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Economic Impact Assessment of Proposed Green Hydrogen Development

Prepared for:
Hiringa Energy Limited

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1. Executive Summary

Context and Purpose of Report

Hiringa Energy Limited ("Hiringa") is a New Zealand company focused on the development of green hydrogen infrastructure to provide zero-emission energy. Ballance Agri-Nutrients ("Ballance") is one of New Zealand's leading producers and distributors of Agri-nutrients. Together, Hiringa and Ballance propose to develop a renewable hydrogen hub at Kapuni in Taranaki (the "Project"). To expedite the proposed development, the parties plan to apply for consent under the COVID-19 Recovery (Fast-track Consenting) Act 2020. To assist, this report assesses the likely economic effects of the proposed development, including its likely impacts on regional GDP, incomes, and employment, plus its wider economic effects.

About the Proposal

The assessment begins by identifying the location of the project and briefly describing its key components. These include (i) the installation of four wind turbines with up to 24 MW of generation capacity, and (ii) the construction and installation of electrolysis plant and hydrogen production, storage, and loadout infrastructure within Ballance's Kapuni Plant site.

Economic Rationale for the Project

The economic rationale for the project is threefold. Namely, it:

- **Capitalises on the Region's Economic Strengths** – these include an untapped, world class wind resource, which will be coupled with a large-scale industrial user of hydrogen (that currently relies on non-renewable natural gas as a feedstock). In addition, the project benefits from a large local heavy vehicle fleet (primarily serving the dairy industry), which can be converted to hydrogen vehicle, and it will also leverage the region's world-leading skills in engineering and fabrication.

- **Facilitates the Development of Hydrogen Transport Fleet** - this project is part of a broader initiative to develop hydrogen refuelling infrastructure throughout New Zealand. It helps resolve a critical "roadblock" in the transition to a hydrogen-based fleet by enabling a green hydrogen source to be developed at scale, with low cost energy, and sold for another purpose until hydrogen refuelling infrastructure, market and heavy fuel cell vehicles are ready. Absent this interim use, the deadlock would be unlikely to be resolved in the short to medium term.

- **Provides Operating Certainty for Ballance –** the Project is the first step in a planned reduction in greenhouse gas emissions at the Ballance Kapuni Plant. In addition, it creates new employment opportunities, while also improving certainty for the existing workforce and contractors at the plant.

Impacts on Jobs and Wages

Next, we used detailed data provided by Hiringa to assess the project's likely impacts on regional jobs and wages. In short, the various tasks involved with constructing and commissioning the project will provide employment for 38 people full time equivalents for 18 months, who will earn

about $4.9m in wages and salaries. Future spending by those employees in the regional economy is estimated to sustain a further 18 full time jobs, which will generate wages of almost $1 million over the 18-month construction period.

Once operational, nearly eight full time employees will be required to maintain and operate the project. Over the project's estimated 25-year lifespan, they will earn wages and salaries of more than $15.7 million, with the project also assisting to secure employment for the 125 employees and contractors of the existing Ballance plant.

Energy Impacts

The project will have several important energy impacts, including:

- **Increased Renewable Energy Generation** - By combining the latest wind turbine technology with an outstanding wind resource, the project generates low-cost, commercially viable hydrogen as a clean energy source, and is thus an important stepping-stone in reducing our dependence on fossil fuels.

- **Assistance with the Transition Away from Natural Gas** - The Ballance plant is a large industrial consumer of natural gas, which uses the same amount annually as all households in the north island of NZ. The project provides a pathway for a carbon-free alternative to gas and hence significantly reduces regional reliance on it as an energy source for industrial processing.

- **Support for a Low-Carbon Heavy Vehicle Fleet** – The project's green hydrogen hub will be linked to a supply and refuelling network that is currently being established across New Zealand to enable the use of hydrogen fuel-cell technology as a new zero-emission heavy transport mode – displacing imported fossil fuels with home-grown clean energy.

Strategic/Policy Fit

The project is also aligned with several key policies and strategies. These include:

- **The H2 Taranaki Roadmap** - This Project is the first in a series of hydrogen energy projects that provide a pathway to developing, attracting, and retaining highly valuable specialist skills in Taranaki. It is a strong example of a "just transition" project, one that leverages the skills and the infrastructure of the region to create a new energy model.

- **National Policy Statement on Renewable Electricity Generation** - The Project also aligns with this policy statement, which classifies developing, operating, maintaining, and upgrading renewable electricity generation as matters of national significance.

- **Various Climate Change Policies and Strategies** - The New Zealand Government has a goal to reach 100 percent renewable electricity by 2035 and to transition to a net zero emission economy by 2050. The Project will provide a reliable and affordable source of renewable energy to help meet these ambitious targets for high emitting sectors that are otherwise difficult to decarbonise.

- **COVID-19 Recovery (Fast-track Consenting) Act 2020 –** The project is an excellent fit with the various objectives identified in section 19 of the Act. Specifically, the project:

    - Provides significant and sustained economic benefits for the region, including industries affected by the pandemic.
    - Supports the transition away from reliance on fossil fuels by local industrial processors and – later – the heavy transport fleet, which will have important social benefits for the region and nation far into the future.
    - Benefits from the streamlined consenting pathway provided by the Act, and
    - Generates employment during both construction and future operations, provides infrastructure to improve economic/employment/environmental outcomes, and contributes to New Zealand's efforts to mitigate climate change. It also provides greater resilience against the potential adverse effects of climate change.

Wider Economic Effects

Finally, we considered various wider economic effects of the proposal. They include:

- **Improved Regional Economic Diversity/Resilience** - The Taranaki regional economy is heavily reliant on a few sectors, such as dairy and Oil & Gas, so it lacks diversity and resilience. The project helps improve regional economic diversity and thus makes it more resilient to changes in domestic and global economic conditions over time.

- **Reduced Import Reliance –** New Zealand is a major user and importer of urea. Producing more of it locally will improve security of supply, while also displacing imports of it (which are often made using coal and other fossil fuels).

- **Investment Signal Effects -** The Project signals that Taranaki is a dynamic, adaptive, and forward-thinking regional economy, which may encourage other regional businesses to also invest and develop new innovative products and projects.

- **This Highest & Best Use of Land/Assets -** Finally, the proposal will enable the subject sites to be put to their highest and best uses, while also allowing existing dairy operations at PKW farms to continue unaffected by the wind turbines proposed to locate there.

