H2 Taranaki Roadmap Update

HOW HYDROGEN WILL PLAY A KEY ROLE IN OUR NEW ENERGY FUTURE

Spring 2021

venture TARANAKI
Te Puna Umanga

A TAPUAE ROA PROJECT

TAPUAE MAKE WAY ROA FOR TARANAKI

H2 TARANAKI

POTENTIAL INTEGRATION OF HYDROGEN INFRASTRUCTURE: UPDATE

THE MAP SHOWS HOW FUTURE HYDROGEN AND RENEWABLE ELECTRICITY DEVELOPMENTS WOULD INTEGRATE WITH TARANAKI'S EXISTING ENERGY INFRASTRUCTURE.

In addition to the above, a study into CCUS led by Ara Ake, and undertaken by Elemental Group and ARUP, is underway.


Offshore Gas Platform
Fixed Offshore Wind and Wave Generation
H2 Powered Heavy Transport
H2 Powered Bus
H2 Production
Green methanol production
NEW PLYMOUTH
Underway
Gas Pipelines
Feasibility and planning underway
Gas Peaker Plant
Blue H2 Production
Remote Stationary Power for Farms
Mount Taranaki
Gas Peaker Plant
STRATFORD
KAPUNI
Onshore Wind
Underground Storage
Green H2 Production
Synthetic fuels
H2 gas storage
Green ammonia
H2 Refuelling Depot
KAPUNI
H2 Powered Milk Tanker
Planning
HAWERA
Dairy Factory
H2 Refuelling Depot
H2 Powered Train
Under investigation
Fixed Offshore Wind and Wave Generation
Onshore Wind
WAVERLEY
PATEA

H2 Taranaki Roadmap – the update

In March 2019 the Prime Minister, Rt Hon. Jacinda Ardern, launched the H2 Taranaki Roadmap.

The Roadmap presented the case for hydrogen to play a major role in New Zealand's transition to a net zero economy by 2050. It envisaged a series of Taranaki-based projects that would lay the groundwork for nationwide development of the hydrogen sector.

This H2 Taranaki Roadmap Update provides an overview of developments since the Roadmap was released. The progress of Taranaki-based projects is summarised. This is provided in the context of an update on hydrogen developments across New Zealand and internationally.

Taranaki was one of the global leaders in developing a regional hydrogen roadmap. Since March 2019 there have been numerous regional and national hydrogen development plans and large-scale investment in commercial hydrogen projects has occurred.

The hydrogen sector is set for significant international growth. It is widely seen as a key part of global decarbonisation efforts.

To retain the leadership position gained by development of the H2 Taranaki Roadmap it is vital that local commitment is maintained and investment encouraged.

The H2 Taranaki Roadmap

There are two H2 Taranaki Roadmap documents – a full-length version and a summary. Both documents can be found on the Venture Taranaki website:

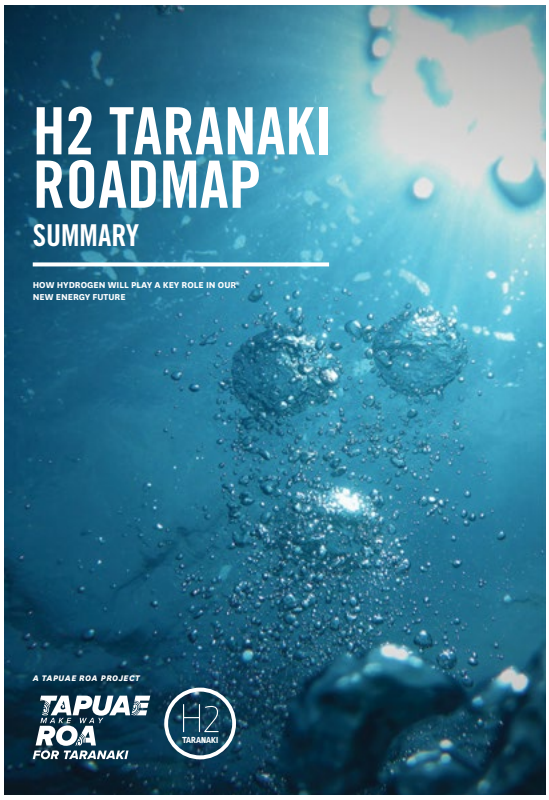
www.venture.org.nz/projects/h2-taranaki-road-map/

The H2 Taranaki Roadmap was prepared with support from the Provincial Growth Fund, New Plymouth District Council and Hiringa Energy.

