National Energy Research Institute

10 December 2020

Minister of Energy and Resources and Research, Science and Innovation
Minister of Education
Minister of Climate Change

cc Minister for the Environment
Minister of Forestry
Minister of Transport
Associate Minister for Research, Science and Innovation

Briefing:

Priority issues for medium-term energy research and education

Summary of recommendations

In the face of the major impending changes in the energy sector, and the role science and education can play in supporting Just Transitions, we recommend the Government:

1. **Make a significant appropriation to Vote: Energy and Resources to help address the gap in medium-term applied directed New Zealand-centric energy research**

2. **Establish a pan-departmental Chief Science Advisor for Energy**

3. **Establish an Energy Sector Skills Action Plan**

Introduction

This note summaries the key issues that NERI[1] considers will arise from changes impacting on the energy sector over the next 20 years, and the implications for New Zealand's investment in energy-related medium-term applied research and skills development.

We make three specific recommendations.

The note is directly relevant to energy, research science and innovation, education, and climate change. It also raises matters relevant to the environment, transport sector (50% of fossil fuel use); the emerging role of forestry as a source of alternative fuels (the Wood Fibres Futures workstream); and science sector/tertiary education relationships and the research workforce. Accordingly, we have also copied in the relevant ministers.

Of necessity the issues are only addressed at a high level, and we would welcome the opportunity to discuss any aspects further.

1. Our energy sector faces major changes over the next 20 years

- The shift away from fossil fuels to low emissions alternatives. The latter tend to be much more dispersed, less energy dense and, currently, higher cost. This will mean major shifts in how New Zealand will source, store, transport, and consume energy.
- Consumer preferences are also shifting toward clean energy and sustainable products. When they reach a tipping point these changes can be rapid, significant, and felt throughout the complete energy supply chain.
- Development of new Energy Technologies continues to accelerate. New energy technologies are reducing costs, increasing efficiency, and increasing our options to manage impacts, including demand reductions. They often enable decentralised, flexible, and more consumer-centric solutions, and with that can drive significant changes in the sector.
- COVID has had some dramatic immediate impacts on the sector, some positive and others negative. These are influencing our ability to achieve an equitable transition to a sustainable, low emissions society. For example, the uptake of remote working and greater support for local produce are likely to be positive, but reductions in international research collaborations and education will reduce our capacity to adapt to changes.
- The changes are global with local impact. New Zealand depends upon the global energy sector. The only energy we trade in is fossil fuels, with imports supplying more than half the energy New Zealand uses; innovation typically comes from abroad notwithstanding us having our share of cutting-edge energy innovations; and we compete for skills internationally.

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

2. New Zealand faces significant and difficult issues, many of which are unique.

- New Zealand's isolated geography, current and potential energy supply and demand, and sector and social and environmental "pinch-points" are relatively unique. Uncritically following international responses will be a mistake.

Some examples of the issues for New Zealand are:

- How best to protect those that are most vulnerable and exposed to the changes? Improving access to energy, reducing energy poverty, achieving warm dry homes, ensuring the availability of mobility, all at a time of change.
- Managing dislocation in employment. Assisting communities through the changes.
- Managing major growth in a relatively unique renewable electricity system while responding to new disruptive technologies (e.g. dry year cover, increased distributed generation).
- Uncertainty in the supply and demand for EVs; fuel supplies for our strategic long-haul air and marine transport; the best fuels for higher duty cycle land transport: better batteries and charging, other electricity carriers (e.g. electrolytic hydrogen); or biofuels.
- The future use of energy in our energy-intensive industries, including the best uses of what will become internationally scarce clean energy.

Successfully addressing these issues ahead of the rest of the world could provide the basis for export opportunities in energy technologies and services.

