Services for our
Sustainable Future

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Energy Markets Policy
Ministry of Business, Innovation and Employment
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A submission to the Accelerating Renewable Energy and Energy Efficiency discussion document

Thank you for this opportunity to make a submission to the *Accelerating renewable energy and energy efficiency* discussion document.

This is a critical area for discussion if New Zealand is going to deliver on our carbon reduction targets. It was therefore disappointing to see it released on the last working day before the Christmas break along with very little time to respond for people early in 2020. This is especially the case as bushfires raged in Australia and the few chemical engineers in New Zealand who know what they are doing were called into action across the Tasman. And, at the same time our electricity market was burning more coal than ever when we were constrained on the HVDC and were spilling our South Island hydro lakes.

Wake up New Zealand Government, this challenge requires engineering solutions and as such this discussion document needs to be put together by experienced engineers who understand the whole energy system and how to deliver carbon reduction through commercial projects. Future policy as important as this should not be based on pro bono submissions.

My background

I have 40 years of practical chemical engineering experience in Process Heat area and I have a proven track record in reducing carbon emissions through my New Zealand and my international work in process integration, process electro-technologies, demand response and more recently in smart grids looking at how to integrate Renewable Energy.

As part of my career, I have managed many project teams like the Fonterra energy team between 2001 and 2006 which achieved a step-changed reduction in carbon emissions (reaching 10% which was their first corporate target) using predominantly improvements in Process Heat. Our project at Whareroa received an innovation award for the use of a stratified hot water energy storage to make real steam and gas savings possible.

I have made many submissions to Government about the lack of depth of basic engineering skills in our process engineering market. My latest submission to the Interim Climate Change Commission as a call of evidence provides further details about the urgency to address this situation.[1]

In the last 8 months, I have teamed up with the University of Waikato and we have run 3 training workshops in New Zealand and Australia predominantly for engineers, both young and old, in

[1] Interim Climate Change Authority, call for evidence from Stephen Drew, SRD Consulting, 14 November 2019

targeting carbon emission reduction using process integration[2]. We have helped 60 engineers with new thinking about techniques developed 30 years ago. Sadly, this basic understanding to underpin sensible policy in process heating for our different industrial sectors is completely lacking in this discussion paper. This doesn't make sense when there is capability in New Zealand. This total lack of understanding is not compassionate with the international competitiveness of our export food process industries.

Systems thinking

New Zealand has to show courage and take a new approach to accelerate renewable energy and energy efficiency. Our present way does not work because there isn't anyone responsible for the actual delivery of decarbonisation at a national level. We have to break the status quo and as such your document does not offer us any confidence or a solution that will lead us in the right direction in our energy transition.

The UK under their Climate Change strategy have eventually realised this and started in 2018 some work on systems thinking in the energy system[3]. Your document starts by talking about the energy system on page 8 then it stops. Why? Decarbonisation is a systems engineering challenge.

We need discussion about system thinking and how we get there in a carefully put together plan. We might then have some chance of a successful transition to a zero emission economy. We will need a new Energy System Operator responsible for the electricity, gas and transport markets to get us there. These 3 energy vectors are all inter-connected and will depend on each other for decarbonisation, affordability and security and reliability.

This is a brave new direction but one that is needed if New Zealand is going to step up and show leadership in heading towards a zero emissions economy. We should take our systems thinking direction to COP26 in Glasgow, learn and catch up quickly.

The five key sections in the paper

There are six sections in your discussion paper which I will use to demonstrate where new thinking and considerable more discussion is needed outside the formal submission process:

Option 1.2 – Electrification information package and feasibility studies – We did this 25 years ago at ECNZ. Our industrial programmes were successful because we had a team of engineers creating projects with dairy, meat, pulp&paper and wood processing. We paved the way for the electro-technologies that have made our process industries competitive. We need to rebuild a similar technical support team as a partnership between the process industries and the electricity sector, especially the distribution companies. Providing an information package from Government departments will not work and will not create the technology and knowledge transfer that we will need. Neither can it be done in isolation from a new Energy System Operator.

Options 3.1 and 3.2 – Technology diffusion and capability building – The funding of technology diffusion and de-risking through demonstration before financial markets can fund the scale-up is critical. Both these sections have been very poorly put together based on the importance of this area to innovation. It should be based on the experiences of ARENA (Australian Renewable Energy Agency) and take their lessons to set up an equivalent funding package here to accelerate the up-

[2] Step by Step, the chemical engineer, November 2019, issue 941

[3] Systems thinking in the energy system, a primer to a complex world, UK Research and Innovation, delivered by Catapult Energy Systems

take of new technology. We can do it better and learn after all they have spent over $2billion and now lead the world in solving many of the issues from rooftop solar and use of DER (Distribution Energy Resources) on networks. We need to learn from our colleagues in Australia.

Option 4.1 Introduce a ban on new coal-fired boilers for low and medium temperature requirements – This section is naive and will not lead to carbon savings or an acceleration in carbon reduction. We must use the principles of sound emissions targeting using process integration techniques and our knowledge of how we are going to integrate low-emissions solutions using a staged-wise approach. Just picking target temperatures like 100°C and 300°C is meaningless and will lead to unintended consequences. We should be using Grand Composite Curves for our standard processes and showing how lower emissions can be met by heat recovery, heat pumping and storage. We then have to prove how new Thermal Energy Storage systems are going to displace boiler capacity. Fossil boilers will have a role in starting up sites and providing cover for cloudy days. Introducing a ban doesn't make sense from a competitive perspective.

Option 5 Boosting investment in energy efficiency and renewable energy technologies - We have seen a lack of investment in this area in the process industries because the commercial drivers of a weak carbon price through the ETS and low fossil fuel prices have maintained the status quo. A consequence is that good competent engineers have lost jobs just when we need their years of experience. Investment needs a boost but in a creative way to raise capabilities once again.

Options 8.2 Encourage greater demand-side participation and develop the demand response market – Our renewable future grid and networks will require industry, communities and homes to participate and be rewarded more fully with their energy storage loads**.** We maintain our level of reserves on the grid now by aggregating the inertia from electric process heating and cooling loads like our iron melters and cold stores**.** Our zero carbon future has to build new electrical loads that can expand these ancillary services. The market has failed in this area in keeping the status quo and there is no plan or vision on building new reserves for the future. If we had built more reserves in the North Island (as a contingency) we would have been able to run each HVDC pole at full capacity in January to minimise burning coal by using more water that was spilling in the South Island. Policy development is lagging well behind the acceleration of technology as this chapter sadly shows.

Options 11 Local network connections and trading arrangements – We are already seeing network capacity constraining industrial growth in electrification. New electric loads from decarbonisation will be step change and in MWs – this is and will overload more circuits and substations leading to more 220kV GXP infrastructure. Integrated planning with engineers working between the distribution industry and their industrial customers, both existing and new entrants, is critical. Industrial sites can build new plant in 1 to 2 years. Building a new GXP take 5 to 8 years. We will and are constrained by our lack of investment for provincial growth.

Putting together a plan to accelerate decarbonisation is complex. New system thinking is essential and the sooner that this is recognised the better so we don't waste the next decade with more submissions that lead nowhere.

Stephen Drew, FIChemE