). *New Zealand Energy Quarterly*. MBIE. Retrieved from link. Based on actual sales data (Sept 2025).

[16] by the Electricity Authority Te Mana Hiko.

that a final investment decision has been made – these are likely to proceed. Forty percent (40%) of the committed projects are solar. These projects will come online in the next two/three years, and will add 1.4kMW. Another 23 projects relating to 2.95kMW projects are classified as "actively pursued"[17]. A spatial breakdown of the type of generation, or the project status is not available on the Electricity Authority's public facing data portal[18].

Understanding electricity demand is critical when assessing the potential benefits of solar farms because demand drives the need for investment in electricity assets and determines the value of electricity. Without demand, generation has little or no economic value. According to Transpower, New Zealand's demand for electricity is projected to grow into the future (2% CAGR[19]). Similarly, the Waikato regional economy and population are growing and consequently, demand for electricity is projected to grow. The electricity network consists of different parts that combine to deliver electricity from where it is generated to where it is used. The Waikato's electricity network is projected to face challenges and capacity constraints over the medium term (circa 2035).

Infrastructure costs and alternatives

The potential economic benefits of adding new solar farms are a function of the additional capacity it provides, the nature of the electricity it provides (intermittent) as well as how it integrates with the transmission/distribution network. There are several costs associated with establishing the asset: including capital costs which includes wider infrastructure (transmission or distribution investments) as well as direct capital expenditures.

The transmission/distribution cost component can be substantial. The need to connect to the Transpower's grid is a function of size – if a project is larger than 150MW then in is likely to connect to the grid. A project between 10MW and 80MW is normally embedded in the local distribution network. This suggests that the project is likely to connect to the local distribution network. However, the potential effects on the wider network should be considered because there could be costs (additional infrastructure investments) or benefits (deferred maintenance).

Transpower is investigating what infrastructure is needed to support the Waikato's growing electricity demand. A key challenge is a 'pressure point' that is emerging at Hamilton Substation where the regional network connects to Transpower's grid. The potential benefit (and cost implications) of the proposed solar farms and how/if they could alleviate some of the identified pressures is an engineering question. If the solar farms alleviate some of the anticipated pressures, then there will be regional benefits associated with a more resilient network, improved reliability and benefits associated with deferred/avoided capital investment. The general costs associated with establishing the necessary connections are in the order of:

- Transmission line build costs $750,000/km (if needed)
- Transmission Grid Exit Point connection cost $19m - $21m (if needed)

[17] If a final investment decision hasn't been made, but other significant milestones have been reached (a location being secured in addition to a consent application being submitted or contracts to finance the project executed) then the project is 'actively pursued.

[18] I have enquired if a detailed breakdown is available, but I have not received an answer.

[19] Transpower New Zealand. (2023). *Transmission Planning Report 2023*. Transpower New Zealand Ltd. Retrieved from Link

- Transformer cost $12m - $15m (if needed).

Apart from the cost to integrate with the distribution network, other costs must be considered, and the project must be considered against the potential alternatives. This is because consumers (and businesses) pay for those assets through prices. The capital costs for different generation technologies varies significantly (within technologies) and locational aspects (site conditions) play a material role. The size of the project also determines 'per unit'($/kW) costs. Work for Transpower[20] shows the complexity of estimating broad project costs but the current capital costs for different technologies are estimated as follows:

- Greenfield onshore windfarm: $3,400/kW (range between $3,000/kW - $3,700/kW)
- Brownfield onshore windfarm: $3,450/kW (range $2,100/kW to $3,900/kW)
- Utility scale solar: $1,900/kWAC[21] (range $1,700/kWAC to $2,100/kWAC).

The forward looking cost trajectory for solar projects shows that the costs are likely to decrease into the future. In terms of operational cost, there is less public information covering this matter. Meridian's Ruakākā development reports that the operating and maintenance costs are in the order of $50/kW/y. Other sources put this value in the $25/kW/y range (inflation adjusted)[22].

The proposed investment will establish approximately 29MW[23] capacity. This is comparable with other *operating* solar farms, including:

- Lauriston (Genesis Energy) 47MW
- Te Herenga o Te Ra (Lodestone Energy) 31MW
- Kohira (Lodestone Energy) 24MW
- Rantiaiki (Lodestone Energy) 24MW
- Te Puna Mauri o Omaru (North Power) 14MW.