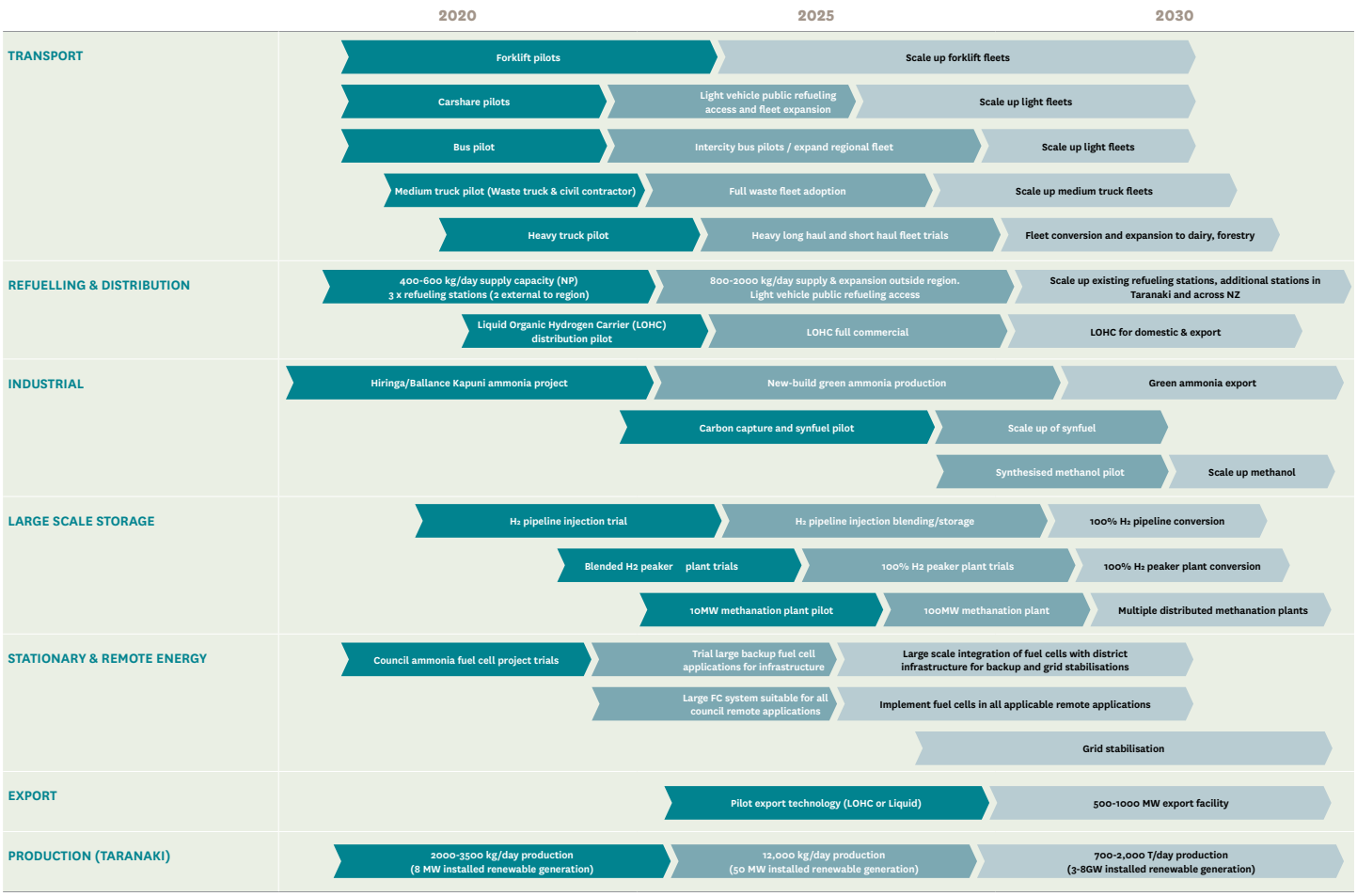
Venture Taranaki was the Project Manager for development of the H2 Taranaki Roadmap.

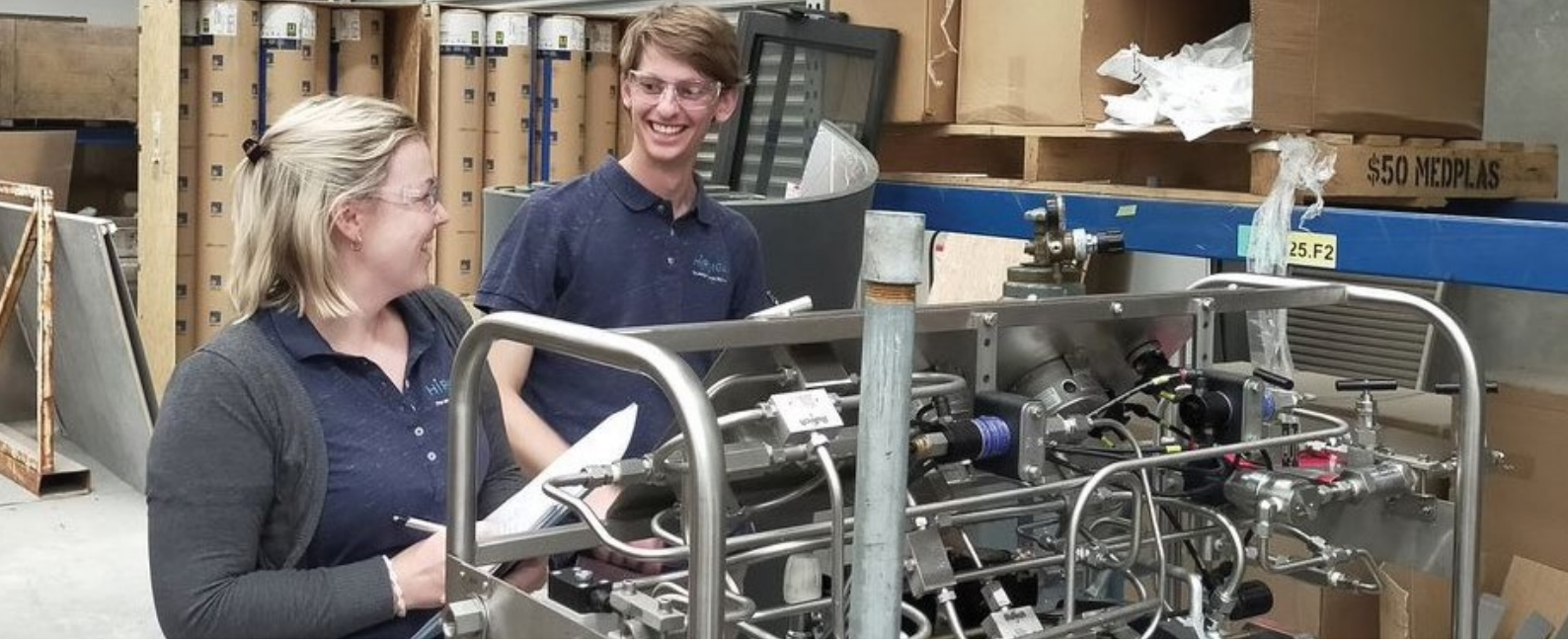
A series of integrated and mutually-supportive actions were proposed in the Roadmap in transport, refuelling and distribution, industrial, large-scale storage, stationary and remote energy and export.