Given the range of important economic impacts outlined above, and noting the absence of any material adverse economic effects, we consider that the Project will result in significant economic and financial benefits to both Taranaki and New Zealand.

2. Introduction

2.1. Background

Hiringa Energy Limited ("Hiringa") is a New Zealand company focused on the development of green hydrogen infrastructure to provide zero-emission energy. Ballance Agri-Nutrients ("Ballance") is one of New Zealand's leading producers and distributors of Agri-nutrients, which has owned and operated New Zealand's only ammonia and urea plant since 1992.

Together, Hiringa and Ballance propose to develop a renewable hydrogen hub at Kapuni in Taranaki (the "Project"). This will be the first in New Zealand to combine wind generation with hydrogen production, creating new technical capabilities, employment opportunities for green hydrogen production and providing the catalyst for decarbonisation of industry and heavy transport. The green hydrogen will initially be used by the existing Ballance Ammonia/Urea production plant as feedstock, but later also used for priority use as a transport fuel once a hydrogen-based transport fleet has evolved.

To expedite the proposed development, the parties plan to apply for consent under the COVID-19 Recovery (Fast-track Consenting) Act 2020. This report assesses the likely economic effects of the proposed development, including its likely impacts on regional GDP, incomes, and employment, and the wider economic effects of the Project.

2.2. Structure of Report

The remainder of this report is structured as follows:

- **Section 3** identifies the project's location and briefly describes its key components;
- **Section 4** discusses the economic rationale for the project;
- **Section 5** quantifies the project's impacts on jobs and wages in the Taranaki region;
- **Section 6** discusses the project energy impacts;
- **Section 7** describes its fit with various regional and national strategic directions; and
- **Section 8** briefly discusses the likely wider economic effects of the project.

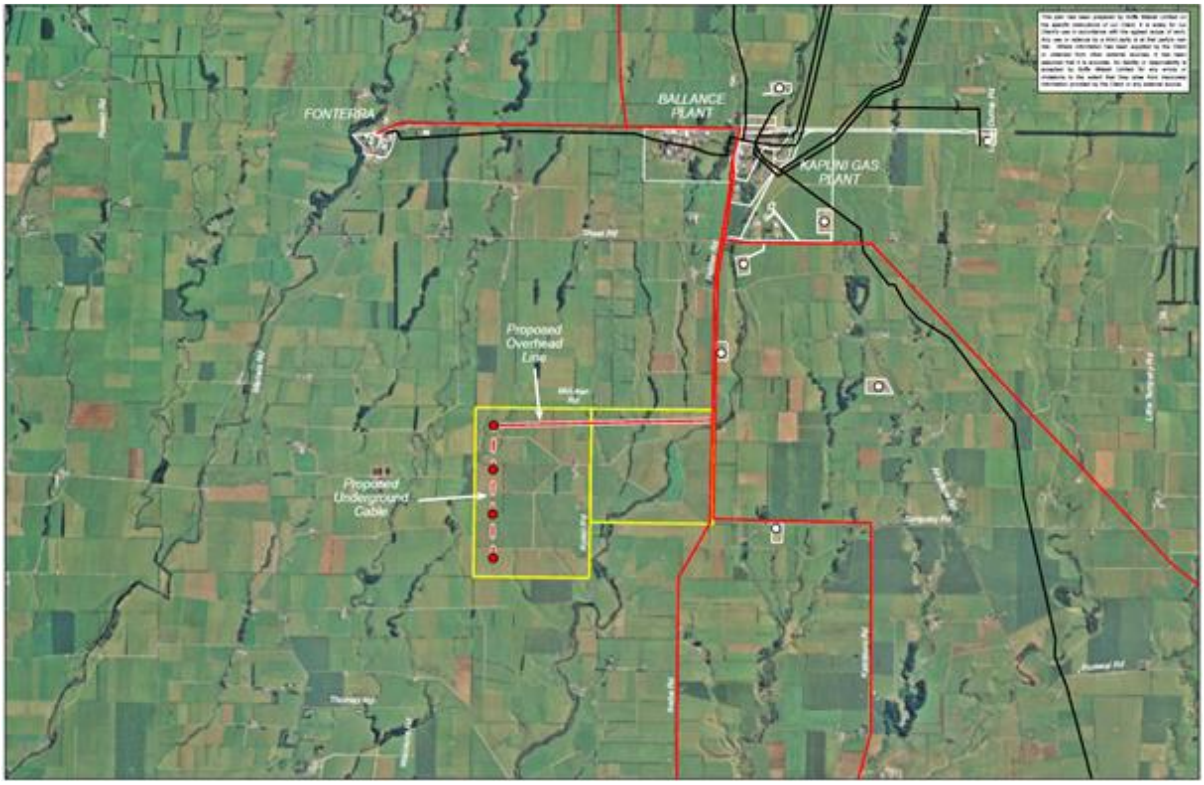
3. About the Proposal

This section identifies the proposal's location and briefly describes its key components.

3.1. Location & Description

The project's components, which are described further below, are spread across two sites in the South Taranaki district. Specifically, the project's wind turbines will be located on PKW farm holdings land, which is located at 271 - 359 and 414 Kokiri Road. The remaining components will be housed at the Ballance Agri-Nutrients Plant, which is located at 309 Palmer Road, Kapuni. The map below identifies these two locations

Figure 1: Project Locations



The project comprises four 6 MW wind turbines to generate 24 MW of power, which will be transported through a new 3.6 km underground cable to the Kapuni Plant. The power will be used to operate the Ballance plant in their production of urea. Excess power will also be used to produce hydrogen which is an industrial feedstock into the production of ammonia and urea. The hydrogen is combined with atmospheric nitrogen to produce green urea. Hydrogen produced will also provide fuel for the transport sector and support the development of a hydrogen energy and transport hub for South Taranaki. Excess power during peak electricity production will also be fed into the electricity grid.

The Project will involve the following key activities:

1. Installation of four wind turbines with up to 24 MW of generation capacity.
2. Construction and installation of electrolysis plant and hydrogen production infrastructure within Ballance's Kapuni Plant site. This plant will involve a modular electrolyser design so that it can be easily scaled in the future to create more hydrogen.
3. Construction and installation of hydrogen storage and loadout facilities within Ballance's Kapuni Plant site.