The scale of the proposed solar farms is significant in the context of the existing solar farms. The proposed development will contribute to New Zealand's ambitions to transition to renewable energy and to decarbonise the economy.

Value of electricity generated

Estimating the value of the electricity is highly complex because wholesale prices are set in the spot market, and the reported prices are not directly comparable. Weather and market conditions have a material impact on short term prices. For example, during the winter of 2024, several factors increased the wholesale prices. Low hydro storage levels, declining gas production and cold weather combined to cause a spike and spot prices. Between July and mid-August 2024 spot prices were much higher than average for winter. Average winter prices between 2018 and 2023 were around $180/MWh. However, in early August the average daily price reached $820/MWh. By late September after high rainfall, average prices fell to around $100/MWh. Further, there was significant variability during the rest of the year. During the last week of December

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[20] *2025 Generation Stack Report* (Transpower New Zealand, prepared by Beca & Concept Consulting, 11 Sep 2025) – a comprehensive NZ generation cost database used for long-term electricity planning and projections.
[21] Solar arrays generate electricity in DC form but to enable it to be compared against other sources it is expressed in kWAC (Alternating Current) terms.
[22] Miller, A. (2020). *Economics of Utility-Scale Solar in Aotearoa New Zealand: Utility-Scale Solar Forecast (v3)*. Ministry of Business, Innovation & Employment. Retrieved from Link
[23] Insight Economics (2025). *Appendix 1K: Economic Impact Assessment*. Matamata Development Limited / Fast-track Approvals Act 2024 substantive application. Retrieved from Link

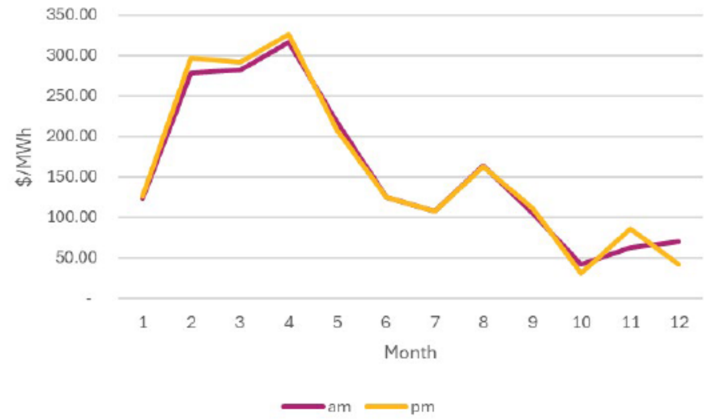
2024/first week of January 2025, average spot prices were $4/MWh. There is also variability between gentailers adding further complexity because of different hedging approaches and client base (e.g., NZ Aluminium Smelter accounts for a large portion of Meridian's generation capacity. In YE June 2025 this share was 24%), as well as generating assets (wind, hydro, gas etc).

Wholesale prices are not widely reported (in financial statements) but some ranges are presented and there is significant variability. Genesis Energy reports the FY25 price received for electricity as:

- wholesale electricity generated $236/MWh (FY 2025), compared to $188/MWh in FY24,
- the average price paid for electricity purchased was $210/MWh (FY2025) compared to $182/MWh in FY24.

The reported averages cover the whole financial year, including periods with low prices and periods with high prices. The average values also include different locations (New Zealand wide). To provide a true estimate of the value of the solar farms' output, the wholesale price needs to be estimated to reflect 'during the day', and 'during summer and winter' spot prices. Estimating a relevant price to use is highly challenging due to data issues. However, an analysis of the Electricity Authority data shows that over average wholesale price for the Central Upper North Island area over the past 12 months averaged $168/MWh. This average is influenced by the high prices recorded in the beginning of 2025 due to low hydro lake levels. Figure 1 shows the average wholesale price per month, in the mornings and afternoons and only considering day-times (calculations based on Electricity Authority data). The weighted average wholesale price is $158/MWh. These values are markedly lower than the figures reported by above and the different timeframes and the impact of the dry year in 2024 is more pronounced in the Genesis Energy data. The variation is evidence of the large swings in wholesale prices that make it difficult to put firm bounds price looking forwards. However, climate change means that such large swings could become the norm. The different estimates are used to provide an indication of the potential value of the electricity output that the solar farms could deliver. There is a degree of uncertainty around these estimates. The values over a 25 year (discounted at 8%) are:

Figure 1: Average Wholesale Price (per Months for truncated periods)



- Setting 1: Weighted wholesale price $95.1m
- Setting 2: Low price reported by Genesis $109.1m
- Setting 3: High price recorded by Genesis $141.5m.

