Process Heat in New Zealand: Opportunities and barriers to lower emissions - Summary of submissions

1. We received 71 submissions from a wide range of stakeholders. This is outlined in the table below. A summary of submissions by barriers identified in the paper have been outlined below.

Submitter type	Examples	# sub-missions
Business groups	New Zealand Business Energy Council (BEC), Major Electricity Users Group (MEUG), Major Gas Users Group (MGUG), Meat Industry Association (MIA).	4
large energy users	Methanex, Refining New Zealand, Fletcher Building, Ballance, New Zealand Steel, Oji Fibre Solutions, Fonterra, Golden Bay Cement, Graymont	10
Renewable and energy efficiency sectors	Energy Management Association of New Zealand (EMANZ), Bioenergy Association, Azwood Energy	3
Fossil fuel sector	Petroleum Exploration and Production New Zealand (PEPANZ), First Gas, Straterra	3
Electricity sector	Transpower, Contact Energy, Pioneer Energy[1]	2
Environmental groups	Greenpeace, Oil Free Otago, Climate Justice Taranaki, and individual submitters associated with the Coal Action Network Aotearoa[2]	23
Research organisations	National Energy Research Institute (NERI), Massey University	2
Local government	Nelson City Council, Auckland City Council	2
Individuals		22
Total		**71**

Barrier A: The cost of emissions is not fully priced

2. The majority of submitters from across a broad range of stakeholders highlighted the importance of regulatory certainty and the role of the emissions price in driving action. Most large users agreed that the ETS and the carbon price have not had a significant impact on process heat investment decisions. Some individual submitters suggested it is important to set carbon prices at certain levels.

3. While BEC said that the ETS does provide an incentive for business to reduce emissions and the price of carbon emissions does influence decision-making, it is unclear to what extent this will influence improvements specifically in process heat efficiency. The future price of carbon is highly uncertain, and businesses are careful when making large investments which involve high short-term costs and larger capital expenditure based on future uncertain carbon prices.

4. Industrial allocation came out as an important issue and there were mixed views on this. BEC, New Zealand Steel, Refining New Zealand, Ballance and MEUG all stated they were disappointed that the issue was re-litigated in this paper.

5. Methanex also said policy settings need to be cautious of emissions leakage as production would move to China and increase global emissions.

[1] Pioneer Energy is also a supplier of renewable wood fuels
[2] 17 individual submissions were identified as being associated with the Coal Action Network Aotearoa due to the use of a template submission provided by Coal Action Network Aotearoa.

6. On the other hand, many individual submissions raised concerns over the risk of over-allocation and were in favour of rapid phase-out of industrial allocation. Some suggested that instead of allocation, the Government could provide financial assistance to businesses that invest in energy efficiency or fuel switching. Others suggested using New Zealand Unit auction proceeds to provide interest-free loans and an educational programme aimed at executives and engineers. Mean Green Mowers suggested that income gained from the ETS (presumably the value of allocation) should be recycled for investment in new plant. An individual submitter suggested that an independent evaluation should be conducted to assess the benefit or otherwise of these companies activities to the New Zealand economy.

7. Pioneer does not believe allocation provides an incentive for recipients to reduce emissions and that historical changes to the ETS have negatively impacted Pioneer's business.[3]

Barrier B: Energy projects have to compete with other capital investment projects

8. There were mixed views as to whether sustainability is considered secondary to risk and return. Pioneer said that management at corporate levels are looking at sustainability but it is not influential enough to support conversions to lower emissions fuels. EMANZ and Massey University noted that 12-18 month investments thresholds are evidence of overly short-term business planning horizons.

Barrier C: Access to capital

9. None of the large energy users specifically said they were not able to access finance; but rather capital budgets were mostly self-imposed by individual firms. Pioneer confirmed this was also their experience when working with clients. Only Fonterra noted that it ring-fences funds for energy efficiency, allowing similar projects (e.g. boiler economisers) to be funded and deployed across multiple sites and didn't need to go through regular project approval process.

Barrier D: Aversion to production disruption

10. Production disruption is an issue for many large submitters, though most have planned shutdown or maintenance periods where energy upgrades are undertaken. Projects must be carefully scoped and planned to minimize production disruption costs. Without upgrading or replacing, boiler plant runs the risk of lower availability and unplanned outages so the trade-off is made between extending old and building new.

Barrier E: Hidden costs and benefits of energy improvements

11. Fletcher Building and Refining New Zealand shared examples of where business cases for energy improvements are aided by co-benefits, principally safety, productivity and efficiency improvements.