3.2. Project Outputs & Markets Served

The construction of the wind turbines and hydrogen electrolysis plant is intended to set up the infrastructure to facilitate the transition from carbon emitting freight vehicles to hydrogen powered low-carbon emission vehicles.

To invest in a hydrogen powered vehicle fleet for long-haul transportation, there must be adequate hydrogen refuelling sites around the country to provide the network to power these vehicles. The Kapuni hydrogen plant is one part of an intended network of hydrogen refuelling stations around New Zealand to allow the operation of a hydrogen powered vehicle fleet.

An important facet of the project is that, while demand for hydrogen refuelling is establishing, power generated by the wind turbines will be used by the Ballance plant to power their operations and to produce urea from green hydrogen without associated carbon emissions.. This project will be a nationwide first and world leading project combining large-scale industrial production, wind generated energy and hydrogen production.

4. Economic Rationale for the Project

This section explains the economic rationale for the project.

4.1. Capitalises on Region's Economic Strengths

There are several region-specific factors that make the project's location especially suitable, namely:

- a world class wind resource that is currently not utilised for economic gains;
- a relatively sparse population/density of houses, which is more suitable for the installation and operation of wind turbines;
- a large-scale industrial user of hydrogen with a proven safety record, which is currently using non-renewable natural gas as a feedstock;
- a large local heavy vehicle fleet (primarily serving the dairy industry) that can be converted to hydrogen vehicles;
- other large scale industrial plants located nearby that are powered by natural gas that can also be provided with renewable energy;
- an available water supply; and
- an available grid connection for excess power.

In addition, the Taranaki region also has human capital assets that are especially well-suited to the project. These include engineering and fabrication capability and Oil and Gas (O&G) workers who can be redeployed to Hydrogen production as the O&G industry eventually phases out over time.

Importantly, given the planned future transition away from O&G in Taranaki and New Zealand, the project provides for diversification/transition of O&G service sector skills. The union E tū and Hiringa are working together to identify skills and training opportunities required as a result of this project, and will develop a specific plan for it to serve as a template for broader worker transition in the region. Specific skills and training required will include wind turbine and electrolyser installation, operations and maintenance, as well as new skills required for Hiringa Energy's related supply infrastructure projects, including refuelling infrastructure, and vehicle development and maintenance.

The Taranaki region also has high quality infrastructure for industrial production through existing industries in Dairy, O&G and other large scale food production facilities.

4.2. Facilitates the Development of Hydrogen Transport Fleet

This project is part of a broader initiative to develop hydrogen refuelling infrastructure throughout New Zealand. Once established, that nationwide infrastructure will help to decarbonise our heavy transport sector by enabling the development and use of hydrogen-based vehicles. This is important because heavy vehicles produce grossly disproportionate emissions, with large line haul trucks generating over 150 times the emission of an average light vehicle.

Importantly, this project helps resolve a "stalemate" in the transition to a hydrogen-based fleet. In short, nationwide hydrogen refuelling infrastructure will not be developed until hydrogen is

available, and hydrogen for fleet use won't be produced until the necessary refuelling infrastructure is in place. This project breaks that deadlock by enabling a green hydrogen source to be developed at scale, with low cost energy and sold for another purpose until the refuelling infrastructure is ready. Absent this interim use by Ballance, the deadlock would be unlikely to be resolved in the short to medium term.[1]

4.3. Provides Operating Certainty for Ballance

This Project is the first step in a planned reduction in greenhouse gas emissions at the Ballance Kapuni Plant. In addition, it creates new employment opportunities, while also improving certainty for the existing workforce and contractors at the plant.

The Ballance Kapuni Plant is one of the largest employers in South Taranaki and in a typical year spends approximately NZ$100m in the local economy. Outside of raw materials, Ballance annually spend NZ$30m on wages, maintenance, and growth/development/innovation.

The plant relies on natural gas for its feedstock, so the Project represents a way to not only future-proof a large employer and improve the Plant's long term economic and environmental outcomes, but also a way to provide a tangible example of a just transition for the region. It will create and support new opportunities, new jobs, new skills, and new investments that will emerge from the transition.

Diversifying the energy and fuel supply for operations at the Ballance Kapuni Plant inherently increases its resilience and reliability and therefore its ability to provide a workplace for employees. It also increases operational certainty with regard to the pricing of electricity for Ballance operations and will maximise asset utilization in the long term.

[1] This project will also enhance the Crown Infrastructure Partners (CIP) funded supply infrastructure project, by providing flexible renewable hydrogen production at scale, that can be diverted to a growing transport market.

5. Impacts on Jobs and Wages

5.1. Overview

In this section, we analyse the impact of the proposal on regional jobs and wages.

5.2. Approach to Assessment

Typically, when undertaking this type of analysis, we start by estimating the financial impacts of the proposal, and then overlay regional economic multiplier tables to derive the resulting impacts on employment and incomes. These economic multipliers incorporate detailed matrices called input-output tables, which show how the various sectors of the economy are interrelated and thus enable the overall impact of the proposal, including its flow-on effects, to be estimated.

The client has provided comprehensive workforce data, which we peer reviewed and then used directly to estimate the employment and household incomes generated directly by the project. These will comprise both one-off and ongoing impacts. One-off impacts reflect one-time increases in regional economic activity associated with the design and construction of the plant, while ongoing impacts capture the sustained economic stimulus of future economic activity while the plant is operational.

