The New Zealand Energy Strategy

Submission by the Kākāriki JV of Elemental Group and Energy Estate

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1. Introduction

Kākāriki is a joint venture between Energy Estate and Elemental Group set up to deliver energy solutions for decarbonising New Zealand and partner nations' economies.

MBIE has delivered the paper Advancing New Zealand's Energy Transition with five well defined documents for consultation, namely:

- Gas Transition Plan issues paper
- Measures for transition to an expanded and highly renewable electricity system
- Implementing a ban on new fossil-fuel baseload electricity generation
- Interim Hydrogen Roadmap
- Developing a regulatory framework for offshore renewable energy

We consider the Energy Strategy needs to focus on:

1. delivering a response to energy's contribution to the climate challenge by 2050, and
2. delivering the best energy ecosystem in the world off the back of this challenge

2. New Zealand's plentiful renewable energy resources

New Zealand is blessed with one of the highest per capita renewable energy capacities in the world. NZ's renewable energy production is 7,100 kWh per capita whereas the global average is 1 kWh per capita. This renewable energy is founded on our hydro, geothermal, wind, biomass and solar resources and bolstered by further potential from solar, onshore and offshore wind.

The current electricity market in New Zealand is 44 TWh/a, whereas the overall energy use is 157 TWh. To put this in perspective, we need to develop another 257% of our renewable energy by 2050 to just stand still socially, culturally and economically in order to achieve our environmental imperatives with respect to climate change.

As a country with an excess of renewable energy we have an opportunity to share that excess with other countries that are less fortunate than ourselves. This, combined with increased energy efficiency in New Zealand, should enable us to export energy embedded products to other countries which do not have the same renewable resources. A great example of the energy efficiency trend is the energy savings from electric vehicles. These are generally 3 times more efficient than petrol/diesel vehicles. The energy efficiency savings we make can then be used for continued decarbonising of our economy and export of green energy, products and services to other countries.

We believe that NZ should have a goal of reaching 600% renewable energy and not just trying to get to 100% renewable electricity. The problem to be solved in a 600% nation is no longer the dry year risk but the intermittency of renewable technologies. This will require deployment of new storage and generation technologies such as hydrogen and/or green ammonia peakers, flow batteries and other long duration energy storage options, rather than leaving hydro and fossil fuel peakers as the de facto solution of today.

3. Innovation and collaboration becomes key in a just transition

In 1984, New Zealand was going broke as a heavily subsidised economy. Farming subsidies were removed and the agriculture sector had to adapt overnight. The human cost with this approach was huge. However, the industry responded and within a decade New Zealand rebounded to have one of the most cost-effective food production ecosystems in the world.

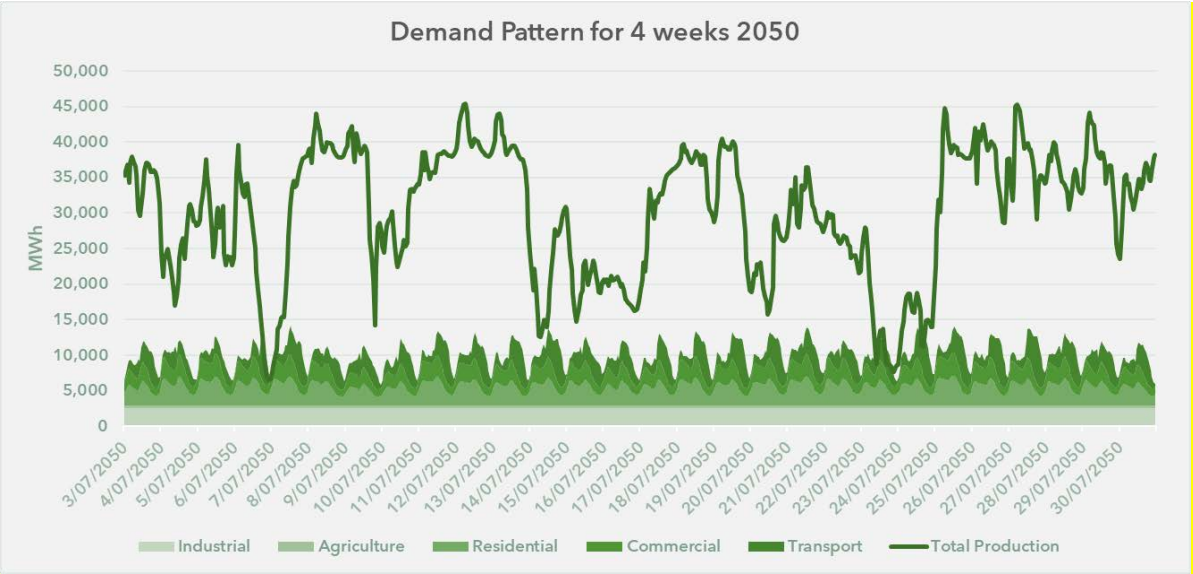
To create a world class renewable energy ecosystem will require innovation and collaboration on a national scale. We need to get our power prices down and we need to get investment into the ecosystem to provide much more competition rather than relying upon the incumbents (event if they may be partially Government-owned). Power prices are a fundamental driver of energy costs in a Net Zero world.

New Zealand already has innovation embedded in the ecosystem. This comes from endeavours such as Rocketlabs, Xero, Team New Zealand, Bspkl, our Crown Research Institutes, Ara Ake and Callaghan Innovation. We strongly believe that energy users, generators, network companies and communities need to be part of the innovation ecosystem. For the ecosystem to innovate, it must be investing in energy projects and it must be trialling new techniques in a collaborative and enabling fashion. This needs to become an ethos of the New Zealand energy ecosystem.