These actions are summarised in this graphic from the Roadmap:



THE H2 TARANAKI ROADMAP ENVISAGES A SERIES OF PROJECTS THROUGH TO 2030:





Hiringa team members with a mobile hydrogen refueller

Progress on Taranaki hydrogen projects

Several projects suggested in the Roadmap have progressed and are summarised below. Underpinning these projects is the development of significant-scale green hydrogen production at Kapuni.

GREEN HYDROGEN

Green hydrogen is produced by using renewable electricity to electrolyse (or split) water into hydrogen and oxygen. There are no greenhouse gas emissions from this process. This contrasts with most of the hydrogen currently produced around the world which is made from fossil fuel hydrocarbons with the production process also releasing CO_2. This is known as brown hydrogen, if produced from coal, or grey hydrogen, if produced from natural gas.

Blue hydrogen also produces no emissions and is the term used when the CO_2 produced from gas or coal production of hydrogen is captured and either used in another product or stored.

The H2 Taranaki Roadmap was primarily focused on developing a green hydrogen industry in Taranaki though the opportunity for blue hydrogen from natural gas was also highlighted.

All the Taranaki projects reported on in this update involve the production of green hydrogen.

INDUSTRIAL

Green hydrogen and ammonia project – Hiringa-Ballance

Ballance Agri-Nutrients owns and operates the ammonia-urea plant at Kapuni in South Taranaki. It produces around 260,000 tonnes of urea per year using hydrogen produced from natural gas as a key feedstock. This is combined with nitrogen extracted from the air to produce ammonia and then urea fertiliser.

In June 2019 **Hiringa Energy** and **Ballance Agri-Nutrients** signed a Joint Development Agreement for an integrated wind to green hydrogen and ammonia project. The two companies plan to build up to four wind turbines producing up to 24MW of renewable electricity. This will provide power to the existing plant with excess electricity being used to power an electrolyser capable of producing up to two tonnes of green hydrogen per day.

The green hydrogen will enable up to 7,000 tonnes of urea to be produced per year and will displace imported urea produced from fossil fuels. It will also create significant volumes of green hydrogen for use in the transport sector which performs an important role in the agricultural supply chain.

The overall cost of the project is expected to be around $60m.

Planning and design for the project is well underway with consultation occurring with local hapu, communities, neighbouring properties as well as business owners. Construction is expected to commence in 2021 with completion in 2022.

DECARBONISATION OF THE GAS NETWORK

H2 Pipeline trial – Firstgas

New Plymouth-based **Firstgas Group** provides the national natural gas transmission network (around 2,500km) and also provides the gas distribution network in several centres (around 4,800km).

Green hydrogen has the potential to be distributed in the gas network displacing the use of a portion of natural gas. This would reduce the carbon intensity of the gas used. Several similar international trials are underway.

In March 2020 Firstgas launched a study on the feasibility of converting its networks to hydrogen. This work was supported by government funding managed by the

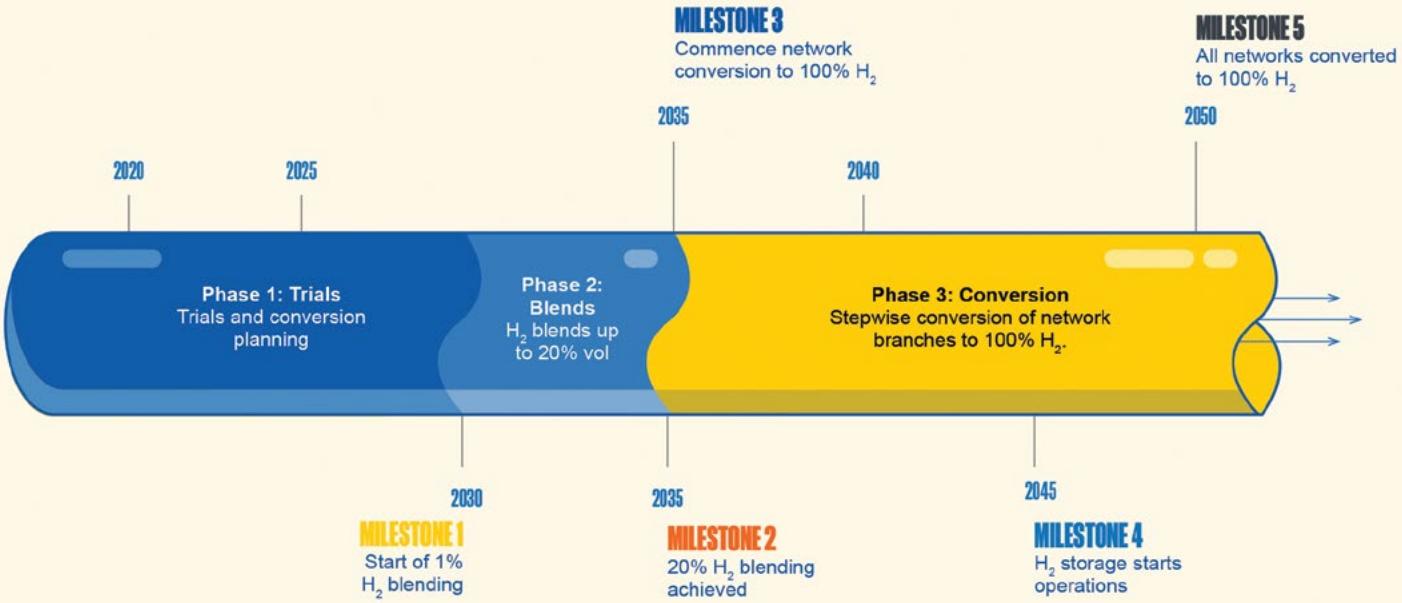


Figure 5: Indicative hydrogen conversion strategy timeline

Firstgas: indicative hydrogen conversion strategy timeline

Provincial Development Unit. This work was completed in March 2020 with the following key findings:

- Firstgas has sufficient pipeline capacity to transport projected hydrogen demand and a viable plan for converting gas networks to 100% hydrogen by 2050 has been developed
- Initially, a 20% hydrogen blend could be used from 2030 to 2035
- There will be no need to change most appliances with a blend of up to 20% hydrogen
- The use of hydrogen could reduce total emissions from the energy sector by 25 per cent by 2050

TRANSPORT

Hydrogen fuel cell electric vehicles (FCEV) have several advantages over battery electric vehicles for heavy and/or high use commercial vehicles – their refuelling time is quicker, their weight is lower and their range is longer.

