

Date: 07 December 2022

Independent report finds hydrogen storage best solution to support a fully renewable electricity system

An independent study by electricity expert Energy Link has found that large-scale hydrogen storage is a better solution than other options that include pumped hydro storage or over-building renewable capacity to fully decarbonise Aotearoa's electricity system.

Energy Link, a New Zealand-based energy analyst and advisor, was commissioned by Firstgas Group (Firstgas) to conduct an independent study that tested methods to meet supply and demand fluctuations in a completely renewable electricity system. They used three options; a pumped hydro solution like that being investigated for Lake Onslow, overbuilding of renewables¹, and large-scale hydrogen storage.

James Irvine, Firstgas Group Future Fuels GM said "Firstgas wanted to assess if one possible use for hydrogen was to deal with increasing energy storage needs including the 'dry year' problem, when lack of rain reduces hydro-electricity generation. We asked Energy Link to compare hydrogen storage with two main storage options being considered by policymakers.

"Firstgas didn't know what the outcome would be when we commissioned it but thought there was a case for hydrogen. The results were even more positive than we expected," added Irvine.

The model was of a New Zealand electricity system where fossil-fuelled generation was phased out and replaced with large-scale expansion of wind and solar generation (complemented with smart 'demand response' to reduce load in times of high wholesale prices).

The testing concluded that large-scale hydrogen storage would achieve the lowest wholesale electricity prices and least price volatility. It was the only option to recover its costs from the wholesale market, effectively paying for itself. It also offered far greater security of supply with less than half the amount of expected emergency events and outages compared with the alternatives.

All three options performed much the same in terms of minimal carbon emissions.

Greg Sise, Energy Link said, "Hydrogen production and large-scale storage offers a potentially elegant solution as the storage is in the North Island where most demand is located and hydrogen-powered peaking generation can be positioned along the existing gas network to best meet the needs of the electricity network."

Hydrogen storage has other benefits. It can be developed in a phased fashion, enabling delivery of benefits faster. It can also make best use of existing assets and infrastructure and can support decarbonisation far beyond the electricity system, with hydrogen most notably an alternative for gas consumers who cannot electrify such as hard to abate industries.

Irvine, said, "The results make stored hydrogen now the lead contender to provide 'dry year' capacity and provide security and affordability in a totally renewable system. Even considering overall conversion efficiency, it is an

¹ Based on the option considered by the Electricity Authority's Market Development Advisory Group (MDAG) which proposed running existing hydro lakes higher to store more energy, 'demand response' management that switches demand off at times of low supply, and 'green peaker plants' that burn a zero-carbon fuel such as biodiesel, biomethane, or green hydrogen (storage undefined).



attractive option that offers many benefits. The findings have interesting implications for the future use of gas infrastructure, particularly underground gas storage."

Irvine says Energy Link's analysis is likely to inform work on the NZ Battery project, which had shortlisted hydrogen storage as one of three non-hydro options for solving the dry-year problem.

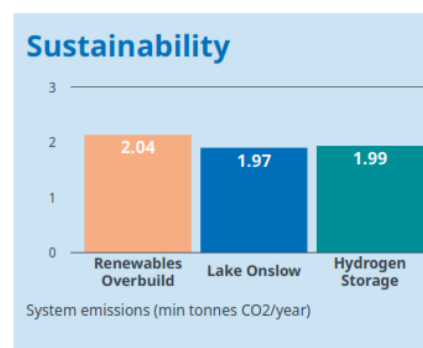
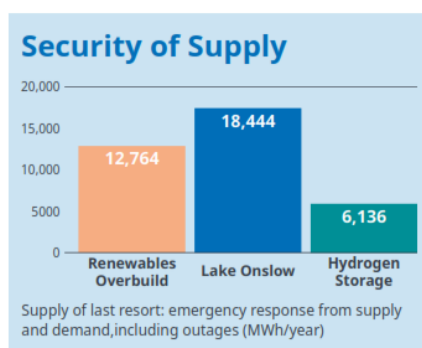
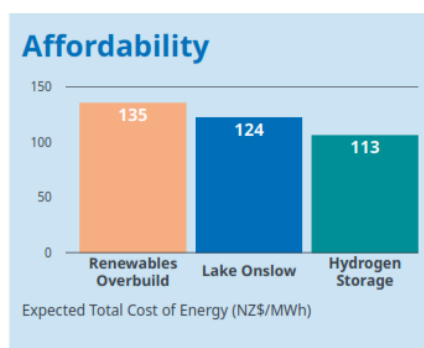
"We urge policymakers to approach renewables with an open mind. The nation cannot afford to be dogmatic about how we reach the 2050 goal."

Firstgas commissioned the independent study as part of what is now a four-year old programme of work preparing the transition to renewable gases. It follows on from the release of the company's Hydrogen Feasibility Study in 2021.

Visit [Clarus.co.nz](https://clarus.co.nz) to view the report.

ENDS

Summary of results from the modelling:



About Clarus:

Energy is what we do, but it's people we do it for – our customers and ourselves, the people who work for Clarus' businesses. Without energy, life as we know it would grind to a halt. We take this responsibility seriously, seeking to ensure that we play our part in safely, reliably, and affordably delivering on the country's energy needs. We're proud of the important role we play in Kiwis' lives.

We're one of New Zealand's largest energy groups, with businesses that touch many parts of the energy supply chain – from energy transmission and distribution to retail supply and even storage.

Our businesses have offices nationwide and we care about and contribute to the communities we're a part of.

Today we're energy experts, using our collective knowledge and experience to advocate for the industry and lead conversations about its future – New Zealand's future. We're leading change beyond the mandatory by actively researching, innovating and investing in future fuels to drive decarbonisation.

For more information contact:

Cressida Gates-Thompson, Firstgas Group External Communications Specialist, Cressida.gates-thompson@clarus.co.nz / 027 703 6177