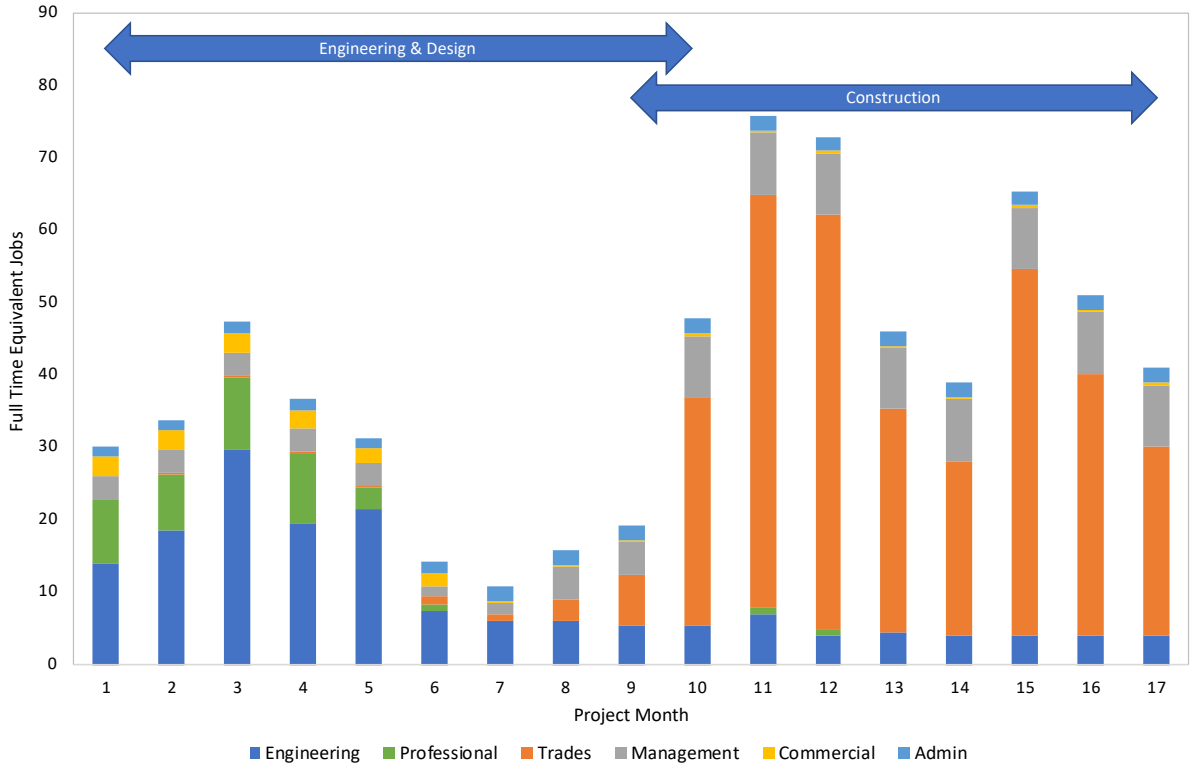
Having determined the direct one-off and ongoing impacts of the proposal on jobs and wages, we then use this to estimate the "induced" economic impacts for the region. This refers to the additional economic stimulus that arises when people employed by the project spend some of their wages and salaries in the local economy. These induced effects are estimated as follows:

1. Identify total wages/salaries paid.
2. Subtract income tax and estimates of household savings.
3. Assume that the remainder is spent in the local economy on a range of household goods and services.
4. Use data from the 2019 Household Economic Survey (HES) to map this spend to detailed sectors of the regional economy.
5. Overlay regional economic multipliers to determine the resulting (induced) impacts on regional jobs and wages.

5.3. Estimated Direct One-Off Impacts

The one-off economic impacts of the project will span an estimated construction period of almost 18 months, from engineering & design through to construction. Figure 2 below provides an overview of the project workforce likely to be employed over that period.

Figure 2: Full-Time Equivalent Jobs by Month and Employee Type



As the chart above indicates, the composition of the workforce varies over the life of the project. For example, as one would expect, the engineering & design phase consists predominantly of engineering, professional and commercial jobs. These include civil, geotechnical, mechanical and structural engineers; planners, lawyers and compliance professionals; and analysts and support staff. Conversely, the construction phase is predominantly made up of trade jobs. These range from truck drivers, crane operators, and turbine installers through to the commissioning crew. In addition, a small number of management and administrative roles are present throughout.

The projected workforce averages just under 40 full time equivalent (FTE) jobs per month across the 17-month period, swelling considerably during the construction phase. As Figure 2 above illustrates, peak employment is anticipated towards the end of the first year, at around 75 FTE jobs. Table 1 below summarises anticipated employment by job category.

Table 1: One-Off Jobs by Category

Category	FTE-Years[2]	Share of Jobs
Admin	2.6	5%
Commercial	1.5	3%
Engineering	13.8	24%
Management	8.0	14%
Professional	3.5	6%
Trades	27.2	48%
Total	**56.6**	**100%**

[2] An FTE-year means one person working full-time for a year. Alternatively, it can also mean 6 people working full-time for 2 months, 12 people working full-time for one month, and so on.

Overall, a one-off employment boost of 56.6 FTE-years is anticipated across the engineering, design and construction phases. The highest share of jobs is in the Trades, with 48% of the total, followed by Engineering (24%), and Management (14%).

Next, we estimated the one-off household incomes that would be generated by these jobs, by overlaying average annual salary figures provided by the Client. The results are provided in Table 2 below.

Table 2: One-Off Household Income by Job Category

Category	FTE-Years	Average Salary	Total Income	Share of Income
Admin	2.6	$60,000	$155,000	3%
Commercial	1.5	$100,000	$147,000	3%
Engineering	13.8	$100,000	$1,382,000	28%
Management	8.0	$120,000	$960,000	20%
Professional	3.5	$100,000	$350,000	7%
Trades	27.2	$70,000	$1,905,000	39%
Total	**56.6**	**$86,575**	**$4,899,000**	**100%**

Overall, nearly $4.9m in one-off household income is expected to be generated by the proposal over the 17-month period, with the average project salary sitting at just over $86,500. Trade workers account for 39% of total income, followed by Engineering (28%) and Management (20%).

5.4. Ongoing Direct Annual Impacts

Once operational, the plant will provide employment for an estimated 7.7 FTE jobs per annum, as outlined in Table 3 below. These roles relate mainly to maintenance of the wind turbines.

Table 3: Ongoing Annual Jobs by Category

Category	FTE Jobs	Share
Admin	0.5	6%
Commercial	1.1	14%
Engineering	0.7	9%
Management	0.8	10%
Trades	4.6	60%
Total	**7.7**	**100%**

We overlaid average salary data by job category to determine the estimated annual household income generated by the ongoing operation of the plant. The results are displayed in Table 3 below.