There are three key actions for hydrogen to fulfil that promise:

- Suitable hydrogen-powered vehicles need to be available
- Companies need to be willing to use them
- A refuelling network needs to be available.

Hydrogen refuelling network – Hiringa Energy

Hiringa Energy is advancing its plans to roll out a nationwide hydrogen refuelling network with the first sites to come online in Q1 2022. In January 2020 Hiringa Energy and **Waitomo Group** announced a partnership to co-locate Hiringa's hydrogen production and refuelling stations on existing Waitomo truck stops. The refuelling network project has three phases:

1 An initial group of eight refuelling stations in Tauranga, Hamilton, New Plymouth, Auckland, Palmerston North, Christchurch, Taupō and Wellington

2 A further 16 stations by 2025

3 Over 100 stations by 2030.

The hydrogen available through this network will come from a combination of onsite production using electrolysers and offsite production delivered to the station by tube trailer. Hydrogen from Kapuni will be available to supply the network.

In August 2020 it was announced that funding of $20m had been provisionally approved by the Infrastructure Reference Group to support the establishment of the refuelling network. The initial network will provide coverage for about 95% of heavy freight routes in the North Island and 82% of the South Island.

Introducing FCEV Trucks and Buses to New Zealand – Hiringa Energy

Hiringa Energy is also working closely with hydrogen fuel cell electric vehicle truck and bus manufacturers to secure cost effective and compliant transport platforms for the New Zealand market.

- FCEV Trucks – Hiringa Energy has been working with **Hyzon Motors, TIL Group** and **TR Group** to develop a New Zealand suitable 50MAX[1] class truck for the line haul market. This has resulted in the signing of a HOA with **Hyzon Motors** for the supply of 20 trucks and line of sight to a further 1,500 trucks over the next 5 years. Hiringa and **Hyundai** have also begun working on a market entry strategy for Hyundai's Xcient FCEV medium duty vehicle which was released in Switzerland mid-2020.
- FCEV Buses – Hiringa Energy has been working with the regional councils across New Zealand to understand the role which FCEV buses will play in the zero emission bus fleets of the future. The expectation based on conversations with regional councils and precedents set internationally is for FCEV buses to make up between 30% and 70% of the total bus fleet with battery and bio-diesel being the remainder. To this end Hiringa has engaged the national and international bus building market with an expression of interest (EOI) for 200 FCEV buses for New Zealand over a 5-year program to 2026. Results of this EOI are currently being evaluated.

Hydrogen for public buses in Taranaki – TRC

The **Taranaki Regional Council** is intending to explore alternative fuel options for the region's public bus fleet including both hydrogen fuel cell and battery electric options. This investigation is expected to occur in 2022. This will be able to leverage the work which Hiringa Energy is doing in developing a broader nationwide fleet procurement as outlined above.

Light Vehicles – Hyundai/Toyota

The development of a public refuelling network also makes it feasible for hydrogen fuel cell light vehicles to enter the New Zealand market.

- Since mid-2019 **Hyundai** has been trialling the Hyundai Nexo SUV in New Zealand. The Nexo is an FCEV which made its first visit to Taranaki in November 2020. It is expected to be available for sale once the hydrogen refuelling network is established.
- **Toyota** have three Mirai FCEVs in New Zealand for evaluation and training purposes, and have Toyota Japan's support to introduce this model once the country's infrastructure is ready.

New Plymouth District Council Thermal Dryer

The **New Plymouth District Council's** wastewater treatment plant has operated a natural gas-powered thermal dryer. This equipment turned wastewater into Bioboost fertiliser but was turned off in February 2020 as it was in urgent need of replacement. In July 2020 it was announced that Government "shovel-ready" funding of $37m will enable the replacement of the dryer with a new one which will run on a blend of natural gas and up to 25% hydrogen. It is proposed that the hydrogen will initially be supplied by **Hiringa Energy** from Kapuni.

The project will significantly reduce the Council's total carbon emissions.

RENEWABLE ENERGY GENERATION

While not directly defined as an action in the H2 Taranaki Roadmap, the development of the green hydrogen sector will encourage renewable energy generation in Taranaki. The regional map in the H2 Taranaki Roadmap documents suggests the potential for several onshore and offshore wind farms to be developed in the region.

The go-ahead for the first onshore wind farm in the region was given in late 2019. Tilt Renewables are constructing the 130MW Waipipi Wind farm between Patea and Waverley which is being commissioned in early 2021. While not specifically connected to any hydrogen projects, it does show the potential of Taranaki for wind generation.

As noted above, Hiringa Energy and Ballance Agri-Nutrients are developing up to 24MW of onshore wind generation near Kapuni.

In April 2020, Venture Taranaki released an Offshore Wind Discussion Paper. This addressed the potential for offshore wind generation in the waters of both South and North Taranaki, including potential for powering large-scale green hydrogen production.

Significant international and domestic commercial interest in offshore wind in Taranaki has ensued. A sold-out New Zealand Offshore Wind Forum was held in New Plymouth in December 2020.

The potential for wave energy generation continues to be explored by New Plymouth company **EHL**, while there is also potential for solar and possibly geothermal generation in Taranaki. If developed, these other sources of renewable electricity could also be utilised for green hydrogen production.

ENERGY STORAGE

The H2 Taranaki Roadmap addressed the potential for green hydrogen as a store of energy from renewable electricity. It could be used when required to generate electricity in existing but modified natural-gas fired power stations. **Mitsubishi Corporation** has carried out an initial investigation of this option which shows promise.