These estimates show the value of the electricity generation opportunity with the lower value being the anticipated value in 'normal years'. However, the upper values could be more realistic due to climate change when considering more climate variability and dry years. Nevertheless, the dollar value of the electricity is a proxy for the gross national benefits that the project will deliver.

The spatial distribution of the benefits associated with the electricity sales is difficult to identify because it is unknown 'to which end users' the electricity will be supplied to. In terms of the direct/ongoing employment benefits[24], these will accrue to the region where the head-office is located. If the head office function is located in the district, then that gross revenue will flow to the region, and the supporting business activities (and salaries and wages, etc) will be spent locally. Regardless, providing additional electricity generation capacity will deliver a range of national benefits, including:

- Contributing to the electricity supply and providing an alternative to fossil-fuel generation during dry years.
- Assist in reducing volatility in the wholesale market, particularly during summer and in dry years, indirectly benefitting businesses and households.

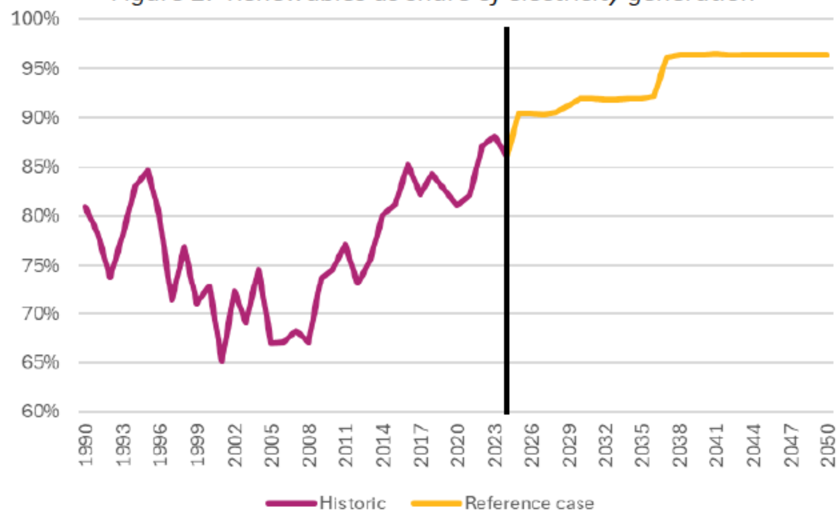
Decarbonisation and benefits of avoided emissions

Developing the solar farms will help New Zealand achieve its decarbonation ambitions. These ambitions require a shift in the energy mix while at the same time providing for demand growth. According to Gensis Energy[25], achieving New Zealand's decarbonisation goals will require the development of around 1,100GWh of new generation capability every year until 2050. This pace of development is almost 2.5 times the rate achieved in the last 25 years. The solar farms will contribute towards decarbonisation, thereby generating national benefits.

The emissions that the solar farms will avoid can be estimated and valued. The scale of the avoided emission is a function of the existing and anticipated emission profile of electricity generation in New Zealand.

MBIE data about the share of generated electricity that is from renewable sources is used to identify the potential value of emissions that could be saved if the proposed solar farms went ahead. It is assumed that the proposal would avoid emissions associated with using non-renewable sources. Currently, between 84% and 86% of net electricity generation is via renewable source (see Figure 1, sourced from MBIE). Over time, this share is projected to increase to 96% by 2050. This transition profile is used in the assessment in the same proportions i.e., most of the electricity would be generated from renewable sources and only a portion would be sourced from generation that emits.

Figure 2: Renewables as share of electricity generation



Importantly, the profile is based on the 'average annual' electricity mix and therefore does not reflect factors such as:

- day and night generation patterns,
- seasonal patterns (winter/summer) or

[24] After accounting for displacement and the opportunity cost of labour.
[25] Genesis Energy Limited. (2025). *Assessment of Environmental Effects for the Tekapo Power Scheme Replacement Resource Consents.* "Achieving New Zealand's decarbonisation goals will require the development of around 1,100 GWh of new generation capability every year until 2050." Retrieved from Link

- adverse weather conditions (for generating electricity i.e., wind still, winter nights) when wind and solar generation is limited.