3. The gap in our current response is in considering the medium-term

- Shorter-term policy issues that touch on the above issues are being addressed. But more difficult energy-related issues lie in the 2030s+.
- When it comes to climate change impacts the Productivity Commission and the Interim Climate Change Commission have both provided some context, and the Climate Change Commission will no doubt provide an overarching assessment and on longer-time scales. However, detailed consideration of specific opportunities and risks in the medium-term and the impacts of technologies is still lacking.
- It is here where the energy research and education community can contribute.
    - Well directed medium-term applied research will reduce the uncertainty and risks in our energy plans, and develop options, opening opportunities, where uncertainty remains.
    - Having skilled people available to address the issues that arise and provide the skills needed in the new environment will smooth the changes.
- Both require informed investment with a view to medium-term outcomes.
- Together they are essential components of a more resilient New Zealand, better able to manage significant change and achieve Just Transitions.

Recommendation 1:

Make a significant appropriation to Vote: Energy and Resources to help address the gap in medium-term applied directed New Zealand-centric energy research

- Internationally, future energy technologies are regularly scoped, road-mapped in a national context, and then funded[2]. Unfortunately, as noted above, the assessments and roadmaps often do not transfer to the New Zealand context or reflect our priorities.
- NERI has provided a high-level context in its *Energy Research Strategy for New Zealand: The Key Issues*[3]. The RS&I sector has recently invested in an Advanced Energy Technology Platform, this was focused on internationally competitive technologies on an investigator-led basis, and only generally on New Zealand's specific needs.
- The energy issues we now face are very much New Zealand-centric and the demand side and social impacts are both central. They will not be solved by a single technology or policy response. They are complex, will take time and will require a multidisciplinary approach. Addressing them systematically will be a central to the Just Transitions work programme.
- New Zealand currently lacks dedicated and coordinated funding to address this need[4], or an overarching research roadmap(s) to inform these kinds of research investments.
- This is a significant weakness in our efforts to manage these changes. The Parliamentary Commissioner for the Environment has just proposed a similar approach in Vote: Environment to address an analogous problem in the environmental sector[5].
- This type of funding already exists in the other major sector contributing to greenhouse gases, *Vote: Primary Industries and Food Safety* where it has been used, for example, to address methane emissions from ruminants.
- A similar appropriation is recommended for *Vote: Energy and Resources* along with a process to roadmap New Zealand's requirements to inform its investments.

Recommendation 2:

Establish a pan-departmental Chief Science Advisor for Energy.

- We have noted that the impacts from changes in the energy sector will be widespread, particularly when working on longer-term issues and user impacts. The issues that face the sector cut across multiple departmental remits. Each has their own science advisors, but none is a specialist in energy, despite the importance of co-ordinated input from the science sector.

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[2] Notably the US Department of Energy.

[3] www.neri.org.nz/strategy

[4] The *Draft Research, Science and Innovation Strategy* https://www.mbie.govt.nz/have-your-say/draft-research-science-and-innovation-strategy/ identified this lack as a general issue in the Government's RS&I investments.

[5] *A review of the funding and prioritisation of environmental research in New Zealand* https://www.pce.parliament.nz/publications/environmental-research-funding-review. While addressing a different sector the report gives more background to the general problem and explores options for implementation.

- We recommend the establishment of such a position.

Recommendation 3:

Establish an Energy Sector Skills Action Plan

- In other sectors where there have been significant skills issues[6] the Government has established programmes/action plans to strengthen connections between the education sector and the sector in question to meet unmet needs.
- While the needs of the Energy Sector are less immediate, they are emerging and will become increasingly acute, well within the timeframes of investment decisions in education. The Sector's requirements will cover basic skills and retraining through to research degrees.
- An Action Plan will bring this together across industry and education, minimise risk of disruption to the skills pipeline of the Reform of Vocational Education, feed into the Workforce Development Councils and establish the education and industry ecosystem needed to ensure NZ has the skills necessary to achieve the sustainable energy objectives, and achieve a just transition.
- We therefore recommend the establishment of an Energy Sector Skills Action Plan.
- COVID is significantly impacting the capability of the sector to undertake both skills development and research and is reducing the capacity to meet future demands.
- Mitigating these impacts should be an early consideration in addressing energy sector skill needs.

Professor Ian Wright
Chair

[6] Food and Fibre, Construction.