Central Government has committed to the NZ Battery project, which is a major investigation of the technical, environmental and commercial feasibility of potential energy storage projects. While the NZ Battery project has a focus on the Lake Onslow pumped hydro project (near Cromwell), alternative technology approaches will also be considered. Green hydrogen-based energy storage options are expected to form part of the NZ Battery investigation[2].

1 *50MAX | Waka Kotahi NZ Transport Agency (nzta.govt.nz)*
2 *NZ Battery Project | Ministry of Business, Innovation & Employment (mbie.govt.nz)*

Sophie Kelly of Venture Taranaki at the wheel of the Hydrogen powered Hyundai Nexo

ADDITIONAL PARTNERSHIPS

Hiringa-Mitsui Strategic Alliance

In June 2020 Hiringa Energy signed a Strategic Alliance agreement with Japanese company **Mitsui & Co** to jointly pursue hydrogen-related commercial projects in New Zealand[3].

Through this agreement the two companies will:

- Work towards a common goal of creating a viable domestic hydrogen economy and export opportunities in New Zealand
- Provide Mitsui & Co with access to participate in multiple Hiringa Energy hydrogen projects including:
  - JV project with Ballance Agri-nutrients
  - Hiringa's nationwide refuelling network.

Hiringa-TR Group MoU

In July 2018 Hiringa Energy signed a Memorandum of Understanding with heavy vehicle rental and leasing company **TR Group**, under which TR Group will provide heavy trucks powered with hydrogen fuel cells for the New Zealand market and Hiringa will develop a nationwide refuelling network.

TR Group will support these vehicles via its heavy fleet, lease, rental and maintenance expertise. Several configurations and weight classes of vehicles will be available from 2021.

Hiringa-TIL Logistics MoU

In November 2018 Hiringa Energy signed a Memorandum of Understanding with New Plymouth-based transport company **TIL Logistics** to develop and deliver transport solutions using hydrogen fuel cell technology in New Zealand. TIL Logistics is a customer of TR Group and currently has over 2,300 vehicles in its fleet.

Hiringa-AB Equipment MoU

In September 2020 Hiringa Energy and **AB Equipment** entered into an MOU to introduce material handling equipment powered by fuel cells into the New Zealand market. AB equipment is one of New Zealand's largest material handling equipment providers and under the agreement the two companies plan to trial the technology with different customers around New Zealand along with supporting the establishment of onsite hydrogen refuelling infrastructure.

3 *The New Zealand and Japanese Governments had earlier signed a Memorandum of Cooperation on hydrogen in October 2018*

Appendix 1 New Zealand hydrogen developments

The New Zealand Government has committed to the development of a New Zealand Hydrogen Roadmap. This multi-stage process is being carried out by MBIE.

"A Vision for Hydrogen in New Zealand"

Public workshops began the process of preparing this New Zealand Government green paper, including one held in New Plymouth in March 2019 by consultants Arup and MBIE.

The resulting document "A Vision for Hydrogen in New Zealand"[4] was released in September 2019 and was followed by a public consultation process. 78 submissions were received. MBIE have prepared a summary of those submissions[5].

The Green Paper noted:

"The establishment of a strong low emissions economy, to which hydrogen contributes, is a very real opportunity and within reaching distance. Private sector investment, facilitated by appropriate Government policies, will allow New Zealand to benefit from significant decarbonisation across the entire energy system.

Green hydrogen is a platform that will help reduce global emissions. New Zealand has an abundance of renewable energy that could be used to produce hydrogen as a next generation fuel in a sustainable way. With green hydrogen we have opportunities to create new jobs, convert heavy transport away from fossil fuels, enhance our security of electricity supply and even create significant export revenue. In combination, electricity and hydrogen provide a robust energy system platform to decarbonize New Zealand. Their complementary characteristics can deliver benefits that neither can deliver in isolation."

Modelling Project

MBIE subsequently commissioned consultants Castalia to prepare a modelling tool[6] that identifies the key drivers for the future of New Zealand's hydrogen economy. MBIE have noted that:

"The model shows that the major drivers of whether economic production of hydrogen is possible in New Zealand will be the cost of electricity and the capacity and scale of electrolysers. New Zealand's role as exporter, importer or producer for domestic production will depend on relative electricity prices in possible competitor countries such as Australia."

A New Zealand Roadmap

As part of its election campaign the Labour Party committed to further support for hydrogen. During the campaign the Minister of Energy and Resources Megan Woods stated:

"A great example of work we can do to become a world leader is the development of a green hydrogen industry. We can produce some of the cleanest green hydrogen in the world, and potentially receive a premium for it in international markets. We are already working with other countries including Japan and have invested in a nationwide fuelling network and will invest $10 million in a roadmap and further opportunities".[7]

The details on preparation of this national roadmap, including the timeline, are yet to be announced.

Ministry of Transport's Green Freight Project

One of the key opportunities for hydrogen is as a fuel for heavy and/or high-use commercial vehicles.

The Ministry of Transport is carrying out a Green Freight Project[8] exploring the roles of alternative green fuels – electricity, biofuels and hydrogen – in the heavy road transport industry. A Green Freight Background Paper was released in September 2019 and a strategic working paper "Green Freight: 2020" was released in May 2020. The two papers note a range of challenges and opportunities for these alternative fuels.