Table 4: Ongoing Annual Household Income by Job Category

Category	FTE Jobs	Average Salary	Total Income	Share
Admin	0.5	60,000	30,000	5%
Commercial	1.1	100,000	110,000	18%
Engineering	0.7	100,000	70,000	11%
Management	0.8	120,000	96,000	15%
Trades	4.6	70,000	322,000	51%
Total	**7.7**	**81,558**	**628,000**	**100%**

Overall, an estimated $628,000 in household income is expected to be generated each year once the plant is operational. With an anticipated lifespan of approximately 25 years, this equates to $15.7m in future wages, ignoring the effects of inflation on future wages and salaries.

Further, while Ballance's future operations are not strictly reliant on the project, at least not in the short term, the project will support continued operations and hence sustain jobs and wages for more than 125 employees and contractors.

5.5. Induced Impacts

In Section 5.3 above we showed that the design and construction phase of the proposal will lead to an increase in regional household wages of an estimated $4.9m. To estimate how much of this will be spent in the Taranaki region, we removed estimates of income tax, GST on purchases, savings, and expenditure occurring outside the region (leakage). This is summarised in Table 5 below.

Table 5: Regional Expenditure from One-Off Wages

Total Wages Paid	**$4,898,417**
Less:	
-Income Tax	25%
-Savings	5%
-Leakage Out of Region %	15%
-GST on Purchases	15%
Equals Regional Expenditure of:	**$2,579,655**

As the table above shows, the one-off wages arising from the proposal will translate to an expected $2.6m in regional expenditure excluding GST.

Next, we used average weekly spend data from the 2019 HES[3] to allocate this spend across detailed categories. Finally, we overlaid our regional multipliers to determine the induced economic impacts of the above expenditure, as shown in Table 6 below.

Table 6: Induced Impact of One-Off Wages

Impact Measures	**Value**
Employment (FTE-years)	27
Income $	940,000

Thus, the additional spending induced by the one-off wages will result in an estimated 27 additional FTE-years of employment, and a boost to household incomes of $940,000.

[3] For the North Island, excluding Auckland and Wellington

6. Energy Impacts

6.1. Increased Renewable Energy Generation

By combining the latest technology in wind turbines with an outstanding wind resource, the project will provide New Zealand's first example of the production of low-cost commercially viable hydrogen for energy production. This is an important stepping-stone in creating viable renewable energy alternatives to fossil fuel resources. Further, because the increased demand for electricity associated with the project will be met by its own renewal/wind generation components, it won't create any demand for thermal generation.

The electricity grid connection also provides the opportunity to capture excess curtailed renewable energy produced anywhere in NZ during low demand periods by approximately 10GWh/yr. The scale of wind generation aligns with the industrial demand at Kapuni, fits into the local network capacity and, when coupled with electrolysis, provides flexibility to match renewable electricity generation.

The proposed electrolyser technology allows hydrogen to be produced and stored during periods of excess electricity generation and supports investment in additional renewable energy. In periods of high electricity demand, hydrogen assets would be able to load shed supporting a resilient renewable electricity network. The use of hydrogen produced from excess electricity can be utilised in multiple applications which are difficult to achieve directly with battery electrification. New Zealand currently exports a significant amount of renewable electricity through base load industrial processes. A key advantage of a hydrogen export industry over base load export industrials is the ability for hydrogen technologies to release power to the grid during periods of supply scarcity.

The project puts into action the government's climate change policy, which is intended to move away from fossil fuel energy sources, by building a viable option for renewable energy generation. The project is both important and timely in the context of government policies and current climate change projections.

The project is a catalyst for the decarbonisation of not only the agri-nutrients sector, but also other large scale industrial users of power. The project will provide a nationwide-first for coupling wind generation and green hydrogen for industrial production and industrial manufacturing energy supply. The development of similar projects across New Zealand will have a significant impact on economic activity, as approximately 60% of New Zealand's energy needs are currently met by fossil fuels.

Furthermore, Ballance Kapuni Plant's hydrogen production is currently constrained. The additional green hydrogen feed that will be generated by the Project will enable the Plant to produce more urea than it does presently. In doing so, this will displace the need to import urea and create a sustainable hydrogen ecosystem. It is estimated that by producing 7000 tonnes of urea from the hydrogen obtained from Hiringa, this will offset 12,500 tonnes of greenhouse gas emissions. The project will therefore contribute to New Zealand's efforts to mitigate climate change in terms of reducing New Zealand's net emissions of greenhouse gases.

6.2. Assistance with Transition Away from Natural Gas

The Ballance plant is a large industrial consumer of natural gas, currently using 7 petajoules of natural gas annually, or 3-4% of annual national production. This is equivalent to the same amount of gas sold annually for domestic use in the North Island for cooking and heating. The project is intended to provide 4.3 MW of power from the wind turbines to the Ballance plant, which equates to annual production of approximately 25 GWhr. The energy from the project used to power the plant may provide up to an additional 20,000 tonnes per annum of carbon dioxide reduction.

Natural gas has also been proposed for full phasing out of existing buildings by 2050 in the Climate Change Commission's recent report released on February 1, 2021. The draft plan has advised that no new natural gas connections are made to the network, or bottled LPG sold, after 2025. Clearly, there is a mandate to reduce reliance on natural gas, which this project directly supports. Indeed, the Project provides a timely example for how wind energy can be used for industrial manufacturing, especially where natural gas is currently the main source of power. In short, the project will provide infrastructure that improves environmental outcomes and contributes to New Zealand's efforts to transition to a low-emissions economy.

6.3. Support for Low-Carbon Heavy Vehicle Fleet

Hydrogen is one of the only currently viable solutions for decarbonising heavy transport. Fuel cell electric vehicles are zero emission vehicles with long ranges and fast refuelling. Fuel cells are 2-3 times more efficient than internal combustion engines, and the amount of hydrogen required to travel is less than if hydrogen was combusted. For example, a car travels approximately 100km - 120km on only 1kg of hydrogen.

A refuelling station is planned at Kapuni. Over 40 trucks a day visit the Ballance Kapuni Plant, and another 40+ trucks visit neighbouring industrial plants in Kapuni per day, making the site an ideal location for the refuelling for heavy vehicles.[4]

Hiringa Energy is working with the local transport companies and has identified potential routes for trials at Kapuni. However, it is anticipated that initially the hydrogen will be transported to other refuelling stations as compressed gas on tube trailers. Hiringa is working with MBIE, NZTA, regulators and equipment suppliers to enable the transport of compressed hydrogen.