4. Storage becomes part of the replacement of fossil fuels

Our storage and peaking technologies currently come from hydro swing and gas and coal peaker plants. As we lose our use of non-sequestered carbon-based fuels, our storage capacity in our energy system is reduced. This is a critical problem and something that must be solved. We do not believe that relying on fossils fuels stored in other parts of the world and shipped to New Zealand “just in time” will help grow our economy. The problem changes with more renewables as sometimes we will have more energy than we need and other times not enough. In a scenario with 600% renewables and a high contribution from wind and solar, we will need a range of storage technologies to provide the energy security for our domestic energy users and our export customers.

The picture below shows how volatile a simulated 2050 renewable energy production system would look against domestic demand and the upside for embedded energy exports.



The solution must become one of batteries, zero emission (hydrogen/green ammonia) peakers, pumped hydro and thermal storage systems all working to deliver customers energy in the form they require.

5. Driving down the cost of energy in New Zealand

Two concepts are important to drive down costs in New Zealand's energy system, namely innovation and competition.

New Zealand's renewable energy prices are cheap by international standards due in part to the competitive nature of power generation. The whole system is premised on the cheapest sources being deployed every second of the day. Technologies and organisations compete to deliver the demand at all times. This is done through the energy based electricity system.

Some commentators have suggested that storage should be supported through a new capacity or equivalent mechanism (as has happened recently in Australia). We believe that storage developments in New Zealand need to be customer and market driven rather than a fundamental change to market design and implementation. Supplying high value (i.e. high demand, low supply) energy from low cost (i.e. low demand, high supply) energy requires the investment in multiple technologies such as BESS (l-ion, flow batteries), pumped hydro, renewable peakers (hydrogen/green ammonia) and flex generation from geothermal and hydro sources. We believe biomass should be prioritised for higher value uses than combustion such as e-fuels and sustainable building materials so we are not advocating large deployment of biomass-to-power projects in New Zealand.

These storage technologies are currently in markets, namely electricity (NZX spot market) and carbon (the NZ ETS biomass). The future fuel that is missing is hydrogen. The hydrogen market

should be developed to help energy users price their use cases and hedge their opportunities to deliver renewable energy. It then becomes a competitive pressure on the energy ecosystem for delivering lower costs and competing with the electricity market to drive down costs around generation, transmission, storage and distribution.

A critical shortcoming to address is the shortage of capacity in the construction sector – this applies to the number and scale of construction companies and delivery partners with capacity and sufficient balance sheet strength and the skilled and mobile workforce required. The energy ecosystem we need will not be built in Auckland and the need for investment in regional capacity is critical.

6. Funding – the New Zealand interest

If New Zealand is to take up this opportunity, it needs to fund it.

The most important part of this is encouraging organisations both locally and internationally to invest in investment and offtake opportunities here. The hydrogen MOUs with South Korea, Singapore and Japan are a good start but New Zealand needs to be have an "Open for business" sign up. The global players are interested in New Zealand but this is a recent development and the momentum that has been created from announcements such as the BlackRock fund needs to be maintained.

Using the BCG analysis from the Future is Electric, we estimate the cost to develop the platform for 600% renewable energy growth would be at least $490 billion. This includes generation, storage, transmission and distribution upgrades. A similar amount of investment would be required for offtake opportunities by investing in hydrogen, ammonia, e-diesel and sustainable aviation fuels as well as embedded energy wood products, dairy processing, aluminium smelting, green steel and other energy embedded products.

This may sound like a lot when compared to the current NZ gross domestic product of $395 billion. However, this investment is about setting up New Zealand to have an enduring energy ecosystem which drives economic growth into the future. The investments in the energy system can be funded by a combination of debt and equity raised in local and global markets. We believe it is critical to give New Zealanders the opportunity to invest in the energy system – whether through long term green bonds, new listed companies and debt instruments and the existing listed energy companies. There will be a need for international investment, just like we have seen in other key sectors such as oil and gas, telecoms and forestry. We shouldn't assume that we have all of the answers in New Zealand and making our country an attractive destination for capital and talent will be key to a thriving and competitive ecosystem. We are strongly in favour of policies that ensure that New Zealanders keep ownership of a very significant part of the energy ecosystem – and this can be achieved through a combination of Government (direct and indirect through SOEs), Māori and local companies and investors.

The second part of the puzzle is the income generated from any emissions trading scheme. Part of this income could be invested into energy transition bonds which are used to fund the transition to 600%. The 2023 NZU forecast is 36.4 million units with issues dropping to zero by 2050. Assuming a price of $75 per unit would give a declining revenue stream of $2.7 billion per annum.

The scale of the investment required to create a new energy ecosystem means that investment in research to reduce the costs can have a major financial benefit for New Zealanders. We believe a new research fund should be created with funds of at least $1 billion which will support research AND deployment of technology at commercial scale. This is comparable to the dairy fund for reducing farm based greenhouse emissions and a similar commitment should be made for the energy ecosystem.

7. Conclusion

New Zealand must seize the opportunity and harness its abundant renewable resources to create a world class energy ecosystem. The first step is to accelerate development of onshore wind, solar, geothermal and storage assets such as pumped hydro and batteries during the 2020s with the mix changing over time as offshore wind and green hydrogen become increasing competitive and we attract new industries to New Zealand and create new export markets. We believe that the key factors for the creation of this energy ecosystem include:

- Delivering low cost sustainable energy to everyone
- Mitigating the volatility of a renewable energy dependent energy system with the right mix of technologies and energy users
- Substantial financial support for innovation
- Encouraging greater levels of local investment into the energy sector
- Putting New Zealand firmly on the global map for investment and talent attraction