National Energy Research Institute

28 October 2023

Comments from NERI[1] on:

Measures for Transition to a Renewable Electricity System

Introduction

The discussion paper is in five parts: Growing Renewable Generation; Competitive Markets; Networks for The Future; Responsive Demand and Smarter Systems; and Whole-of-System Considerations.

Under those headings it covers an extraordinarily wide range of issues (63 consultation questions) with little sense of materiality or priority. Establishing this should be the first step in any work programme to grow a highly renewable electricity system. Without this, effort will be wasted on matters that are not "mission critical", because they are of minor importance, will be addressed anyway under BAU, are inconsistent with each other, etc.

Part 5 addresses this issue, so rather than comment on the balance of the Paper that will need to be reworked with better consideration of the Whole-of-System issues, we focus in on Q57 – Q63.

We recommend that **the Whole-of-System be addressed to identify priorities and materiality before considering the balance of the issues raised in the paper.**

Whole-of-System issues

Four initial observations:

- The development of the electricity system cannot be assessed without considering the whole energy system, along with the sources of demand. A

[1] The National Energy Research Institute (NERI) is a Charitable Trust incorporated in New Zealand (NZ). Its primary purpose is to enhance NZ's sustainability and to benefit the NZ community by stimulating, promoting, co-ordinating and supporting high-quality energy research and education within NZ. Its research members are GNS Science, Scion, University of Canterbury, University of Otago and the Western Institute of Technology at Taranaki, and its industry association members are the Bioenergy Association of NZ, BusinessNZ Energy Council, the Carbon and Energy Professionals New Zealand, the New Zealand Geothermal Association, the New Zealand Wind Energy Association, Ia Ara Aotearoa Transporting New Zealand, and Tourism Industry Aotearoa.

Box 16 135, Te Horo 5544, New Zealand - Phone +64 4 248 1753 - www.neri.org.nz

variety of publications have addressed this in the New Zealand context, and these give a sense of where the priorities lie for the electricity system[2].

- There are areas where we are fairly certain what will occur and can tell the type of response required, and others that are uncertain. The former calls for a system that can efficiently achieve the relevant goals, the latter calls for a system that is adaptive i.e., where the uncertainties are identified and researched, options are developed, and low-cost experimentation enabled. Decentralised decision making within a broadly understood framework is often a feature of an adaptive system.
- As the discussion document notes, the energy system in general and the electricity system in particular, consist of a mix of different participants of differing sizes, roles, influence, and capabilities. The Government has unique powers to regulate the system, including the access to and the availability of energy resources. It also has a significant role to play in the provision of generation and transmission services. It is desirable to separate these two roles when considering priorities for the Government.
- The primary purpose of the electricity/energy system is to deliver energy to meet users' needs. This imperative should not be lost when thinking about how to manage undesirable features like GHG emissions from fossil fuels and household energy poverty.

In terms of the major changes in the electricity system over the next 15-20 years we can expect:

1. Ongoing growth in demand for renewable electricity from BAU growth in the population and the economy, along with the replacement of existing fossil fuelled generation with renewables. Meeting this is reasonably well understood although ensuring stability and reliability of supply is still unclear (see 5. below).
2. New demand coming from areas where renewable electricity is reasonably clearly indicated as the least cost option. Shorter haul BEVs fit into this category. The speed of growth of this load is not totally predictable but it is incremental and has reasonable lead times.
3. Potential new loads where there is significant uncertainty as to their size and timing of coming onstream:
    a. Long-haul transport (BEVs vs electrolytic hydrogen for FCEVs and possibly biofuels). Given the different conversion losses there are significant differences in renewable electricity requirements between BEVs and FCEVs. The general evidence is that in the NZ context BEVs will dominate here, but this needs to be confirmed. Charging infrastructure will need to be rolled out and fleets replaced, and if necessary, these will be delayed if renewable electricity supply is an issue.
    b. Long-haul aviation fuels will initially start with bio-SAF blends, but syn-SAF may be required and may require considerable electrolytic hydrogen. This is uncertain but relatively long-term (mid-2030s at the earliest by most accounts). The immediate priority is to understand if and how these loads might develop.

