

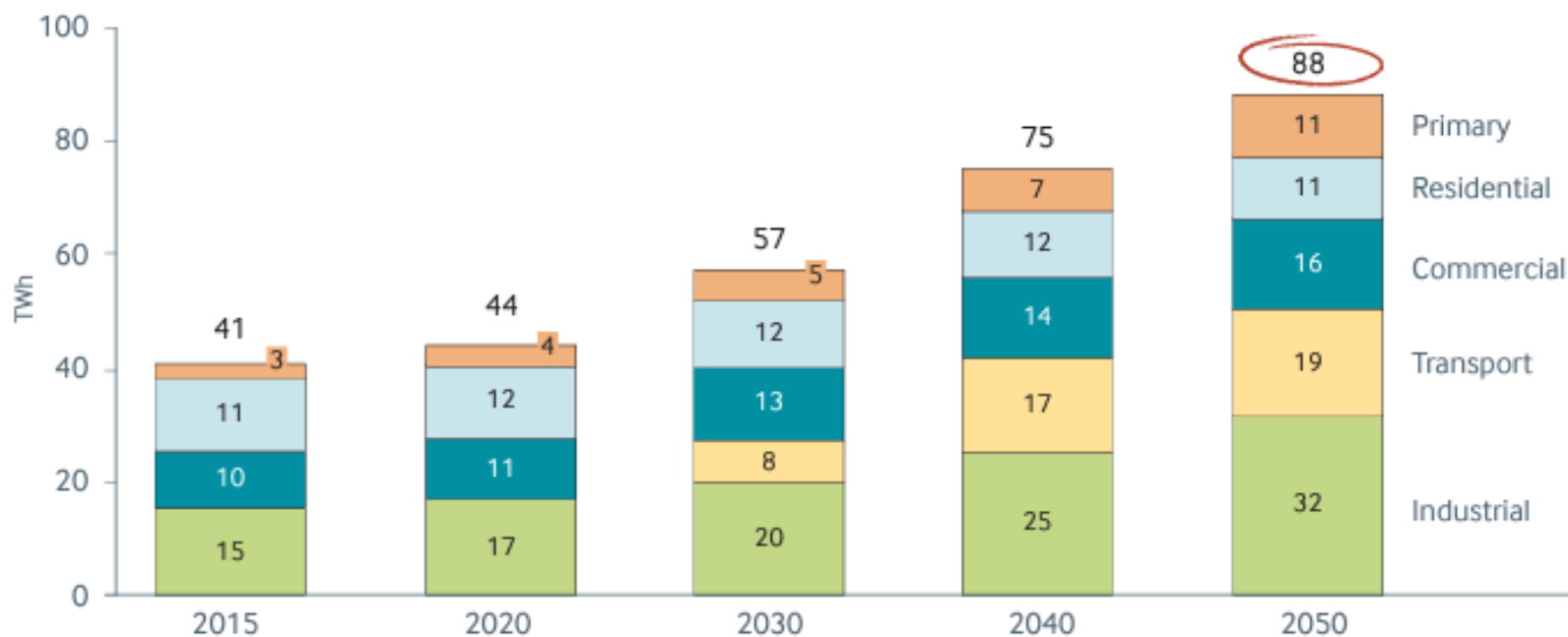


In pursuit of 600% renewables

Te Mauri Hiko - The future of energy demand

New Zealand has world class offshore wind resources which complement existing and new hydro, geothermal and onshore wind and solar generation. Offshore wind can accelerate New Zealand's progress towards achieving its net zero target and support the decarbonisation of key industries such as transport and agriculture.

New Zealand will benefit from rapidly falling costs for offshore wind - **and remember** - in a global market it is the comparative cost of offshore wind which matters not whether offshore wind in New Zealand is cheaper than onshore wind or hydro.