12. Fonterra noted additional costs outside the actual capital installation for energy improvements, including feasibility studies, and resourcing to identify and design projects.[4] Pioneer considers that the hidden costs and benefits of energy improvements can be addressed through performance-based contracting and shared energy savings contracts.

[3] Pioneer Energy is a both end-use consumer and a commercial supplier of wood fuels to many industrial, institutional and small commercial boiler sites across the New Zealand process heating sector.

[4] Fonterra believe this is an area where having resource available in the form of industry shared learnings/best practise, technical experts or feasibility funding can assist to progress new capital projects. A good example of this approach is the support from EECA to complete the biomass trial at Fonterra's Brightwater site.

Barrier F: Inadequate information on the emissions profiles of products or firms

13. There were mixed views on whether there would be benefits from publishing individual emissions data reported by ETS participants[5] and/or large process heat users. Individuals tended to be in favour.

14. Some large energy users (Ballance, Graymont, New Zealand Steel, MIA, Refining New Zealand) were against the public reporting of emissions due to commercial sensitivity concerns, potential for misinterpretation of data, or unfairness on the grounds that importers of competing products might not also be required to report.

15. Golden Bay Cement, Fonterra, Fletcher Building were "on the fence", emphasising that any requirements would need to address consistency with international protocols, equal treatment for importers and other large emission sources in New Zealand. Fonterra and Fletcher Building noted they already report publicly at an aggregate level.

16. Transpower and Pioneer would prefer more complete information, such as government support conferred to a business against a set of agreed performance criteria and KPIs. This is similar to a benchmarking agreement where businesses improve their emissions intensity over a defined period and may receive government assistance to do so.

Barrier G: Some firms have poor information on their own energy use

17. Many large energy users where energy is a significant cost of production reported having good information on their own energy use and use energy metrics or KPIs at a facility level and in real-time. Ballance (urea production) and Refining New Zealand engage consultants in international benchmarking to compare performance and seek improvements.

18. Conversely, EMANZ believes there is enormous potential for improvement in operational efficiency, including among substantial emitters and disagrees that "the largest potential gains especially for large energy users, have likely already occurred." (point 45 in the technical paper).

19. Fletcher Building and the MIA noted the presence of information barriers. MIA is currently developing an industry energy, water and emissions benchmark to allow processing and rendering plants against the industry average. MIA suggested the Government could have a role in this.

Barrier H: Lack of information or aversion to new technologies

20. This is a significant barrier for Ballance, NZ Steel, and Pioneer and Transpower, and Massey University. Ballance and NZ Steel would never pilot or install an unproven technology, which may place people at risk of harm or lead to disruption to product supply/quality. Pioneer agrees that engineering advisors see more risk in a low emission solution than the "tried and true".

21. Golden Bay Cement makes significant effort to learn about new and emerging technology, yet the primary barrier is that customers and end user specifiers (engineering consultants) have a bias towards blends that they are familiar with, and not with lower emission cement products that have proven performance in developed jurisdictions.

[5] Note that Minister for Climate Change seeking a decision from Cabinet in early April to require the publication of participant level emissions and removal data to improve the transparency of the NZ ETS to the public and participants, from 2021 onwards. However, due to the upstream nature of the scheme, this reporting would not provide the appropriate level of information on emissions by site or product.

22. Transpower's view is that new technology for process heat electrification has not yet been widely deployed in New Zealand. Massey University considers that some electro-technology, including high temperature heat pumps, is perceived as experimental and risky, though the high capital costs of many such technologies is often at least as significant as a barrier.

23. SRD Consulting noted the importance of demonstration projects not only to de-risk emerging process heating technology but to train, build and retain new capability for the future. The submission noted there is a risk to business of low labour quality and capability in the area of process heating. Spurring or encouraging competitive innovation and accelerating market adoption to scale is key to building a portfolio of emission reduction projects and retaining expertise in New Zealand, to avoid engineers moving to Australia.

Barriers to the electrification of production

24. Fonterra, Fletcher Building, Refining New Zealand gave examples of having electrified part of their business, particularly of non-core processes and utilities.

25. Fonterra noted that, due to a range of electrification barriers, they see reducing thermal load through efficiency improvements is an important step before transitioning to electricity.

26. Fletcher Building, New Zealand Steel, Golden Bay Cement, Methanex highlighted either lack of proven technologies or extremely high costs to electrify their processes. Methanex noted that while technically feasible, total electrification of its plant would be very capital intensive and require similar electricity demand to Tiwai Point.