Hydrogen can also be cost effectively piped, and Hiringa's engineering team together with consulting engineers and international experts are designing reticulation piping systems for hydrogen. 2,000kg per day will be enough green hydrogen to power approximately 6,000 light vehicles or up to 300 buses and trucks.

[4] The heavy vehicle fleet provides an important opportunity to decarbonise our transport fleet, because one linehaul truck emits roughly the same amount of CO_2 as 150 cars. Further, the cost of a new line haul hydrogen-powered truck is approximately $700,000, while 150 new hydrogen-powered cars would cost more like $9 million to achieve the same impact. This explains why Hiringa is focussed on improving the heavy transport fleet first.

In 2018, New Zealand's gross greenhouse gas emissions were mainly made up of carbon dioxide (44.5 percent), methane (43.5 percent), and nitrous oxide (9.6 percent). Carbon dioxide emissions were mainly produced by transport (47 percent), manufacturing industries and construction (17.9 percent), and public electricity and heat production (9.4 percent)). Transport emissions were mainly made up of road vehicle emissions (90.7 percent), with heavy trucks being disproportionate contributors (generating 26% of emissions from only 4% of the total vehicle fleet)[5]. The Project will provide a zero-emissions fuel source for heavy transport and serve as a catalyst for decarbonisation of that sector.

Pollutants from fossil-fuel vehicles (particularly those that run on diesel) are associated with respiratory illnesses such as asthma, impaired lung development and function, heart and brain problems, and other general health issues. A shift to a low-emissions heavy vehicle fleet would assist to remove these pollutants, provide cleaner air, and reduced rates of illness and mortality caused by air pollution. Increasing the capacity of renewable electricity generation in New Zealand will also lead to a decentralised power network. This, too, could have potential positive benefits for air quality by displacing carbon-intense fuels with clean, emissions-free local generation.

The first phase of development, where wind-generated hydrogen is used by the Ballance Kapuni plant, presents a unique situation to de-risk the investment in wind-generated hydrogen production for vehicle refuelling. The initial output from the wind turbines and hydrogen plant can be utilised by the Ballance Kapuni plant, while demand for vehicle hydrogen refuelling is being realised.

As the hydrogen transport market develops, an increased hydrogen supply for transportation with a hydrogen offtake will occur. Additional hydrogen generation will be added as markets / demand requires, utilising wind turbine capacity that is exported to the grid in the initial phase. The hydrogen production can be approximately doubled with additional electrolysis using the existing wind farm. As scale and electrolyser technology develops, the cost of producing green hydrogen is expected to reduce and become commercially competitive with Steam Methane Reforming.

The Project is a key step for the energy sector transition in Taranaki and in New Zealand. The "Kapuni Green Hydrogen Hub" will be linked to a hydrogen supply and refuelling network that is being established across New Zealand to enable use of hydrogen fuel cell technology for zero-emission heavy transport – displacing imported fossil fuels with home-grown clean energy.

[5] Source, Stats NZ, https://www.stats.govt.nz/indicators/new-zealands-greenhouse-gas-emissions

7. Strategic/Policy Fit

7.1. Overview

The purpose of the Project is to establish commercially sustainable green hydrogen and ammonia production at scale, demonstrating New Zealand's capability and leadership in the de-carbonisation of the heavy industry and heavy transport sectors.

A key objective is to provide a catalyst for a faster transition to a low emissions economy and to provide infrastructure that will improve economic, employment and environmental outcomes. The Project has national significance and aligns with the H2 Taranaki roadmap, the National Policy Statement for Renewable Electricity Generation, Government's climate change policy objectives and the wider business community's commitment to transitioning to a low-carbon economy. Each is briefly discussed below.

7.2. H2 Taranaki Roadmap

The New Plymouth District Council, Venture Taranaki and Hiringa have jointly funded and released a hydrogen roadmap referred to as the H2 Taranaki initiative. The H2 roadmap was launched by Prime Minister Jacinda Arden, Energy Minister Megan Woods, and New Plymouth Mayor Neil Holdom.

The Project is a cornerstone of the H2 Taranaki road map, with its importance noted to provide the foundation for a transition of industry, and for the growth of a hydrogen transport market.

H2 Taranaki is a key initiative of Tapuae Roa, Make Way for Taranaki, Energy Futures Action Plan that has been endorsed by the four Taranaki Councils (TRC, NPDC, SDC, STDC), and outlines the strategic priorities of the region including progressing the Energy Futures initiatives. Engagement on the scope of the Tapuae Roa action plan, including the H2 Taranaki initiative, has been ongoing with both private sector and local government throughout this economic development strategy process. H2 Taranaki is an initiative resulting from that process.

This Project is the first in a series of hydrogen energy projects that provide a pathway to developing, attracting, and retaining highly valuable specialist skills in the region for the benefit of NZ. It will help create a vision for the region where it has an ongoing role in the future of energy generation. It is a particularly strong example of a just transition project, one that leverages the skills and the infrastructure of the region to create a new energy model.

7.3. National Policy Statement on Renewable Electricity Generation

The Project also aligns with the National Policy Statement on Renewable Electricity Generation (2011) ("NES REG"). Under the NES REG the need to develop, operate, maintain, and upgrade renewable electricity generation activities throughout New Zealand is a matter of national significance and importance.

The Project is consistent with the NES REG and will use renewable natural resources to increase New Zealand's electricity generation capacity while reducing and displacing greenhouse gas emissions. It will also increase the security of electricity supply at local and regional levels by diversifying the type and location of electricity generation and provide instant load shedding during peak times. The Project also avoids reverse sensitivity effects on other renewable generation activities, aligns with the South Taranaki District Plan (STDP) and Taranaki Regional Policy Statement provisions, and has used the opportunity provided by the STDP to investigate the wind resource as part of due diligence.

7.4. Climate Change Policy

The New Zealand Government has a goal to reach 100 percent renewable electricity by 2035 and to transition to a net zero emission economy by 2050. The Climate Change Response (Zero Carbon) Amendment Act was passed by Parliament Select Committee in November 2019. This Act sets a series of emissions budgets to act as stepping-stones towards the long-term 2050 target. The Project will provide a reliable and affordable source of renewable energy that will help to meet the target of 100 percent renewable electricity by 2035. It will also provide a model for similar projects elsewhere in New Zealand for converting non-renewable energy to renewable methods.