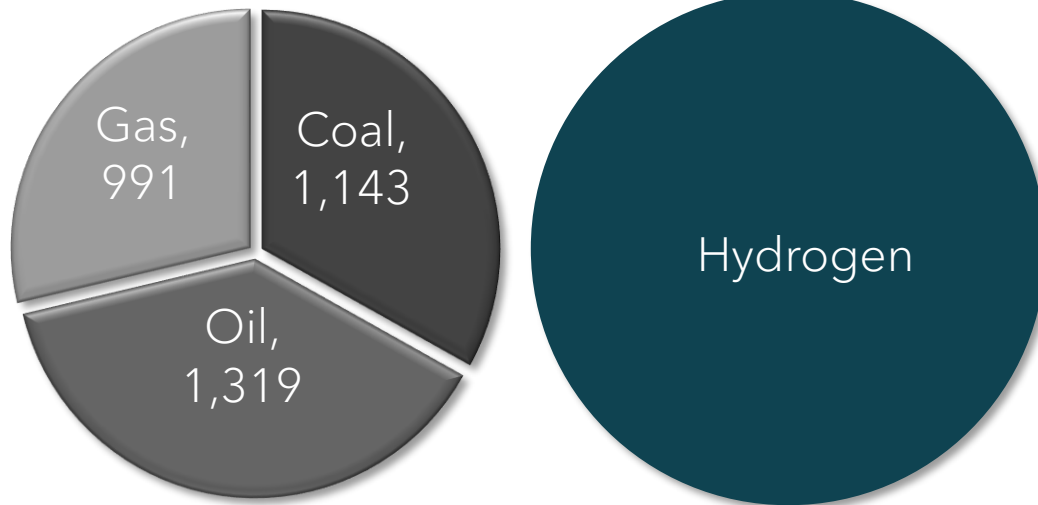


Source - Te Mauri Hiko, Transpower

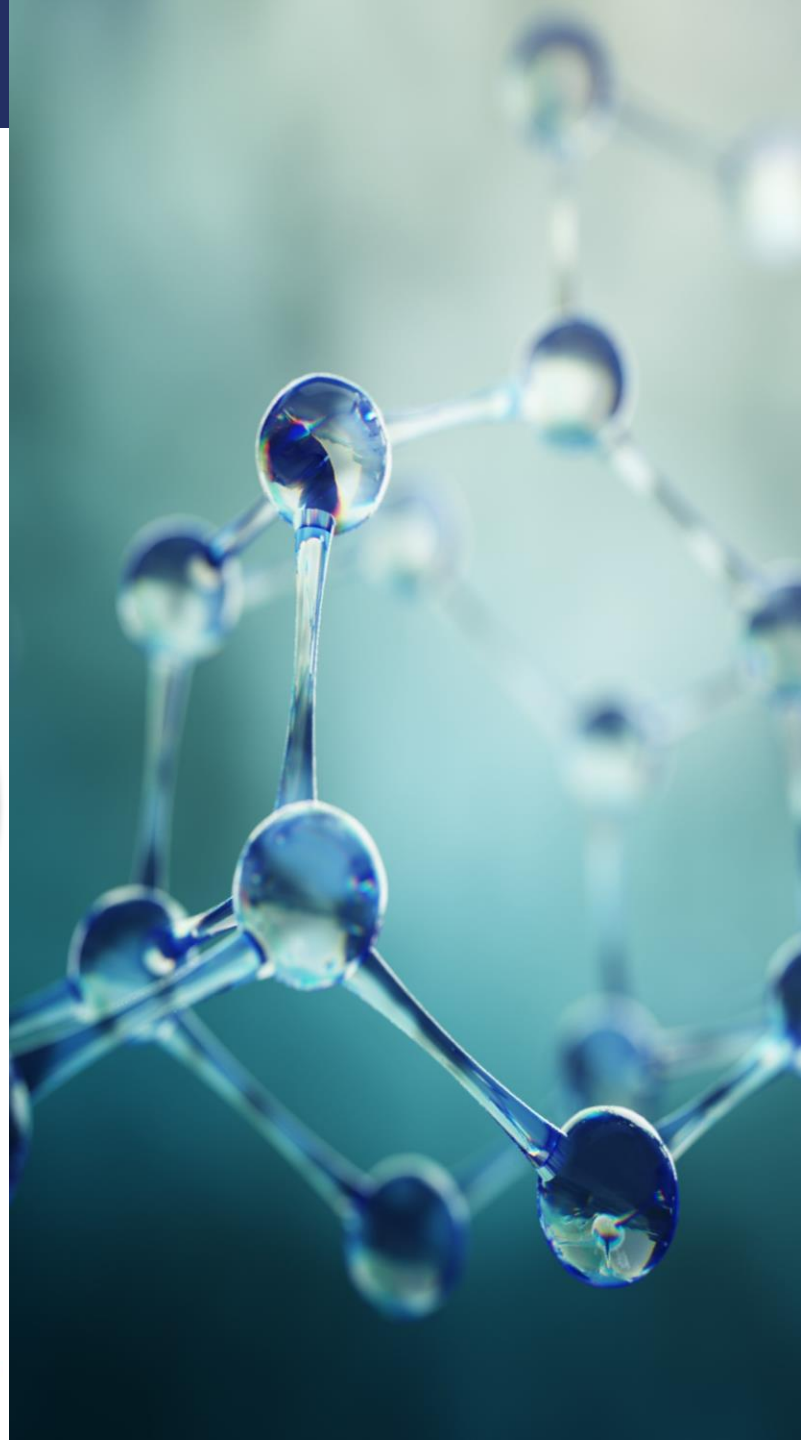
The scale of the challenge

2019 global fossil fuel production is 3,450 Mt/a hydrogen

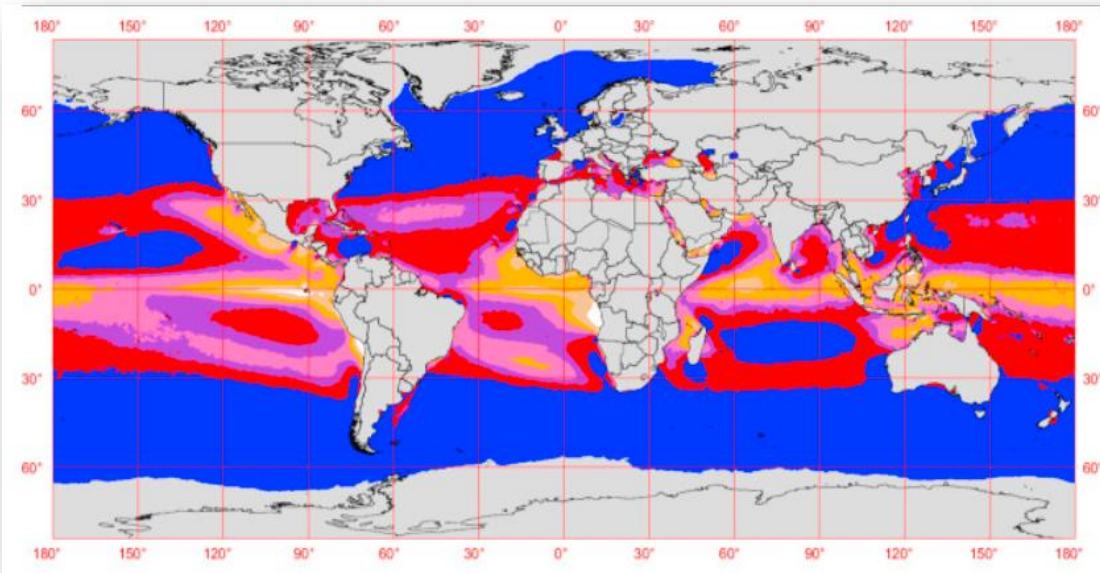
2050 hydrogen replacement 3,450 Mt/a hydrogen



IEA



Globally significant wind resources & market



Global offshore wind stats:

6.1 GW installed in 2020

35 GW total installations by 2020

270 GW installations estimated by 2030

NZ context:

9GW electricity generation in NZ now
(hydro, thermal, geothermal, wind)

6.5GW of wind generation needed by
2050 (Transpower)

