



Services for our Sustainable Future

SRD Consulting
12 Upland Road
Kelburn
Wellington 6012
New Zealand
+64 21 634 880
stephendrew643@outlook.com

2nd June 2018

Low-emissions economy
New Zealand Productivity Commission
PO Box 8036
The Terrace
Wellington 6143

A submission to the Low-emissions economy draft report

Thank you for this opportunity to make a submission to the Productivity Commission about the Low-emissions economy draft report. Your draft report is very encouraging and is heading in the right direction for New Zealand.

As background, I have 40 years of practical chemical engineering experience in reducing carbon emissions through my international work in process integration, demand response and more recently in smart grids. I have worked for business and government. I have been on working groups for the Electricity Authority and the New Zealand Smart Grid Forum. I am now on the ARENA (Australian Renewable Energy Agency) expert advisory panel.

I have selected the most relevant chapters from my own personal experience to provide further supporting evidence to some highlighted text from these chapters:

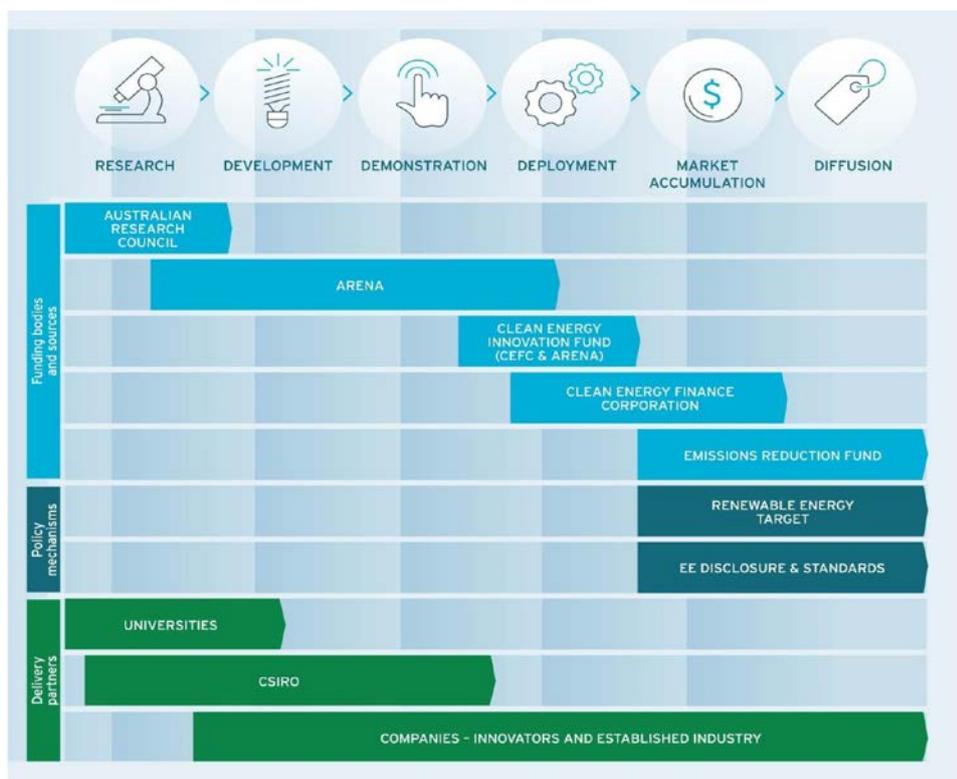
Chapter 5 – innovation

“The current government investment in science and innovation to support a transition to a low-emissions economy lacks a clear strategic focus and priority commensurate with the imperative to be successful in achieving the objective and to taking bold action. Current investments are also inadequate in size and scope.”

This statement stands out as one of our missing pieces of climate change policy. How do we urgently improve our capability for energy businesses and energy consumers to innovate?

Our capability to innovate and more importantly learn is essential if we are going to start our transition to a low-emissions economy. Innovation is accepted as an essential part of this transition. I will introduce two examples from Australia with ARENA and in the UK from Ofgem’s Low Carbon Network Fund.

ARENA was established in 2012 to make renewable energy solutions more affordable and increase the supply of renewable energy especially electricity. In their first 5 years, ARENA has increased the momentum towards renewables in the electricity market. They are now focused on doing the same in DER (Distributed Energy Resources) on networks, energy productivity in industry and in transport.