7.5. Business Community

The commitment of businesses to addressing climate change in their operations is illustrated by the Climate Leader's Coalition, a coalition of 121 leading New Zealand businesses responsible for 60% of New Zealand's gross emissions. These companies have publicly pledged to commit to the Paris Agreement and New Zealand's commitment to it. Several of these businesses are actively engaged in the growing hydrogen sector and working with Hiringa Energy on infrastructure and fuel cell vehicle fleet strategies.

As the first project in New Zealand to couple renewable wind generation with hydrogen production, the Project has key regional and national implications and is a major development in the transition to low-carbon energy production. It provides a model to New Zealand and internationally for how to integrate renewable energy and hydrogen production for both industrial uses and zero-emission transport.

7.6. COVID-19 Recovery (Fast-track Consenting) Act 2020

In addition to supporting and giving effect to several key policies and strategies, the project also aligns with the purpose of the COVID-19 Recovery (Fast-track Consenting) Act 2020. Below we briefly reconcile the project with the objectives and criteria of the Act, as set out in section 19.

- *The project's economic benefits and costs for people or industries affected by COVID-19* – the project provides significant and sustained economic benefits for the region, including industries affected by the pandemic.

- *The project's effect on the social and cultural well-being of current and future generations* – the project's support for transitioning away from reliance on fossil fuels by local industrial processors and – later – the heavy transport fleet, which will have important social benefits for the region and nation far into the future.

- *Whether the project would be likely to progress faster by using the processes provided by this Act than would otherwise be the case* – the Act provides a valuable option to expedite the delivery of this ground-breaking project, and provides a more agile and streamlined process than traditional RMA consenting routes.

- *Whether the project may result in a public benefit by, for example,—*
    - *generating employment:*
    - *increasing housing supply:*
    - *contributing to well-functioning urban environments:*
    - *providing infrastructure in order to improve economic, employment, and environmental outcomes, and increase productivity:*
    - *improving environmental outcomes for coastal or freshwater quality, air quality, or indigenous biodiversity:*
    - *minimising waste:*
    - *contributing to New Zealand's efforts to mitigate climate change and transition more quickly to a low-emissions economy (in terms of reducing New Zealand's net emissions of greenhouse gases):*
    - *promoting the protection of historic heritage:*
    - *strengthening environmental, economic, and social resilience, in terms of managing the risks from natural hazards and the effects of climate change:*

  The project ticks many of these boxes. For example, not only does it generate employment during construction and future operations, but it also provides infrastructure to improve economic, employment, and environmental outcomes. In addition, the project contributes to New Zealand's efforts to mitigate climate change and to transition more quickly to a low-emissions economy. Finally, the project provides greater resilience against the potential adverse effects of climate change.

- *Whether there is potential for the project to have significant adverse environmental effects, including greenhouse gas emissions* – No. To the contrary, the project helps avoid adverse environmental effects while also creating a just transition for regional workers that were formerly employed in the carbon-intensive O&G sector.

8. Wider Economic Effects

8.1. Improved Regional Economic Diversity/Resilience

The Taranaki regional economy is heavily reliant on a few sectors, and therefore lacks diversity and resilience. This is demonstrated in Table 7 below, which displays the proportion of regional GDP produced by key industries in 2020. Mining is clearly very important, providing 22% of regional GDP. This reflects the region's strong specialisation in O&G. Agriculture, forestry and fishing are also cornerstone industries, as is manufacturing (contributing 18% and 13% of regional GDP, respectively).

Table 7: Proportion of Taranaki regional GDP by industry

Industry	Proportion of GDP
Mining	22%
Agriculture, Forestry and Fishing	18%
Manufacturing	13%
Electricity, Gas, Water and Waste Services	11%
Unallocated	10%
Owner-Occupied Property Operation	7%
Construction	6%
Professional, Scientific and Technical Services	5%
Health Care and Social Assistance	5%
All others	31%

Source: Infometrics 2020 Taranaki Region Economic Profile.

To put this reliance on a few key sectors in context, we calculated location quotients. This expresses an economy's reliance on each industry relative to the national average. Specifically, the location quotient for an industry equals its share of regional employment divided by the corresponding share of national employment. For example, if an industry accounts for 10% of regional employment but only 5% of national employment, its location quotient is 2.

Bearing that definition in mind, Table 8 presents the location quotients of Taranaki region's top 20 industries. It shows that the mining industry (i.e. O&G) has a location quotient of 14.2 which means that mining industry is 14 times more important as a source of employment for the region than the national average. Other important sources of regional employment include forestry, dairy farming, dairy product manufacturing, and electricity and gas supply.

Table 8: Location quotient for Taranaki region by industry

Industry	Location Quotient	Share of total GDP
Mining	14.2	17%
Forestry & Logging	4.4	3%
Dairy Cattle Farming	4.2	8%
Dairy Product Manufacturing	3.6	2%
Electricity & Gas Supply	3.5	8%
Meat & Meat Product Manufacturing	2.9	2%
Poultry, Deer & Other Livestock Farming	2.6	0.4%
Basic Chemical & Chemical Product Manu	2.4	1%
Primary Metal & Metal Product Manu	1.9	0.5%
Fishing & Aquaculture	1.5	0.2%
Sheep, Beef Cattle & Grain Farming	1.4	1%
Fabricated Metal Product Manufacturing	1.3	1%
Agric Support Services & Hunting	1.3	1%
Water, Sewerage & Waste Services	1.2	0.6%
Machinery & Other Equipment Manu	1.1	2%
Road Transport	1.1	2%
Wood Product Manufacturing	1.1	0.6%
Motor Vehicle, Parts & Fuel Retailing	0.8	0.6%
Local Government Administration	0.8	0.4%
Heavy & Civil Engineering Construction	0.8	1%
Administrative & Support Services	0.8	2%

Source: Infometrics 2020 Taranaki Region Economic Profile.

The relatively high concentration of O&G activity in Taranaki presents a unique opportunity to take advantage of historical expertise in energy and fuel production to create the new energy industry of the future. This will involve new energy generation methods, such as wind turbines, to create energy from renewable resources. This presents a powerful branding opportunity for Taranaki to harness and lead the way out of industries associated with climate change into greener industries. It also creates a positive perception of Taranaki within New Zealand and internationally, as we look to export our goods and services, including tourism, to consumers that are increasingly aware of the costs of climate change.