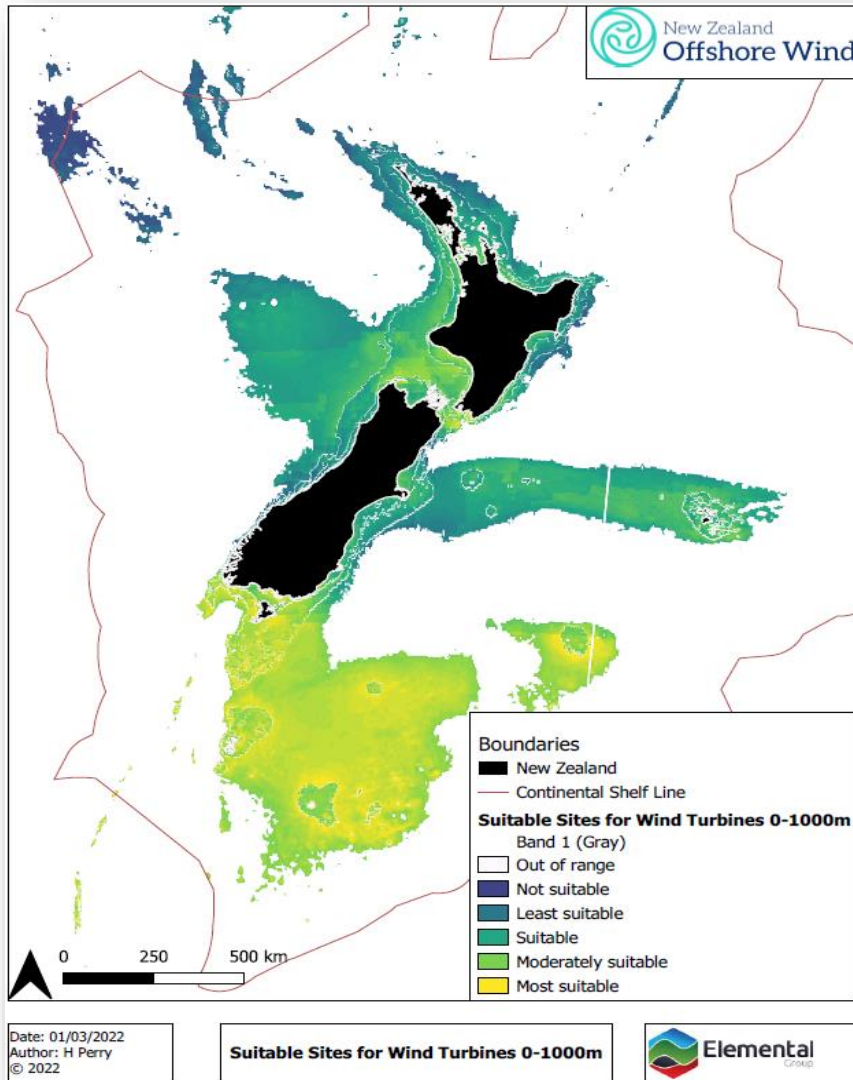
2,000GW of technical potential for NZ
offshore wind production (GWEC)

Wind power class	Resource potential	Wind power density (W/m ²)
1	Poor	0 - 100
2	Marginal	100 - 150
3	Fair	150 - 200
4	Good	200 - 250
5	Excellent	250 - 300
6	Outstanding	300 - 400
7	Superb	> 400

New Zealand has outstanding offshore wind resource potential

That creates a huge opportunity to become net zero positive and leading exporter of renewable energy

Where is the resource?



GWEC estimate - 2,000 GW technical potential of offshore wind resource

Breaks down as:

- Proven fixed turbines - 22 GW
- Proven floating to 200m - 57 GW
- Feasible floating to 1000m - 271 GW

Total feasible energy - 350 GW

Haumoana: Capacity building report

In November '21 Energy Estate, Elemental Group and BlueFloat Energy, published a report which highlighted New Zealand's untapped potential for offshore wind development

Key themes were:

Fostering regional & national economic development

- Facilitate trans-Tasman collaboration in manufacturing & establishing world-class expertise and training
- Long term employment opportunities for locals + transfer of complimentary technical expertise & skills from offshore oil, gas & marine industries
- Establish a broader ecosystem of regional economic development

Delivering broader benefits for Aotearoa and its communities

- Opportunity to design the regulatory framework & development standards so as to deliver wider benefits to Iwi & local communities
- Accelerate NZ's progress towards achieving its net zero target
- Re-purpose existing infrastructure (such as offshore oil & gas infrastructure, ports)
- Build close to demand centre & reduce the dependency on SI generation