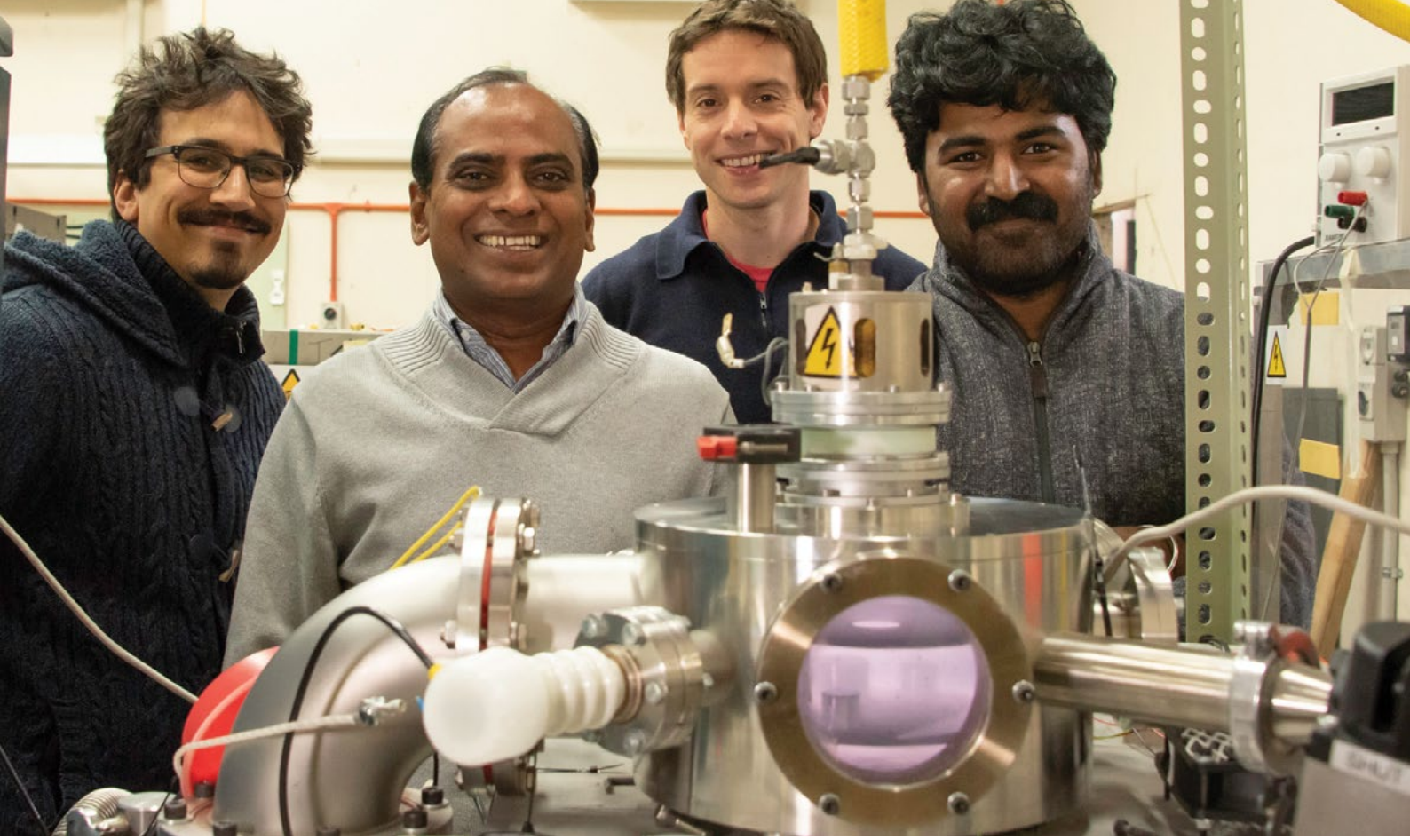
The Green Freight 2020 paper included a Case Study on Hiringa Energy and its work with the heavy transport sector.

Ports of Auckland

In 2018 Ports of Auckland announced it was committed to building a hydrogen production and refuelling facility at its Waitemata port. Auckland Council, Auckland Transport and Kiwirail are project partners.

In January 2019 the project received support from the Energy Efficiency and Conservation Authority's (EECA) Low

4 *A vision for hydrogen in New Zealand | Ministry of Business, Innovation & Employment (mbie.govt.nz)*
5 *Analysis of Hydrogen Vision submissions (mbie.govt.nz)*
6 *A roadmap for hydrogen in New Zealand | Ministry of Business, Innovation & Employment (mbie.govt.nz)*
7 *100% renewable electricity generation by 2030 - NZ Labour Party*
8 *Green freight project | Ministry of Transport*



Scientists involved in the green hydrogen project at GNS Science. Photo: Margaret Low, GNS Science

Emissions Vehicles Contestable Fund. This funding will be used to support the procurement of a hydrogen fuel cell bus and three hydrogen fuel cell cars.

Christchurch company Global Bus Ventures has been contracted to build the bus.

Tuaropaki Trust – Obayashi

The Tuaropaki Trust owns the Mokai Geothermal Plant located about 30km northwest of Taupo. The Trust has established Halcyon Power as a hydrogen production joint venture with Obayashi Corporation of Japan. A hydrogen production plant is currently under construction and will use a 1.5MW electrolyser to produce around 100 tonnes of hydrogen annually.

Tiwai Point

The closure of the Tiwai Point Aluminium Smelter was announced by Rio Tinto in July 2020 with the intention of this taking effect from August 2021. The smelter consumes around 13% of New Zealand's electricity with much of it supplied from the Manapouri Power Scheme. After the closure was announced there was considerable discussion on the best options for the future use of this supply of electricity. While grid upgrades are being advanced to get the power further northwards in the South Island there was widespread speculation that the Manapouri electricity supply could be used to power a green hydrogen production facility.

In December 2020 Meridian Energy and Contact Energy announced they were co-funding a $2 million feasibility study into large-scale green hydrogen production in the lower South Island. If this occurs it would have a major impact on the development of the green hydrogen sector in New Zealand. Subsequently, in January 2021, it was announced that a deal had been reached between Rio Tinto, Meridian Energy and Contact Energy which will keep the smelter operating until at least the end of 2024. Options past this date, including green hydrogen production, remain on the table.