Location of Australian Government agencies and programs on the energy innovation chain. Source: ARENA general funding strategy 2017-2018

The role that ARENA plays in the energy innovation chain is illustrated in the above figure. ARENA is the agency that facilitates and funds the route from Development to Demonstration and to Deployment for projects before the innovation fund with the Clean Energy Finance Corporation (our equivalent will be the new Green Investment Fund) takes over¹.

Ofgem in the UK introduced regulatory incentives a lot earlier in 2004 for network innovation. This has had a significant effect in releasing unexplored opportunities. Ofgem has since strengthened in materiality and process this Low Carbon Network Fund (now called NIC) which is core to its regulatory model².

In New Zealand, we do not have an ARENA equivalent (Callaghan has not stepped into this role) or a regulator with an obligation to fund innovation. **Your final report should recommend a new approach to build innovation in our transition.**

Chapter 6 – investment

“Yet barriers to low-emissions investments do exist and require attention...In addition, the role of government in providing direct financial support for low-emissions investment is likely to be higher at the beginning of the transition while other policies (such as emissions pricing) take effect.”

Public investment into innovation will be critical in the next 5 years to build a pipeline of projects for our modest Green Investment Fund being set up with a budget of \$100m. This pipeline will become the deal desk to make the fund work. The growth in renewable and clean energy projects by

¹ ARENA submission to the CEFC (Clean Energy Finance Corporation) Statutory Review, 2017

² The presentation titled “Innovation in Power Systems” by John Scott from Chiltern Power was presented to the Productivity Commission in March 2018.

the private sector in both Australia and the UK over the last 5 and 10 years respectively has been due to their publicly funded innovation.

ARENA has given support to a total of 320 projects with over a \$A1 billion in grant funding, unlocking \$A2.5 billion in additional funds to secure a total \$A3.5 billion investment in the Australian renewable sector. Several firsts in innovation have been achieved along the way³.

Ofgem's reports have confirmed the innovation returns. £300m has been invested in 23 flagship and 40 smaller projects. The discounted net benefit to consumers is between £800m and £1.2 billion if the projects are only rolled out to the host distribution business. If the projects are rolled out wider to all distribution companies, the discounted net benefits rise to £4.8 billion to £8.1 billion. However, there are big steps from a successful demonstration to new Business-as-Usual practices.

Chapter 12 - electricity

“Integration of flexible demand response and distributed energy resources into a future electricity system will require the ongoing adjustment of the regulation of electricity distribution....The EA should review the capabilities of the electricity distribution businesses to ensure that they can fully support innovation that will benefit consumers and help reduce emissions.”

Sadly, a review by the EA about the innovation capabilities of distribution businesses to ensure that they can support their consumers will not take us very far forward. Recent evidence is that the EA wants to keep the status quo and slow down innovation⁴.

The distribution industry needs to take a lead and the larger ones have already started. Innovation will be needed in the Low Voltage networks with increasing DER penetration (look at what is happening in Australia with rooftop solar especially in Queensland and South Australia). More collaboration between the distribution companies and with retailers is going to be essential if consumers are going to benefit.

Collaboration, demonstration at scale and good knowledge sharing with customers is starting to appear but it is not part yet of the present competitive market culture in our renewable electricity sector. This can change if there is strong leadership and our ability to knowledge share to consumers is taken more seriously by our regulators and government agencies.

The draft report fails to introduce the concept of smart grid and the need for more total systems engineering architecture thinking⁵. The work of the New Zealand Smart Grid Forum should be acknowledged along with a recommendation to re-introduce it with appropriate funding to enable it to become sustainable and provide consumers with the information they need to get more value from their solar, their hot water cylinders and charging of their Electric Vehicles. We are leading in our design of solar diverters⁶.

³ ARENA year 2016/17 annual report “We’re innovating energy”

⁴ The EA’s recent decision in March 2018 to stop work on new Instantaneous Reserves products is a case in point. How are consumers meant to help the grid maintain its stability and security with their batteries if we are not going to pay a fair market price for their fast response reserves. In the short term, this stops innovation with consumers so the only solution will be to build more supply-side assets which consumers will pay for (the present Transpower model).

⁵ The draft report only mentioned smart grid once and then it was in passing.

⁶ Paladin, the solar diverter developed in New Zealand, is becoming one of the leading controllers in Australia - <http://www.paladinsolarcontroller.com.au/>

The key to success will be a portfolio of demonstration projects on networks with a strong focus on customer knowledge sharing. The demonstration work in Australia and the UK has shown the need to bring energy consumers along the journey too.