Apart from the generation mix, several other assumptions were made to enable estimation of the avoided emissions, including:

- The proposed solar farms are reported to generate approximately 52,000 MWh per year.
- The capacity and generation estimates are expressed in AC terms. Inverter efficiency losses are therefore already incorporated and no further adjustment for DC-to-AC conversion is required.
- Huntly PowerStation is used as the alternative electricity source for the non-renewable component. The emissions factors that apply are[26]:
    - Coal 970g of CO_2 per kilowatt-hour
    - Gas 400g of CO_2 per kilowatt-hour
    - Overall 700g of CO_2 per kilowatt-hour.
- The shadow price of carbon is based on the New Zealand Treasury's estimates.[27] The central estimate shows that the $/t of CO_2-equivalents (-e) starts at $106/t$CO_2$-e increasing to $229/t$CO_2$-e by 2059 – a 25 year period. The lower and high estimates are used to illustrate the range.
- The Treasury's non-commercial discount rate is applied – 2%.
- The life of the infrastructure is assumed to be 25 years.
- No allowance is made for performance decline as the asset ages.

Based on these assumptions, the present value of the avoided emissions is estimated at:

- Low estimate $3.1m
- Central estimate $6.2m
- High estimate $9.4m.

These results reflect the Dollar value of the emissions that would be avoided if the solar farms were developed and are seen as regional benefits[28].

Solar farms have limited economic life and the potential cost to 'clean up' and remove the infrastructure from the land should be factored into an assessment of the potential (net) benefits that proposal would deliver. These costs are unknown.

Opportunity costs

The solar farms will be developed in a way that enables some agricultural activities to be continued. I understand that this is in the form of sheep farming. The Waikato is known for dairy farming. There will be opportunity costs in transitioning away from dairy farming to solar farming plus sheep farming. In simple

[26] Parliamentary Commissioner for the Environment. (2020). *Restricting the production of fossil fuels in Aotearoa New Zealand: A note on the ban on new petroleum permits outside onshore Taranaki*. Wellington: Parliamentary Commissioner for the Environment. Retrieved from Link

[27] The Treasury. (2025). *Assessing climate change and environmental impacts in the CBAx tool* (October 2025). New Zealand Treasury. Retrieved from Link

[28] This is because valuing the avoided emissions include health effects that are felt locally (i.e., in the region).

terms, the net position of the new land use is the gains from the solar farms less the differences between the economic value of dairy farming and sheep farming.

The Waikato's dairy industry is a significant driver of the regional economy. According to Infometrics regional profile data, dairy cattle farming accounts for $2.2bn of regional GDP (6% of GDP) and in Matamata-Piako district, the equivalent values are $477m and 17% of GDP. The sheep, beef cattle and fruit growing sector is smaller – accounting for 1.5% of Matamata-Piako's GDP and 1.4% of regional GDP.

Drawing on the DairyNZ's Dairy Statistics[29] foregoing the dairying opportunity will see a potential loss of between $5.5m and 6.2m of gross revenue (return per kg/Milksolid,[30] present value @2% over 25 years). Continuing with sheep farming will generate gross revenue in the order of $1.9m (present value at 2%). These figures suggest that the opportunity (gross) cost associated with the farming transition is between $3.6m and $4.2m present value @2% over 25 years). The opportunity cost is not incurred beyond this point because the option to reinstate the land and continue with dairying remains option and is not foreclosed by the solar farms.

Apart from the direct losses, the potential effects of losing dairy product on the rest of the Matamata-Piako and Waikato sectors should be considered. In the local and regional context, the loss of dairy farming is very small and using the foregone milk solid production ($/kg * 2024/25 milk solid price) shows that the potential loss is less than 0.04% of the district's milk solid production and 0.01% of regional milk solid production. In my view, the lost raw product is too small to have any impact on the wider dairy industry so there are no additional economic costs relating to other industry effects to consider.