GNS Research

Crown Research Institute GNS was awarded $8,450,000 through the MBIE 2020 Endeavour fund to advance its research programme: *Powering NZ's Green-Hydrogen economy: Next-generation electrocatalytic systems for energy production and storage*. This programme focuses on utilising renewable electricity as an energy source to generate hydrogen by water splitting (electrolysis) – producing a clean, emission-free variant of this key industrial feedstock for stationary power and transport. While electrolysis is not new, it relies on high-cost, inefficient materials to make it work, making hydrogen production in this manner uncompetitive with the conventional fossil-fuel reforming. The GNS research aims to stimulate the creation of next-generation technologies with an order-of-magnitude improvement in performance relative to existing water electrolysis-based hydrogen production systems, along with new capabilities in hydrogen storage and distribution.

Appendix 2 International hydrogen developments

There has been significant and increasing global interest in the green hydrogen sector in recent years. This interest was developing before the H2 Taranaki Roadmap was prepared but has stepped up to another level since it was launched.

World Energy Council

The WEC and consultants Ludwig-Bölkow-Systemtechnik released a summary document "International Hydrogen Strategies" in September 2020[9]. It reviewed government actions supporting the hydrogen sector in 16 countries or states and in the European Union. Key points noted were:

- Quickly emerging hydrogen strategies indicate a dynamically growing market
- Hydrogen is clearly recognized as an essential element of a decarbonized energy system
- Scaling demand expectations for 2050 indicates a global hydrogen potential of up to 9000 TWh per annum (about 270 million tonnes of hydrogen)
- In countries with high energy needs, a substantial share of the H_2 demand will be served by imports, initially on the basis of bilateral agreements
- Initial applications focus on the transport and industry sectors
- Green hydrogen is central to all strategies
- Refineries and chemical industry to become the first important large-scale hydrogen markets in the mid-term
- Large industrial partnerships will be formed for production and export/import
- Road transport and fuel cell market is currently stronger in Asia than in Europe
- Green synthetic liquid e-fuels (PtL[10]) can grow into an interesting opportunity, particularly in the aviation and/or maritime sector
- New policies needed to achieve strategic aims – policies should focus on commercialisation
- A green hydrogen certification needs to be put in place
- Infrastructure development requires central coordination and financial support
- Public acceptance is key.

International Energy Agency

The IEA released "The Future of Hydrogen: Seizing today's opportunities" in June 2019[11]. It noted:

"The report finds that clean hydrogen is currently enjoying unprecedented political and business momentum, with the number of policies and projects around the world expanding rapidly. It concludes that now is the time to scale up technologies and bring down costs to allow hydrogen to become widely used."

International Renewable Energy Agency

IRENA has had a long interest in hydrogen. It released "Hydrogen: a renewable energy perspective" in September 2019. The report noted:

"Two key developments have contributed to the growth of hydrogen in recent years: the cost of hydrogen supply from renewables has come down and continues to fall, while the urgency of greenhouse gas emission mitigation has increased, and many countries have begun to take action to decarbonise their economies, notably energy supply and demand. The hydrogen debate has evolved over the past two decades, with a shift in attention from applications for the auto industry to hard-to-decarbonise sectors such as energy-intensive industries, trucks, aviation, shipping and heating applications."

Green Hydrogen Catapult

Seven significant green hydrogen project developers and their partners launched the Green Hydrogen Catapult initiative in December 2020. This initiative aims to deploy 25GW of green hydrogen production and drive costs of green hydrogen below US$2 per kilogram by 2026.

The seven key developers are ACWA Power, CWP Renewables, Envision, Iberdrola, Ørsted, Snam and Yara. They suggest the initiative will require investment of US$110 billion.

Australia

The opportunities for green hydrogen production have been attracting considerable attention in Australia. Following the preparation of a National Hydrogen Roadmap[12] by the CSIRO in 2018, Australia's National

9 *LBST Report H2-strategies (weltenergierat.de)*
10 *Power to Liquid – a subset of the broader Power to X concept where renewable energy is used to manufacture products such as green hydrogen, ammonia or methanol.*
11 *The Future of Hydrogen – Analysis - IEA*
12 *National Hydrogen Roadmap - CSIRO*

Hydrogen Strategy[13] was released by the Department of Industry, Science, Energy and Resources in November 2019.

State hydrogen plans have also been released for South Australia, Tasmania, Queensland and for the Northern Territory while Victoria released a Green Hydrogen Discussion Paper in 2019.

The Australian Renewable Energy Agency (ARENA) is helping seed the hydrogen sector with a $70m Renewable Hydrogen Deployment Funding Round supporting several electrolyser projects[14]. The Clean Energy Finance Corporation (CEFC) has up to $300m available via the Advancing Hydrogen Fund "to support the growth of a clean, innovative, safe and competitive Australian hydrogen industry."[15] State funding support totalling $230m is also available.

There are several small-scale hydrogen development and trial projects underway in Australia including Hydrogen Park in the Tonsley Innovation District in Adelaide, South Australia[16]. It will produce green hydrogen using wind and solar and a 1.25MW electrolyser. The hydrogen will be blended at 5% in the local natural gas network and will also be used for local industry and as a transport fuel.

Some large commercial hydrogen projects have also been announced in Australia.

Infinite Blue Energy has announced the Arrowsmith Hydrogen Project in Western Australia which, from 2022, is intended to produce 25 tonnes of green hydrogen per day powered by 85MW solar and 75MW of onshore wind. The company has secured AUS$300m of investment funding for the project. They have plans for a subsequent project three times as large.

Infinite Blue Energy has also announced plans for Project Neo which is a much larger project involving 1GW of capacity. This project is designed to produce green hydrogen using variable renewable electricity from wind and solar which is then used to produce baseload electricity or on demand. Their plan is to have the project up and running by 2027.

In October 2020 the Australian Federal Government awarded "major project status" to the Asian Renewable Energy Hub. This is a massive $36b project starting with 15GW of electricity generation and eventually expanding to 26GW. It will be one of the world's largest power generation projects and will be located in 6,500km2 of land in the remote Pilbara region of Western Australia. When developed it would increase Australia's current total electricity supply by more than 30%. The project is however, designed to use this electricity to produce green hydrogen and then transform it to ammonia for export. It is being developed by InterContinental Energy, CWP Energy Asia, Vestas and a Macquarie Group fund.