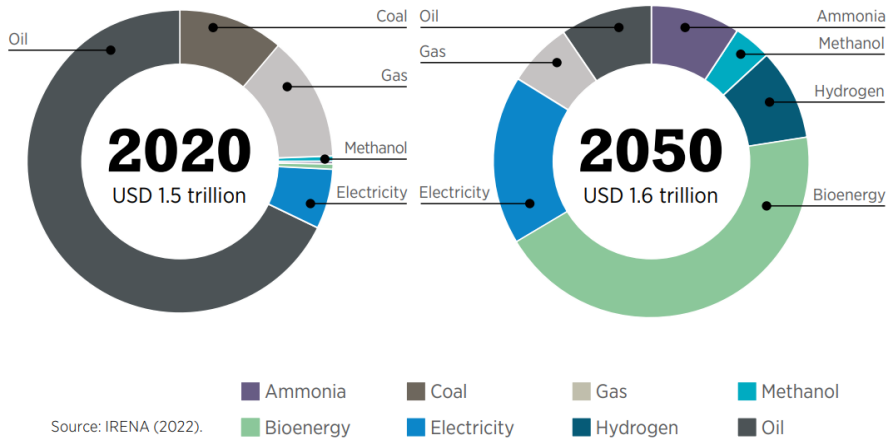
Supporting innovation

- Opportunity to create low-cost competitive green hydrogen & e-fuels for domestic & export markets
- Enable corporate energy users to meet their increasing demand for renewable energy
- Local businesses partner with experienced international offshore wind players to create a skill base



NZ Pure – the green gas export opportunity

Figure S.1 Shifts in the value of trade in energy commodities, 2020 to 2050

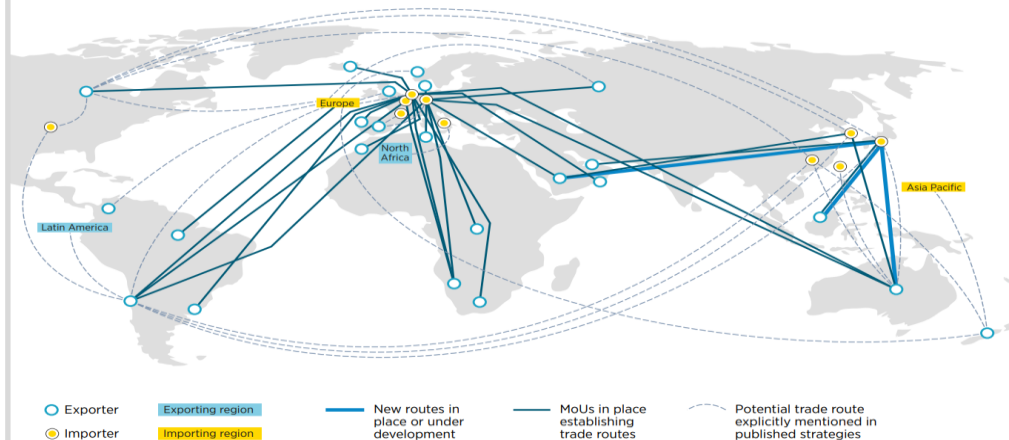


600% RE can displace 31 MT CO₂e /a

This is equivalent to 50 % of New Zealand's net emissions or 0.1% of global fossil fuel emissions

Potential to produce 3.3 million tonnes of hydrogen equivalent energy by 2050, a \$10 billion per annum industry (or even more at today's prices)