The project has already attracted international attention with partnerships with leading equipment suppliers and energy sector investors. For example, Hiringa and Mitsui & Co, have signed a strategic alliance agreement to jointly pursue hydrogen related commercial projects in New Zealand. Through this agreement the two companies will:

- Work towards a common goal of creating a viable domestic hydrogen economy and export opportunities in NZ
- Provide Mitsui & Co with access to participate in multiple Hiringa hydrogen projects including The Kapuni Green Hydrogen Project (this project), and Hiringa's nationwide refuelling network.

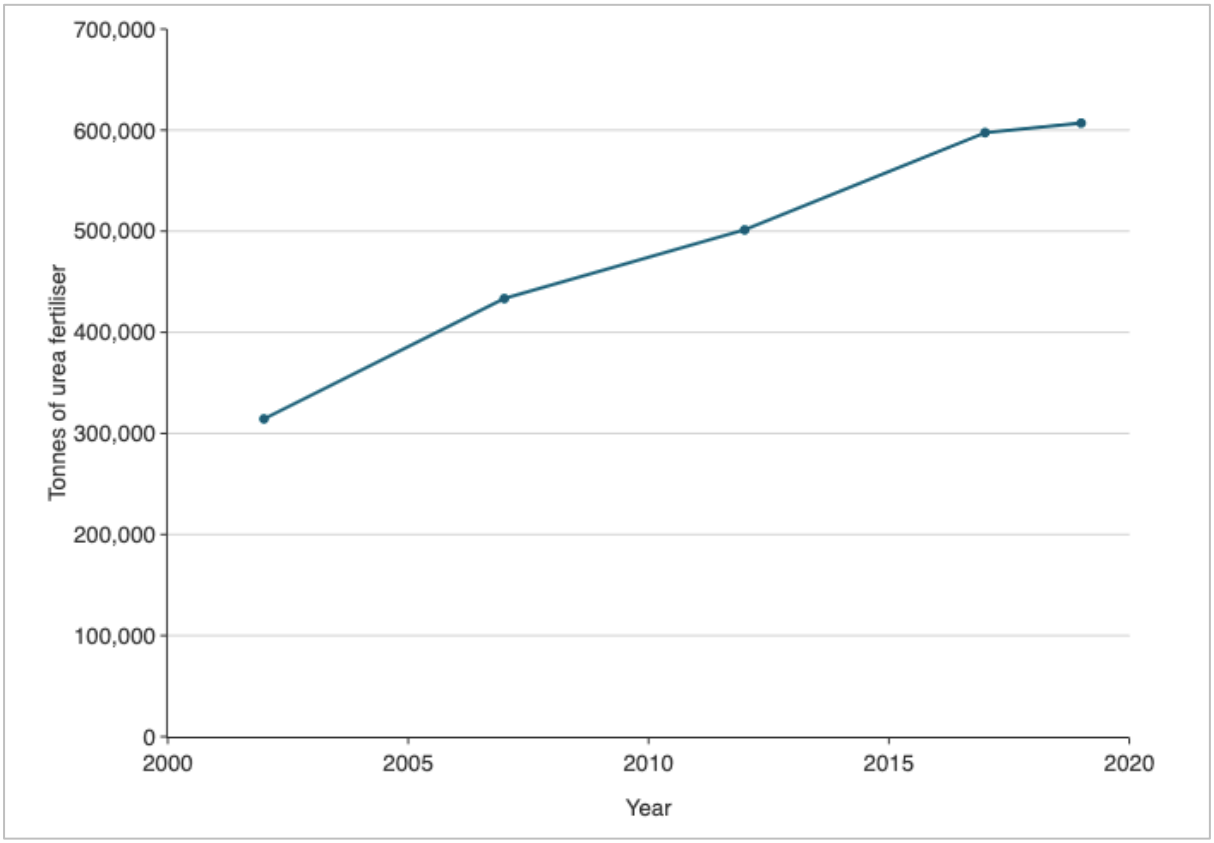
The new skills learnt to initiate and operate renewable energy will help to diversify the Taranaki economy, in particular, by future-proofing industries which are intended to be gradually phased out over time. The Project will build capability in renewable energy – wind development,

maintenance and operations - in the region that can be put to use elsewhere in New Zealand and potentially exported internationally.

8.2. Reduced Import Reliance

New Zealand is a large user of urea for fertiliser. For example, Figure 3 plots the total amount of urea fertiliser applied in New Zealand between 2002-2019. The most recent estimate is that 607,000 tonnes were used in 2019.

Figure 3: Urea fertiliser applied in New Zealand, 2002-2019



Source: Stats NZ, Retrieved: https://www.stats.govt.nz/indicators/fertilisers-nitrogen-and-phosphorus

Ballance operates the only urea manufacturing plant in New Zealand at Kapuni. It produces an average of 730 tonnes of urea each day, or 265,000 tonnes annually. Because domestic consumption of urea was estimated in 2019 at just over 600,000 tonnes annually, New Zealand relies heavily on imports of urea to meet domestic needs.

As a result of our import reliance on urea, we lose income to overseas urea producers and are also subject to volatility in global urea prices. As such a significant input to farming operations, volatility in urea fertiliser prices presents a significant risk to New Zealand's primary industries.

Increasing the domestic production of urea therefore presents an opportunity to secure supply of an affordable fertiliser for New Zealand, while reducing volatility in farm input prices. Increasing domestic production of urea will also displace imports of it, thereby keeping more income in New Zealand. In fact, it is estimated that an additional 7,000 tons of urea will be produced per annum

by Ballance with the hydrogen project operational. This equates to approximately $3m of displaced imports.

Further, even if total domestic urea demand eventually falls over time, urea produced by green hydrogen will still be required for a very long time as it currently represents about only 1% of the amount used in New Zealand.

8.3. Investment Signal Effects

The Project signals that Taranaki is a dynamic, adaptive and forward-thinking regional economy, which can in turn encourage other businesses in the region to invest in new innovative projects.

8.4. This Highest & Best Use of Land/Assets

Finally, we note that the proposal will enable the land to be put to its highest and best use, which is a precondition for economic efficiency to hold in the underlying land market. It will also enable existing dairy operations at PKW farms to continue unaffected by the wind turbines proposed to locate there.