[2] See e.g., NERI (2023) "*From Fossil Fuels to Local Renewables*"

4. Developments required to manage the interface between the grid and both increasing distributed generation and intelligent loads. This is an area that is actively being researched in NZ, but not systematically from a policy perspective.
5. Developments required to manage the stability and reliability of supply from the grid. Primarily this arises as an issue because the kinds of generation currently used to manage this are large scale fossil fuelled. The risks are exacerbated here by the risk of assets being decommissioned without time to adjust. Again, it is an area that has had considerable attention recently (Onslow).

1. & **2.** above require predictable supply to meet the loads coming onstream with some level of notice and certainty. Anything that simplifies delivering this and lowers its cost will be advantageous e.g., simplified consenting and access to resources. However unexpected systemic failure to meet the emerging demand would seem unlikely, particularly with customers incentivised to avoid this. Some improvements in the regulatory framework around this may assist but this doesn't appear to be a major area of risk going forward.

3. raises the key issue of what should be being done today while the uncertainty gets resolved[3]. In the first instance there needs to be investment into better understanding these issues in the NZ context – the main options and what drives them relative to the others, what can be done to develop them, and the low-cost investments that can be made to start de-risking each of them[4]. Key information required would be the prospective supply chain for each option (including the energy and energy resources required), critical paths and timing, and where and when investment in those should be occurring.

While **4.** is being investigated it is still expected that grid connected generation will dominate the supply for the next decade at least. Where significant changes may occur is on the demand side and its potential role in providing electricity services. This implies aggregating decentralised capabilities to allow a coordinated response at the grid scale.

As an example, there is the potential a significant EV fleet could offer to assist in both demand management and in storage. This is not well researched in the NZ context. EECA projects, perhaps ambitiously, 1.3m EVs by 2035. Each might potentially have an 80kWh battery. This amounts to over 100 GWhs of storage that at any time might be <50% used.

With **5.** it is a mistake to see this as an electricity system problem alone, it is both a fuel/energy resource problem and any solutions again need to consider both supply and demand.

[3] Mixed solutions are quite possible.
[4] Research being an obvious example.

Based on these comments we would respond to the questions in this section as follows but would emphasise the points made above need to be addressed first.

Q57: What measures do you consider the government should prioritise to support the transition?

The priorities should be:

- With industry participants, analyse the supply chains for potential new renewable generation, identify critical paths and bottlenecks and take steps to reduce these where the government has a role as either regulator or part owner. This should particularly consider low-cost steps that would allow flexible responses to foreseeable variability in demand. This analysis needs to consider all constraints in the supply chain e.g., skills, capital, social, environmental etc.
- Ensure the sources of significant demand are incentivised to take responsibility for this, i.e., to ensure the supply of reliable energy is not just seen as being something for an amorphous energy system.
- Invest in applied research to improve the information publicly available about emerging demand and sources of supply, the options including alternatives to electricity, and comparisons between them. A more systematic approach to developing and funding of such a research programme is needed, and it needs to include options that help manage risks and the opportunities that arise from **4.** & **5.** above.

In general, the public interest lies less in predicting the future and addressing that, and more in preparing for the range of likely futures and de-risk those.

Q58: Are there gaps in terms of information co-ordination or direction for decision-making as we transition towards an expanded and more highly renewable electricity system and meeting our emissions goals? Please provide examples of what you'd like to see in this area.

The lack of structure to the discussion paper points to the fundamental information gap.

The first step required is <u>not</u> to develop priorities for addressing the public interests in the electricity system that is fixed in time, but rather <u>to establish a process</u> <u>involving participants</u> whereby these can be identified and modified over time. The place of electricity in the wider energy system needs to be in scope in any such process.

Because we are dealing with an uncertain future there is "no clear mechanism ensuring an optimal pathway …." (p. 111) even with centralised control. Some over investment in redundancy is likely to be a good thing to improve dynamic efficiency.