27. Contact Energy disagrees with many of the descriptions of electricity barriers in the paper and says there are readily available solutions for all of the supposed barriers reported however, it considers that the one main barrier we consider contributes the largest to electricity costs and that is the network cost allocation.

Barrier I: High cost of electrical energy relative to other high carbon fuels

28. BEC, Fonterra, Pioneer, MIA, and Straterra consider that the high cost of electricity makes it economically unviable in many cases. MIA noted that recent volatile electricity prices have not helped meat processors to consider electrification.

29. Pioneer notes that delivered electricity cost is a much bigger barrier than complexity, and is not confident that electricity costs will reduce given that electric technologies are mature and are well down the cost learning curves. Fonterra noted that greater use of electricity in its sites would occur in summer and is counter-cyclical to winter demand peaks, so they would benefit from lower summer electricity prices.

30. Several submitters including BEC, PEPANZ were also concerned about the future prices of electricity if widespread electrification occurs, and believed that the extent of electrification as well as objectives to transitioning to 100 percent renewable electricity created uncertainty in the electricity system. Ballance is concerned that increased volatility in electricity prices caused by increased renewable electricity generation is an issue for manufacturing processes, particularly when due to the nature of their processes they are unable to reduce demand quickly.

31. Contact disagrees that the high cost of 'electrical energy' is a barrier to the electrification process and believes that the paper conflates electricity generation (i.e. energy costs) and network costs (transmission and distribution). Electrical heat plant can have a lower economic cost, and be more efficient, than a fossil fuel heat plant. Currently the network cost allocation (distribution and transmission) makes the investment prohibitively expensive and hence Contact supports a more cost reflective transmission (and distribution) allocation.

32. In Transpower's view there is a lack of robust information comparing the price of electricity to other fuels for process heat. This should take account of the efficiency of electrical process heat at different temperatures as this is a key aspect of the economics.

Barrier J: Electricity supply is fundamentally more complex than other fuels

33. Pioneer and Transpower do not believe that electricity supply is more fundamentally complex than other fuels. In fact, Pioneer suggests that for either reliability and/or heating continuity purposes, electricity can be stored in batteries or more specifically in hot or cold water storage tanks. Transpower's view is that the barrier occurs at the point of contemplating electrification, and this should be a focus of initiatives designed to ease the electrification challenge.

34. Transpower considers the key barrier to electrification is the information and technical expertise to start economic conversions, retrofitting and new investments. In its view, MBIE should recommend the Government take a leadership role in building capability in terms of the provision of information, and technical advice and support for the conversion of process heat plants to electricity. This could demonstrate the compelling economics of electrification and allay concerns about reliability and complexity.

Barrier J1: Connection costs and the Transmission Pricing Methodology

35. Transpower notes that it is required to ensure the transmission system meets prescribed security and reliability standards. This is their focus when designing and building transmission assets.

36. Many submitters raised the issue of high connection costs and the Transmission Pricing Methodology. MEUG believes that Transpower's charges are too high for the risk and service they provide, thereby increasing the cost to consumers of electrifying process heat plant.

37. Pioneer raised work by the Electricity Authority (EA) that has entailed wealth transfers between different market participants, some of which are consumers and all of whom are investors, in the billions of dollars.

38. Contact Energy, who disagreed with how many of the other barriers were characterised, did agree on this occasion that grid users pay for assets that do not benefit them.

Barrier J2: Time and costs associated with developing electricity connections and new generation plants

39. Fonterra, Transpower and Massey University noted this as a major barrier, which could be prohibitive for some businesses. Fonterra says the process heat requirements at our sites mean they would not be able to immediately switch to electricity without requiring a distribution or transmission grid upgrade at most locations. Massey says the costs to upgrade the electrical supply within the business's site (as well as externally) can often be just as large as the investment in the electro-technology itself.

Barrier J3: Perceived risk of electricity supply disruptions

40. Several submitters including BEC perceive electricity as less secure than other fuels. Ballance, Fonterra, and Golden Bay Cement have experienced electricity supply disruptions that have caused costly plant outages. However, Fonterra acknowledged that average outage rates across the network may achieve desired industry targets.

41. Transpower considers that it is critical to have regulatory settings facilitate sufficient investment in new renewable generation, and proactive investment in the transmission network, to ensure supply is sufficiently secure (including in a dry year) to meet the increasing demand. Transpower's role is also to enable new technology (such as

batteries and other distributed energy resources) and to develop new potential service offerings.