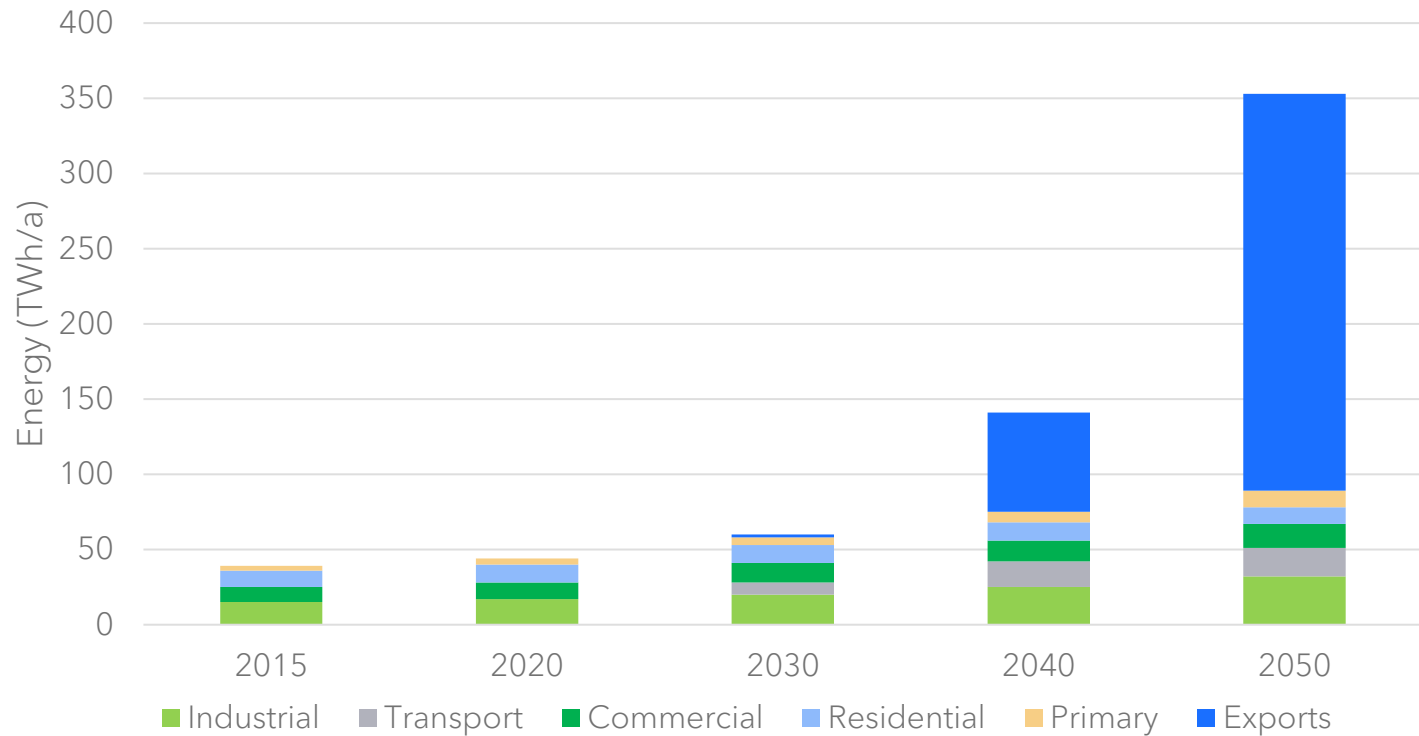
Figure S.2 An expanding network of hydrogen trade routes, plans and agreements



Map source: Natural Earth, 2021

Our vision - taking it slowly

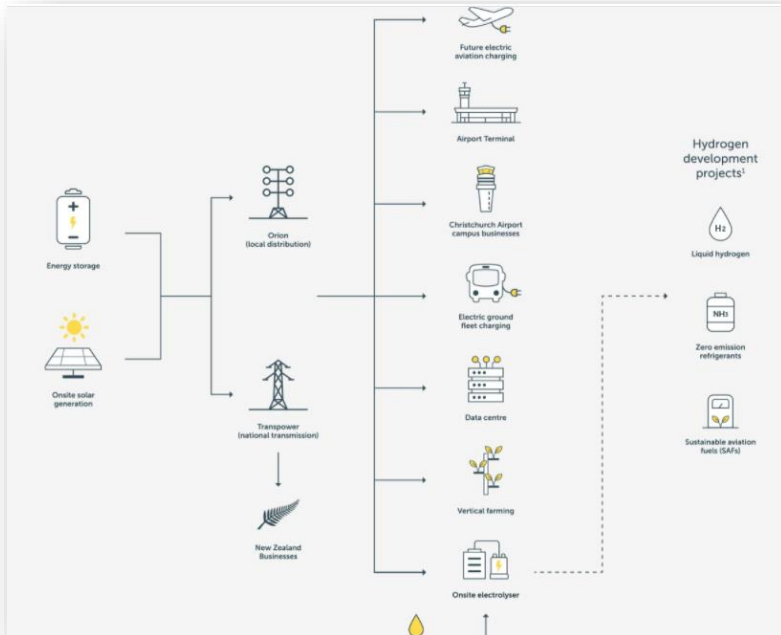
The path to 600% renewables



600% isn't just about exports – take a look at Kowhai Park

Solar Bay has committed a minimum of \$100m to the first phase of the development of large scale solar generation at CIAL as part of a new clean industrial precinct which will serve the airport, create new industry and support the Canterbury region.