Having a centralised system operator working to some kind of whole-of-electricity-system plan could <u>possibly</u> be the best solution, but they will <u>inevitably get it wrong</u>, and in the end, it is the potential user or taxpayers that bears the consequences. An objective therefore is to have redundancy to help minimise the cost of significant mistakes.

Q59: Are there significant advantages in adopting a REZ model, or a central planning model (like the NSW EnergyCo), to coordinate electricity transmission investment in New Zealand?

Would a REZ model for local electricity distribution be an effective means of addressing first mover disadvantage with connecting to electricity distribution networks?

Getting electricity from new generation to the corresponding loads is a cost of that generation, so it is not clear why this requires special attention over and above BAU. If a systematic analysis of the supply chains were undertaken and investment in distribution appeared to be a constraint this could be addressed, but REZ are just one of a number of possible solutions, as the discussion document notes.

The big risk of these zones with centralised control is as outlined in Q58.

Q60: Should MBIE regularly publish opportunities for generation investment to enable informed market decision-making?

Any improvement in the information available to participants will be valuable, although it is not clear that MBIE would be the best organisation to do this since it potentially introduces the notion of a government endorsement.

Q61: How should the government balance the aims of sustainability, reliability and affordability as we transition to a renewable electricity system?

These attributes need slightly different consideration, and the discussion document also uses a range of other terms. Working with those in the Question:

- The sustainability of the electricity system is generally understood to mean that the generation is renewable or has low GHG emissions and that the system is providing for its renewal. The cost of the latter needs to be reflected in electricity pricing. Beyond this, since electricity is interchangeable with other forms of energy and there is competition for energy resources, the environmental costs are better established and applied outside the electricity system. This is what our environmental legislation including the ETS is designed to do. Requiring compliance with this and the consequent costs reflected in the electricity price has the advantage of not distorting energy markets.
- The reliability of the electricity system, and the electricity delivered is an attribute of the system, and different consumers will have different needs for this. It is therefore something that consumers should see the cost of and be involved in establishing.
- Affordability could be interpreted as the ability to provide energy/electricity at a manageable cost, and it is assumed that New Zealand will continue to aim to do this but accepting that this will be reflective of choices made about where the load is etc. Equity dictates that people in similar circumstances have similar access, and that the costs are fairly apportioned. However, this begs the question of whether people are able to afford the energy they need in amongst their other costs. This is best achieved through wider welfare policy, with the electricity system focusing on efficiency and offering low-cost options.

As noted in the opening remarks, in a period of change there is considerable advantage in a more adaptive system. Market-based pricing systems are efficient ways to convey changing costs to participants and to encourage behaviour change.

At the same time there are the known problems with this particularly where the markets are not themselves efficient (market power) and/or there are externalities (GHGs) and/or welfare (affordability) considerations.

Overall, this argues for explicit attention being paid to policies to address these various attributes of electricity supply, and political choices need to be made between the relative weight placed on each, but there are disadvantages in muddling the policies that seek to achieve these goals, and at times of change policies that are inflexible in the face of it.

Q62: To what extent should wholesale, transmission, distribution or retail electricity pricing be influenced by objectives beyond the (affordability-related) efficiencies achieved by cost reflective pricing, such as sustainability, or equity?

See Q61.

Q63: Are the current objectives for the system's regulators set in law (generally focusing on economic efficiency) appropriate, or should these also include more focussed objectives of equity and/or affordability?

It is wrong to suggest that the system is only subject to regulation "generally focussing on economic efficiency", compliance with a large number of other regimes is required.

The system's regulator is focused on its performance to ensure it is fairly pricing to grow and renew itself, investing and operating in a way that gives least cost electricity, and the system is offering a reasonable range of options to meet consumer needs.

As suggested above, moving from this to include other considerations will have costs, and a strong case would be needed that desired social and environmental outcomes can best be met in this way. This is not presented in the discussion document.