In terms of direct employment, after accounting for opportunity cost and displacement, the present value of the employment benefit is estimated at circa +$450,000 (@2% over 25 years). This is based on difference between the minimum wage, and the anticipated wage for solar farm employees (derived from ME and StatsNZ data[31] and reflecting a skilled trade person), as well as a portion to reflect displacements effects.

Based on the preceding, establishing the solar farms will deliver economic benefits (regional and national) that outweigh the associated opportunity costs associated with dairy cattle farming.

Concluding remarks

Estimating the potential economic effects and benefits of any proposed solar farm is a complex undertaking. The proposed solar farms will deliver substantial benefits to both the Waikato region and New Zealand by adding generating capacity equivalent to the electricity needs of circa 6,900 households. The solar farms will deliver benefits associated with:

- Adding capacity to the generation network (estimated at between $95m and $141.5m to the wholesale market),
- a more resilient electricity supply network (especially during dry years),
- contributing towards national decarbonisation goals by reducing reliance on fossil-fuel generation and avoiding emissions valued at $6.2m,
- Potentially defer broader infrastructure investment.

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[29] Livestock Improvement Corporation Limited and DairyNZ Limited. New Zealand Dairy Statistics. 2024-25. Accessed from: Link

[30] *Fonterra Co-operative Group. "Financial Reports and Farmgate Milk Price." Fonterra, available at* Link

[31] Excluding any multiplier effects.

In the context of the purpose of the FTAA, the key benefits and contributions that the solar farms will make are:

- The solar farms will facilitate and contribute towards New Zealand’s ambitions relating to decarbonisation and reducing emissions.
- Deliver regional and national benefits in terms of additional electricity generation capacity, and adding to resilience in the electricity supply situation.

Appendix 1: Credentials

Lawrence McIlrath

Director

MBA (2004)

B.A. et Sc (Planning & Economics) (1999)

[redacted] [redacted]

[redacted] [redacted]

Professional Experience

- 2017 –Director, Market Economics
- 2016 – Associate Director, PwC (Finance and Economics)
- 2008 – 2016, Senior Consultant, Market Economics Ltd
- 2006 – 2008, Senior Economic Analyst, Christchurch City Council
- 2001-2006, Economic researcher and Team Leader, Urban-Econ.

Lawrence has 25 years' experience as a consulting economist gained while working for the private sector, one of the big four and local government sectors. Lawrence enjoys the challenges of working in the economic development field and has assisted clients in understanding the dynamic forces affecting their businesses and the markets within which they operate. Lawrence typically focuses on industry and sector interactions, relationships and financial characteristics. He is also interested in wider 'socio-environmental' implications of everyday economic activities.

Lawrence integrates economic and financial analysis tools and models, making it possible to complete assessments in an integrated and holistic fashion. Lawrence is accomplished in designing and developing models that cover spatial, economic, demographics and business dimensions. This capability is used in sector analyses and forecasts, strategic assessments, policy formulation and evaluation and impact assessments.

Lawrence has appeared as expert witness in Council hearings and in the Environment Court.

Relevant Areas of Expertise

Spatial and Economic Modelling | Economic Efficiency Assessment | Cost Benefit Analysis | Economic Modelling including Input-Output, Computable General Equilibrium | Urban and Regional Economics | Economic Growth Modelling | Financial Modelling | Local Government Funding | Infrastructure Funding and Investment | Supply and Demand Analysis | Sectoral Analysis | Demand Analysis and Forecasting | Policy Analysis and Advice | Strategic Advice | Project Management

My full name is Lawrence Ryan McIlrath. I am a director of Market Economics Ltd (M.E). I have 25 years consulting experience working in both the private and public sectors. I have worked on numerous projects assessing and evaluating the financial and market aspects of projects, policies, and investment programmes. Most of these assessments reflected the interplays between, and spatial distribution of, market segments. I have a BA et Sc (Planning), majoring in Economics from the Potchefstroom University of Christian Higher Education (South Africa), as well as a Master of Business Administration from North-West University (South Africa).

I specialise in market assessments, demand and supply analysis, sectoral analysis, and urban economic analysis. My work includes assessing sectoral structures and interactions, over time and across locations, scenario assessment and growth modelling, as well as evaluating the implications of different growth pathways on market segments. I have applied these skills across many sectors and locations around New Zealand.

I have successfully completed a range of economic assessments with the following showing the breadth of relevant experience.