Europe

Many European countries have also released Hydrogen strategies and roadmaps in the past couple of years including Germany, The Netherlands, France, Finland, Portugal and Spain. Italy is about to prepare its hydrogen strategy. A European Strategy was released in July 2020[17].

The EU has invested in hydrogen projects over the past 20 years via the Fuel Cell and Hydrogen Joint Undertaking[18]. This is focused on increasing efficiency and reducing costs of green hydrogen production, encouraging clean transport, demonstrating the use of hydrogen for enabling renewable electricity production by grid balancing and minimising use of critical raw materials. From 2014 to 2020 the FCH JU invested over €1.33b in hydrogen projects.

In Europe the hydrogen sector is increasingly linked with offshore wind as the source of renewable energy. Major electricity and oil and gas companies are collaborating and competing to ramp up production of offshore wind, green hydrogen production and projects which will use the hydrogen produced. Green hydrogen lies at the core of European decarbonisation efforts and at the transition of energy companies.

As in Australia, very large projects involving companies from throughout the green hydrogen value chain are being put together in Europe. For example, Danish energy company Ørsted (the world's leading offshore wind generator) is developing an offshore wind and green hydrogen project with Maersk, Copenhagen Airports and the City of Copenhagen starting with a 10MW electrolyser by 2023, scaled up to 250MW by 2027 and to 1.3GW by 2030[19]. Another example is Equinor, RWE, Shell, Gasunie and Groningen Seaports which have launched the NorthH2 project to create green hydrogen capacity of 4GW by 2030 and 10GW by 2040. NorthH2 links offshore wind electricity generation with hydrogen production, distribution and storage and hydrogen use for electricity generation and production of industrial chemicals.

OMV, the international oil and gas company, with extensive operations in Taranaki, has recently announced their investment in the construction of a 10 MW electrolyser, at a refinery outside Vienna. Costing an estimated 25 million euros (NZ$41.57 million), the plant will make biofuels and petroleum-based fuels substituting 'grey' hydrogen made with gas, but there will be no capturing of excess CO_2. OMV expects the unit to be completed in 2023.

---

13 Australia's National Hydrogen Strategy | Department of Industry, Science, Energy and Resources
14 Seven shortlisted for $70 million hydrogen funding round – Australian Renewable Energy Agency (ARENA)
15 Hydrogen – Clean Energy Finance Corporation (cefc.com.au)
16 Hydrogen Park South Australia - Renewables SA
17 Powering a climate-neutral economy (europa.eu)
18 www.fch.europa.eu
19 www.climatechangenews.com/2020/08/24/orsted-backs-danish-offshore-wind-powered-hydrogen-project/

UK

Prime Minister Boris Johnson released his Government's "10 Point Plan for a Green Industrial Revolution"[20] in November 2020. Point 2 was "Driving the Growth of Low Carbon Hydrogen".

The Plan notes:

"Working alongside partners in industry, our aim is for the UK to develop 5GW of low carbon hydrogen production capacity by 2030 that could see the UK benefit from around 8,000 jobs across our industrial heartlands and beyond. This will be supported by a range of measures, including a £240 million Net Zero Hydrogen Fund".

In its definition of "low carbon" hydrogen the UK includes hydrogen produced from natural gas where the CO_2 produced is captured and stored underground. It views this "blue hydrogen" as an initially cheaper form of hydrogen that will aid the sector's development and ultimate transition to green hydrogen from renewable energy.

The UK is launching its hydrogen strategy in the first quarter of 2021.

Asia

Japan, South Korea and China continue to place considerable emphasis on hydrogen – as potential customers for green hydrogen, as potential investors in green hydrogen projects and as suppliers of plant and equipment to the sector. Japan was set to showcase hydrogen at the 2020 Olympics, now delayed by Covid-19 until 2021. Mitsubishi Corp and its subsidiary Chiyoda have trialled the international transport of hydrogen from Brunei to Japan using their SPERA technology[21]. This combines hydrogen with toluene for shipping at ambient temperature and pressure. A trial of this technology in New Zealand is suggested as an action in the H2 Taranaki Roadmap.

Saudi Arabia

The Saudi Government is developing Neom, a new city near the country's borders with Egypt and Jordan. Its ambition is for Neom to become a global centre for renewable energy and green hydrogen production. While Saudi Arabia is a leading oil producer it also has excellent solar and wind resources and the ability to produce cheap renewable energy.

In July 2020 it was announced that a US company Air Products & Chemicals will be building a green hydrogen plant at Neom powered by 4GW of wind and solar power. This will produce 650 tonnes of green hydrogen daily which will be converted to ammonia for export. Green Hydrogen will also form a core part of Neom's overall energy system.

USA

Under President Trump the USA lagged in addressing greenhouse gas emissions at a federal level. Nevertheless, many US states and companies are exploring options including green hydrogen production and technologies for using hydrogen.

President Joe Biden has proposed a US$2 trillion green investment plan to enable the country to meet its decarbonisation targets. The plan includes investment in innovation to "Drive dramatic reductions in clean energy technologies" including renewable hydrogen[22].

US support will help the global green hydrogen sector grow even more rapidly than it has since the H2 Taranaki Roadmap was launched in March 2019.

---

20 The ten point plan for a green industrial revolution - GOV.UK (www.gov.uk)

21 SPERA Hydrogen® Chiyoda's Hydrogen Supply Chain Business | CHIYODA CORPORATION

22 The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future | Joe Biden for President: Official Campaign Website

Pictured: Cathy Clennett, Dan Kahn, and Andrew Clennett of Hiringa

venture
TARANAKI
Te Puna Umanga

Taranaki's Regional Development Agency

25 Dawson Street, PO Box 670
New Plymouth 4340, New Zealand

T+64 6 759 5150
E info@venture.org.nz

www.taranaki.info

First published in April 2021