Barrier J4: Variable and uncertain emissions intensity of electricity use

42. Fonterra agree that the emission intensity of electricity is variable depending on the makeup of generating sources and that there are established approaches to reporting emissions intensity.

43. New Zealand Steel, Ballance and an individual submitter highlighted an issue with the wholesale marginal pricing mechanism, and how carbon costs are factored into it. Wholesale electricity pricing builds in a carbon price even when the generation is largely renewable (when fossil fuel is on margin) and negates New Zealand's "low cost renewable" advantage. The electricity price is set by the marginal producer, and infra-marginal producers (those who entered the market with lower bids) then all receive this same price. The individual's view is that this creates an incentive for keeping more expensive generation in the system, which currently works well for the major electricity suppliers, but not for customers.

Barrier K: Electricity has historically been a 'last choice fuel' for industrial processes

44. BEC notes that electrification and biomass seem to be a better option for low to medium heat temperature users.

45. Fonterra and Refining New Zealand note that they have historically favoured fossil fuel to provide the required heat load to run plants efficiently and cost effectively. However, today electricity is no longer a last choice fuel and they are both currently looking at every option to electrify their processes wherever possible.

Barriers to the use of biomass

46. Scion, Azwood, the Bioenergy Association and Oji Fibre Solutions (Oji) note that there are many opportunities for replacing coal with wood fuels, which can be used for process heat applications and on-site electricity generation. Oji considers that 60 per cent of the current coal use in heat plant could be replaced by biomass fuel, depending on the availability and price of biomass.

47. The Bioenergy Association considers that biomass fuels are better than electricity in certain respects. For example, the infrastructure for the biomass fuel supply chain can be designed and built within a short time period, and biofuels are storable for use when required.

48. On the other hand, an individual submitter considers that biomass is not an ideal option as a fuel, as it does not reduce emissions as much as solar and wind. Another noted that emissions related to the biomass supply chain (e.g. those associated with transporting biomass) should be minimised, and the sources of biomass should be environmentally sustainable (e.g. using wood waste as feedstock rather than crops).

Barrier L: Economics of biomass fuels

49. Some submitters, particularly those with a good understanding of biomass fuels, agree that the availability and economics of biomass fuels depends on the location of the site of the processing plant, although they note that the economics of coal and geothermal are also location-specific. Auckland Council notes that biomass fuels may potentially be suitable for regions that are close to the sources of biomass, but Auckland is not one of these regions.

50. Golden Bay Cement noted that the cost of woody biomass has risen in recent years because more widespread interest in woody biomass led to tighter supply. Graymont and Straterra considers that for biomass fuels to be cost-competitive with fossil fuels, there would need to be significant improvements in bioenergy technology and supply

chain. Also, converting biomass into a high energy density fuel is currently prohibitively expensive.

Barrier M: Undeveloped biomass supply chains

51. The Bioenergy Association and Azwood consider that there are enough suppliers with commercial and technical capability to expand the supply of biomass if demand for biomass fuel increases in an orderly manner. For example, biomass fuel suppliers have secured long-term fuel supply agreements with forest owners and users.

52. In terms of the sources of biomass, Oji notes that the forestry and wood processing sector have the most potential to produce residual biomass suitable as an energy fuel, and forestry resource in the central North Island can be increased to provide feedstock for the pulping process.

53. However, some submitters, such as Business NZ Energy Council and the Meat Industry Association, note that there is uncertainty about the reliability of biomass supply. Pioneer Energy noted that the woody biomass processors have not acquired forests or forest cutting rights to secure low-cost supply of woody biomass. Also, Straterra pointed out that the quality of biomass fuels can vary widely, depending on the moisture content of the wood waste. The Major Gas Users Group noted that there is a lack of facilities for chipping and drying woody biomass to produce high energy density biomass fuels.

54. On the demand side, some submitters note that most heat plants are in the small to medium scale range, and wood chip and wood pellet boilers are very efficient. However, some submitters believe that consultants who are familiar with coal and gas will continue to design plants that use such fuels rather than biomass fuels. Furthermore, demand for biomass fuels is limited by the cost of biomass fuels, difficulties in transporting them, and the fact that biomass fuels are not suitable for certain production processes. For example, SRD Consulting noted that copper-chrome-arsenate treated timber is not suitable for use in a lime kiln.