The long term plans include up to 500MW of solar PV, developing and owning new large scale wind generation in Canterbury region, on-site BESS and green hydrogen and e-fuels/SAF production and refuelling facilities. Potential large new energy users include data centres, Air NZ – electric and SAF, shipping, transport, fuel switching for dairy sector and other industry, LPG substitution with synthetic propane or butane. **Potential demand (deep decarbonisation) circa 4GW.**



Doing our bit for our Pacific neighbours

Pilot project for Green Hydrogen supply from Queensland to Palau

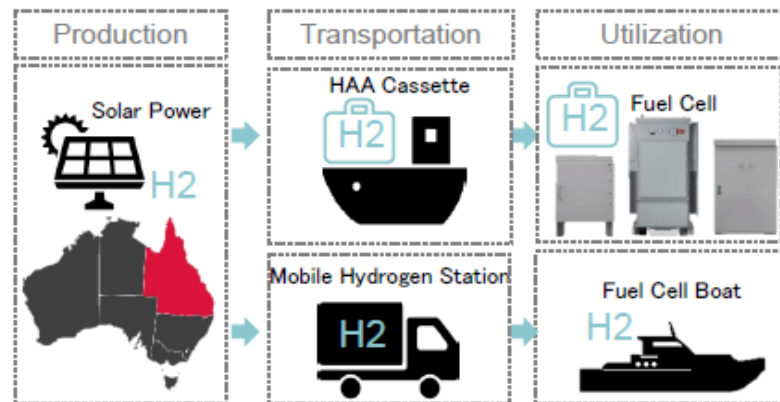
Sojitz will begin a demonstration project together with CS Energy and Nippon Engineering Consultants to transport renewable hydrogen produced by CS Energy in Queensland, Australia to Palau for utilization in fuel cells and hydrogen fuel cell vessels. The project has received subsidies from the Ministry of the Environment of Japan (MOEJ) under the “Pilot Project for Comprehensive Support Throughout the Whole Hydrogen Supply Chain Abroad.”

1. Stationary Fuel cells

Transport hydrogen to Palau by Hydrogen Absorbing Alloy (HAA) cassette. In anticipation of a hydrogen-based society after 2030, demonstrations will be conducted with the aim of implementing stationary fuel cells to realize a distributed power supply and backup power sources.

2. Fuel Cell Boat

In anticipation of a hydrogen-based society after 2030, a demonstration will be conducted with the goal of converting marine fuel small boats to hydrogen fuel boats in the future. During the period for this project, demonstrations with hydrogen fuel boats will first be carried out off the coast of Queensland, Australia.



Outline of partner country / region



【Production: QLD, Australia】

The government of Japan and Australia have announced their commitment to the Japan-Australia Partnership on Decarbonization through Technology.

【Utilization: Palau & QLD】

There is currently a high dependence on fossil fuels for energy. As part of its efforts to shift towards decarbonization, Palau has committed to achieving a target of 45% renewable energy generation by 2025.

Prospects at commercialization (around 2030)

Expected GHG reduction: 9,131tCO₂/y


Seek to achieve early commercialization of an economically efficient hydrogen supply chain that will extend to include neighboring Pacific Island countries.

1. Stationary Fuel cells

Palau has a poor power grid system, and there is a demand for the construction of a backup power system. At present, the country's main source of energy is independent power plants that rely on diesel fuel. Try to achieve decarbonization by implementing stationary fuel cells as a distributed power supply and a backup power source.

2. Fuel Cell Boat

Palau is an archipelago comprised of over 200 islands, where more than 1000 marine fuel small boats are in operation as part of island tourism, daily life, and the fishing industry. Try to achieve decarbonization by converting marine fuel small boats to hydrogen fuel boats.



BlueFloat is headquartered in Madrid, Spain, continually expanding their team of clean energy experts to advance the growing portfolio of offshore wind energy projects across the globe.

Energy Estate maintains an office in Sydney on the traditional lands of the Gadigal people of the Eora Nation, and in Adelaide on the lands of the Kaurna people.

We recognize their continuing connection to the land and waters and thank them for protecting this land and its ecosystems since time immemorial. We pay our respects to Elders past, present and emerging.

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