In Australia, ARENA has introduced an A-lab for energy system innovation. This is a grid innovation hub and draws on a network of people with a wide range of expertise and passion to drive the systemic change for the electricity sector⁷. In the UK, ongoing work has adopted the SGAM (Smart Grid Architecture Model) developed by European standards as a framework to understand Smart Grid Architecture and the gaps that have to be closed.

Your final report should ask **“Who is responsible in New Zealand so that we are ready for our smart grid world?”**. This is another missing piece in future policy

Chapter 13 – heat and industrial processes

Most opportunities to reduce emissions from heat processes are for medium and lower temperature heat needs (eg drying milk powder, heating glass houses etc) and lie in process efficiencies and conversions to lower-emissions fuel sources. ...decarbonisation of industrial processes is likely to occur gradually as the capital assets (namely boilers) reach the end of their useful lives. Carbon Capture and Storage (CCS) is rapidly-evolving and potentially significant mitigation technology...

This chapter is the domain of chemical engineering and the final version should be peer reviewed by someone from the profession to improve the technical content.

There are huge opportunities to take advantage of solar thermal and storage technologies which will displace the use of fossil fuels in boilers for our process heating needs below 250°C. Our process engineering challenge is to integrate these solar technologies onto sites but also the energy storage onto our smart grid of the future. New Zealand could take a lead with the right leadership.

The costs for solar and storage are dropping very fast and this low emissions technology will be demanded by markets as we invest to reduce carbon footprints. The economics of renewables like solar will displace fossil fuelled boilers well before they reach the end of their useful life. There will be stranded assets if new large boilers are installed.

Before we can look at the best integration of renewable process heat, we should understand and integrate the emerging electro-technologies to improve the energy productivity of our processes⁸. We have taken a lead in evaporation by introducing electric MVR (Mechanical Vapour Recompression) evaporators for our milk and whey plants over the last 20 years. Modern MVR fans give us an extremely efficient electric heat pump. This disruption from the old fossil and steam driven evaporators has come about from the processing advantages of MVR rather than their energy efficiency benefits. None the less, the installation of greenfield MVR evaporators has eliminated the need for more boilers from being installed and saved carbon emissions. We have already gone part-electric and we need to accelerate to the next stages of this transition.

⁷ ARENA submission, independent review into the future security of the NEM, 3 March 2017

⁸ The industrial programme at ECNZ focused on this work between 1992 to 1996. Once the competitive market was introduced this group was abandoned and the benefits of electro-technologies have not been marketed professionally by the electricity industry to our process industries for the last 20 years.

This next stage and our country's biggest chemical engineering challenge is to electrify the drying of our food products. This is the most important energy intensive operation which requires extensive RDD&D at scale over the next 5 to 10 years. The Endeavour fund has failed to see the science and strategy behind this research so as a country we have failed again to support pioneering research work over the next 5 to 10 years. Again, this shows clearly the lack of government strategic focus on reducing emissions and goes back to the Productivity Commission's point about encouraging innovation in chapter 5 and introducing better coordination of priorities.

CCS has been given too much attention in the report by the Productivity Commission as an emerging technology. There are still major challenges before this technology can be commercialised and this is well outside New Zealand's influence. A report about the recent chemical engineering perspectives has just been released by IChemE⁹.

If the Productivity Commission wants to highlight an emerging technology, then **solar and storage and smart grid** which all together are more relevant to New Zealand's renewable energy future for our growing food sector than CCS. This emerging technology should clearly stand out in the final report not CCS. Or a better balance should be found.

In summary

Even though a low emissions economy is a 30 year transformation, the next 5 years are critical in building our system engineering skills for the future. A new government policy initiative in **innovation and investment** with a better focus and **a strategic action plan** is urgently needed to accelerate the transition to start reducing emissions in a sustainable way. This is a requirement to underpin short term targets even to 2030 and to stand up as a country to take responsibility for our emissions.

Thank you for reading my submission. Please do not hesitate to come back to me if you would like further supporting evidence about any of these chapters.

A handwritten signature in blue ink, appearing to read 'Stephen Drew', with a stylized flourish at the end.

Stephen Drew, FIChemE

⁹ See full CCS report - <http://www.icheme.org/~media/Documents/icheme/Media%20centre/Energy-centre/2018%20CCS%20Report%20FINAL.pdf>