55. Some submitters suggested government actions to incentivise further development of the biomass fuels market, including:

    a. information measures, such as providing information on current and future sources of biomass supply, up-to-date data on process heat demand and trends, and guidance on biomass fuels

    b. market facilitation measures, such as compiling a list of wood energy consultants, accreditation of biomass suppliers

    c. policy measures, such as adjusting the NZ ETS settings, procurement policies, requiring tree felling operations to convert waste wood into fuels, addressing air quality regulations set by local authorities

    d. financial measures, such as R&D programme, and extending the payback period of Crown Loans for biomass energy facilities.

Waste-to-energy opportunities

56. The Bioenergy Association noted that the technical paper did not adequately discuss the waste-to-energy opportunities, such as the treatment of waste by anaerobic digestion to produce biogas for process heat. It suggested a number of measures for encouraging the use of waste as an energy source, including:

    a. implementing nationwide zero organic waste to landfill policy

    b. monitoring, reporting and setting a target for the reduction of methane from organic waste, and waste water treatment plants.

c. Developing strategies and implementation plans to address barriers to reducing methane emissions from waste

d. amending the criteria for the Waste Minimisation Fund.

Direct use of geothermal

57. The Geoheat Association notes there is significant potential for geothermal resources by improving well drilling and improving geothermal technology to increase temperature output.

58. Contact advises that the main barrier to the uptake of geothermal is the ability to attract existing and new industries to the region where the resource is located.

59. Pioneer cautioned the costs of in-ground drilling and operating systems management are not trivial and need to be carefully considered when making life cycle comparisons of heating options.

60. Submitters associated with Coal Action Network Aotearoa deem that other renewable energy sources should still be preferred to geothermal energy.

Switching from coal to gas

61. Environmental groups including Greenpeace and individual submitters consider that natural gas should not be seen as a transition fuel.

62. MGUG believe the value of this technical paper would be enhanced if it were to recommend a better understanding of industries' use of natural gas (including as a feedstock) along with the broader role they play as major consumers of gas in contributing to economic value in New Zealand.

63. PEPANZ prefers to use the term "low emissions" over "renewable energy" (presumably to include natural gas as a lower emissions energy source compared with coal), and that the role of gas in the electricity system should be acknowledged, particularly to meet peak demand.

64. First Gas thinks there are considerable emission reduction benefits available from converting industrial heat processes from coal to gas, and this could help to achieve real progress over the next 5 – 10 years. Converting existing coal users in North Island to Gas should be prioritised as it enables cost effective emission reduction option for a range of industrial temperatures.

65. MGUG, PEPANZ, Fonterra and Ballance question the viability of switching to natural gas from coal following the offshore ban on oil exploration. Fonterra was considering switching some of its coal-fired operations in the North Island to gas; and Ballance reported that it has been deterred to investment in new greenfield sites using gas. MEUG noted that businesses considering process heat decisions will be factoring in the timing of when government might change and therefore when future gas supplies, prices and security of supply will become more attractive to substitute for higher emission fuels.

66. Referring to gas in the South Island, PEPANZ urged officials to consider the Barque Field Development Economic Impact Assessment prepared by Martin Jenkins, which showed that an economically viable gas-to-shore scenario exists if a sufficiently large field is found.

Cogeneration and Self-generation

67. Pioneer believes there is potential over the medium term for more cogeneration. In particular, Pioneer would like to see further consideration of how industrial cogeneration could also provide network reinforcement (through transmission or network alternatives).

68. Pioneer noted that the incentive for on-site and embedded generation was in place from 2009 to 2016, in the form of avoided transmission costs (ACOT) payments. The 2016 change in Code effectively re-instated the barrier, thus increasing the investment and pricing risks for consumers looking to reduce their exposure to future grid costs.

Hydrogen

69. Ballance and Refining New Zealand believes that hydrogen generated from electrolysis is an opportunity for their business. First Gas suggested that investments in gas infrastructure could open up opportunities for the future deployment of hydrogen for industry.

70. The Coal Action Network Aotearoa and several individual submitters believe that if hydrogen is used as an energy source for process heat, it must be generated by renewable means, not derived from fossil fuels.

Solutions

71. While the technical paper did not ask specific questions on possible solutions to reducing emissions from process heat, a number of submitters suggested actions Government could take.

72. Greenpeace, Climate Justice Taranaki and a number of individual submitters supported ending future investment in fossil fuels plants and prohibiting new fossil fuel plants or major upgrades on existing fossil fuel assets.

73. Transpower noted they have a role to enable new technology (such as batteries and other distributed energy resources) and to develop new potential service offerings). We will meet with them to discuss this issue in further detail.