



# Call for evidence

## Contact details

<b>Name and/or organisation</b>	Stephen Drew SRD Consulting
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<b>Email address</b>	

## Submissions on similar topics

<b><i>Please indicate any other submissions you have made on relevant topics, noting the particular material or information you think we should be aware of.</i></b>
<b>Answer:</b>  <i>Submissions from SRD Consulting to the Low-emissions economy inquiry, Productivity Commission, 2 October 2017 and 2 June 2018</i>  <i>A submission from SRD Consulting to the Process Heat NZ, MBIE, 22 February 2019</i>

## Commercially sensitive information

<b><i>Do you have any objection to the release of any information contained in your response, including commercially sensitive information?</i></b>  <b><i>If yes, which part(s) do you consider should be withheld, together with the reason(s) for withholding this information.</i></b>
<b>Answer:</b> No

Thank you for your questions for consideration. I have preferred to answer your request for evidence to help you set the scene for the first emission budget 2022 to 2025 because if New Zealand cannot build the process engineering capability up in this time frame for future budgets the emission reduction from the process industries will be at serious risk at not being achieved.

**My areas of expertise** - In my 40 year chemical engineering career in New Zealand, I have been involved in two major initiatives that enable me to provide this evidence; (1) I managed Fonterra's energy efficiency team between 2002 and 2006 when we delivered 10% real energy savings – mainly in process heat and (2) I pioneered and built the aggregation of 200 MW of reserves in the wholesale electricity market. This experience underpins what we need to do to reduce carbon emissions in our future smart manufacturing and smart renewable grid world.

**Issue** – New Zealand's process engineering capability in the market today is at an **all time low point**. This capability is essential if we are to develop and build the industrial projects we will need to deliver step changes in carbon dioxide savings eventually leading to zero emissions in our export food sector. This will target 4 million t CO<sub>2</sub>/y to reach zero emissions.

**Why** – Investment in our process engineering capability from both business and government **has not been forward looking** and has been run down steadily over the last 20 years.

**There is now real urgency to invest in our system engineering future** – We are tasked to double our energy productivity (half our energy use) in our food sector so we can head to zero emissions on a commercial basis. We have to build the knowledge and experience in system engineering involving both process and electrical engineering. We have to invest in new process engineering capability or our future using Industry 4.0 and our 5G world of smart manufacturing is just a dream.

**What is needed** - Grant funding will be needed to launch a portfolio of reference or demonstration projects that will underpin the training of our new system engineers. This work would then feed a pipeline of projects into our Green fund and other institutional funds that would enable the ICCG to set realistic hard targets to reduce carbon emissions based on sound engineering principles.

If we make this investment, New Zealand will **avoid being a slow follower**.

**The evidence comes from permanent process engineering job losses, not applying process integration thinking to business as usual, the lack of understanding of the challenges ahead in process development, our backward-looking nature of our science funding, yet there is high interest from young engineers and all the good engineering work being done is on a pro bono basis:**

- 1) New Zealand invested 30-40 years ago in process engineering in our industrial development and in our research organisations like in the DSIR, dairy (DRI), in meat (MIRINZ), in pulp & paper (PAPRO) and in the electricity sector (at ECNZ and the integrated retailers of the day). These organisations provided hands-on training for engineers to gain practical experience. We funded pilot plants and scale up. We learned that good process engineering requires this knowledge to de-risk projects. We built new plants that were more energy efficient. For example, we built and operated all electric and zero emission meat plants in the South Island which now burn coal. Well over 100 permanent jobs for experienced process engineers have disappeared from the market in this time frame.
- 2) Then this year, we lost even more jobs in process engineering from a major consultancy in this area because of the lack vision in the future investment to take plants to zero emissions.

- 3) If we use Process Integration as the benchmark of our progress. This chemical engineering technique called pinch analysis was introduced 30 years ago in the food sector but is still not used in business as usual to understand our site heating and cooling and more importantly how we can set robust emission reduction targets. Energy audits have not adopted this technique because they are not based on process engineering principles. Workshops to build this capability have started once again in Australia (thanks to ARENA and A2EP) and in New Zealand (thanks to the University of Waikato). Countries like Switzerland have invested strongly in this area and their manufacturers have become more competitive and leaders in Europe.
- 4) The challenge in process heat has been over-simplified by policy analysts. Just considering boilers in isolation is wrong and is flawed future thinking. The challenge is to understand the process first. It is the process development work that will determine lower temperature levels and less process heating and cooling demands. This is the discipline of chemical or process engineering. This is the missing piece.
- 5) Future investment to the order of \$4 billion is needed by the food sector in improved heat exchanger networks, the use of heat pumps and thermal energy storage systems, new electro-technologies and use of renewables – not in fossil boilers and steam systems. This Industry 4.0 manufacturing will take us into electrification and smart grid. Process engineers will partner with electrical engineers and will be the system engineers of the future. We need to encourage these collaborative teams to emerge.
- 6) This is supported by a chapter by David Frame in a recent book about meeting our low emissions future *“The backward-nature of our science investment portfolio is part of the New Zealand research, science and innovation sector’s productivity problem. Many countries are investing heavily in RD&D that is relevant to low emissions transformations. We should do this too, since it is a great way to offer people new jobs in potential sunrise sectors, and also of spreading the benefits of the transition. Ridiculously, New Zealand’s thinking tends to be the exact reverse of this: because others are investing in CO<sub>2</sub> mitigation research – the MBIE thinking goes – we shouldn’t, this is crazy”*
- 7) Yet, it is encouraging to see that interest in this area is building. A recent young engineers group meeting in Wellington talking about process heat sold out on-line in 3 hours and feedback received 6,000 hits of support.
- 8) All the good work going on here and in Australia (with groups like Beyond Zero Emissions) is pro bono and requires donations to keep going. The BZE report about *Electrifying Industry* recently won a state award in Victoria. This basic engineering work towards our low emissions future should be better funded if we want projects and investment to emerge.

**We can learn from Australia** – where \$ billions of grant money has and is being spent by ARENA in the last eight years to accelerate the growth in renewables for decarbonisation. For example in their latest investment plan, there are funds available for renewable process heat. The RACE capability build project has a budget of \$320m over 10 years which is a good example of the sort of technology skills transformation project that the world will require.

**Taking small steps** - I would be happy to meet the ICCG to discuss a national business case for building new process engineering capability so we can accelerate the mitigation of carbon dioxide and lower the carbon footprints of our food export products.

## References

*Step by step* by the author in the Chemical Engineer journal – November 2019

<https://www.thechemicalengineer.com/features/step-by-step/>

*A careful revolution – towards a low-emissions future* – BWB Texts - David Frame's chapter "bringing the people with you" quoted text from page 159

ARENA's investment plan – Innovating energy – 2019 - <https://arena.gov.au/assets/2019/08/2019-arena-investment-plan.pdf>

Reliable Affordable Clean Energy (RACE) to 2030 collaborative project

<https://www.racefor2030.net.au/>

Australian Alliance for Energy Productivity (A2EP) - <https://a2se.org.au/>

Beyond Zero Emissions -

<https://bze.org.au/research/manufacturing-industrial-processes/electrifying-industry/>

Thank you for reading my evidence

A handwritten signature in blue ink that reads "Stephen Drew". The signature is written in a cursive style with a large, sweeping flourish at the end.

Stephen Drew, FIChemE