- CBA of Domestic Burner Management Options (Emissions) (for MfE)
- Economic assessment of the wider effects of New Zealand's Cruise Sector (EIA, CBA and MCA, for MBIE)
- Tauranga Multi-function Stadium Development, EIA, CBA and Social Impact Assessment
- Christchurch Red Zone. Economic assessment in support of business case, assessment in support of Fast Track Approval Act applications (substantive, current project)
- Review of Cost and Benefits of Auckland Council Plan to implement Air Quality Management Options
- Hananui Aquaculture Project. Economic Assessment for FFTA substantive application
- Waitaki Whitestone GeoPark (UNESCO application) Business Case (EIA and CBA)
- Pakiri consent renewals – economic effects assessment (consent assessment, council hearings, Environment Court)
- Economic assessment of New Zealand's Domestic Air Network
- Value chain analysis of the food and beverage sector in Auckland
- Taranaki Food and Fibre Value Chain Assessments (prepared for Venture Taranaki)
- Economic assessment for Port Taranaki in support of dredging consent application
- Brookby Quarry Stage 3. Economic assessment to support Covid Fast-Track Application
- RS Sand (Cambridge) Consent application. Economic assessment and Council hearing
- Whitehills Quarry Consent application. Economic assessment and Council hearing
- Waitewheta Quarry Consent application. Economic assessment
- Economic effects of establishing the Marton Rail Hub and Industrial Area (Plan Change, Environment Court appearance, a PGF project)
- Economic assessment to support the Food North Business Case
- Flooding in Canterbury – Economic Impact Model to assess the rural economy impacts (model for Environment Canterbury)
- Hekeao-Hinds - Managed Aquifer Recharge Scheme (MAR) Economic Assessment
- Economic benefits of Unmanned Aircraft (drones, assessment for MoT)
- Chatham Islands – economic assessment of runway lengthening and strengthening to support aquaculture growth and development.
- Bay of Plenty Aquaculture – economic assessments of four different development options (in support of funding applications and business case processes)
- Economic and Social Contribution of NZ's Airport Network
- Cost and Benefit Model of NZ Airports (Model developed for Ministry of Transport)
- Tongariro Alpine Crossing Visitor Limits – peer review of economic assessment, and undertaking full economic assessment (prepared for Department of Conservation)
- Opua Wharf extension – economic assessment

- Open Oceans Aquaculture – economic assessment for the business case submitted to NZTE
- Napier-Hastings Industrial Capacity Assessment (part of HBA)
- Tauranga Business Land Assessment (part of HBA)
- Tataki Auckland Unlimited (Auckland Tourism, Events and Economic Development/Tataki Auckland Unlimited)
    - Economic Impacts of the agency's economic development initiatives.
    - GridAKL (Auckland) Economic Contribution and Long Term outlook
- Auckland Community Recycling Centre – Business Case, market analysis, opportunity scoping and pro forma financial statements (Auckland Council)
- Wynyard Quarter Super Yachts – Development Options Assessment
- Cook Island Investment Corporation – Government Building Consolidation Project – Economic assessment of the costs and benefits, and the economic impacts.
- Several assessments to support Provincial Growth Fund applications, completed both EIA and CBAs
    - Opua wharf and Russell wharves expansion
    - Ngawha Springs
    - Bay of Islands Airport expansion (CBA)
    - Opua – Marine servicing and Oyster Landing Facility (current)
    - Bay of Plenty Aquaculture Development – economic assessment of different species
    - Port Tarakohe expansion – wharf expansion to support aquaculture development
    - 90-Mile Beach Mussel Farming (EIA and CBA)
    - Sugarloaf Wharf and Aquaculture Development
    - Te Aroha Visitor Complex Business Case and Economic Assessment
- Economic contribution of the Whangarei Airport (Whangarei Airport Locations Option Study)
- Kaipara Water Transport Network and Wharves Feasibility Assessment (economic assessment)
- Okara Marina (Whangarei) – economic impact assessment and business case roadmap
- Oceania Marine - Marine business survey and market assessment and EIA for new travel lift.
- Northland Rail Opportunity CBA.
- Whakatane Marina development - economic impact assessment of proposed development
- Wynyard Quarter Super Yachts – Development Options Assessment
- Queenstown Airport Economic Impact Assessment (general aviation)

Appendix 2: Rounds of Impacts