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20th February 2019

Energy Markets
Ministry of Business, Innovation, and Employment
PO Box 1473
Wellington 6140
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Re: **Pioneer Energy Ltd submission on Process Heat in New Zealand - Opportunities and Barriers to lowering emissions**

Thank you for the opportunity to submit Pioneer Energy's response to this first Technical Report on process heating. 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. Pioneer has also built and operates district process heating facilities capable of co-firing coal and wood fuels and supplying multiple process heat customers. We also generate electricity from biogas, have gas fired combined heat and power facilities, and retail electricity directly to our customers. Many of the boiler sites and facilities contracted with Pioneer have operated for more than 10 years making us one of the most experienced operators of wood and waste fired process heat facilities in New Zealand.

With this depth of development and operating experience in the process heat market segments, we believe our feedback on this report can assist government in formulating proactive policies that will enable customers and their suppliers to make the transition from fossil to renewable heating fuels.

Specific responses to questions are attached in the Q&A format as requested. The key points of our response are;

- There is the opportunity to utilise renewable heating fuels using process wastes and wood fuels immediately, with the potential identified by Scion to switch at least 50% of current coal fuel use to biomass or 11PJ using existing biomass residues.

- The key policy issue and greatest barrier to switching away from fossil fuels is the higher market cost of renewable heating fuels in a very cost sensitive industrial market. We believe the ETS emissions price will need to be over $50 /t-c to achieve a level of price parity required to switch future investment decisions to renewable heating plants. In this respect biomass fuels have a considerable delivered cost advantage over direct electrical heating for process heating applications over 80°C.

- We also estimate that electrifying process heat above 80°C will require approximately 3x the level of capital investment per MW of heat delivered than is required for switching boilers to wood fuels.

We believe therefore that developing biomass resources and supply chains should be a policy priority for government in the higher temperature heat segments.

We welcome further discussion on the points we have raised below and invite MBIE/EECA to review any part of existing operations to better understand how the barriers raised in this report have been overcome by Pioneer working with its customers.

Yours truly

Fraser Jonker
Chief Executive

Pioneer Energy Responses to Specific Questions

Barrier A: The cost of emissions is not fully priced

Q1: To what extent has the NZ ETS influenced process heat investments in your business?

Q2: To what extent do you agree that businesses are accounting for the price (and future price) of emissions, but face other barriers to reducing process heat related emissions?

Q3: To what extent do you agree that businesses are accounting for emissions prices but are unresponsive to changes in the emissions price?

Q4: Does the NZ ETS provide an incentive to significantly reduce emissions beyond current levels for business who receive industrial allocation?

Q1 – NZ ETS, and importantly government changes to the ETS, have negatively influenced investment in Pioneers heat business. Since the NZ ETS was first introduced as part of the Kyoto Protocol policy response, Pioneers heat business has had to advise prospective customers and make informed long-term investment decisions relating to how the ETS might influence the cost of traditional higher emissions fossil fuels. Forecast carbon prices were always the subject of international market direction and influence, however, the greater barriers to investment were created by the actions of government in deferring policy settings for allocations of emissions units i.e. the level of net exposure emitters actually had to the internationally indexed carbon price.

Q2 – We do not believe that businesses are yet accounting for the price (and future price) of emissions. Instead, informed larger businesses are considering the net cost of emissions traded taking account of their allocations of “free” ETS budget units. Many businesses are still in a “wait and see” mode until government provides longer term national policy settings. Government has yet to signal future emissions costs through its procurement policy settings or set realistic shadow carbon prices for its own institutional business cases, so is not yet accounting for the future price of emissions. Instead it is still procuring LPG heating systems for South Island institutions. Smaller businesses will have a fuel cost pass-through, budget setting approach to emissions costs.

Q3 – Recent advice to government suggests that ETS prices will need to be of the order of $150 per tonne carbon equivalent to achieve Net Zero emission levels. Our view is the market still has no confidence in the future level of emissions prices, or the possibility of avoiding emissions prices through complimentary measures to the ETS. As such, there is no market investment price path and thus deferred investment in renewable alternatives is likely. This ultimately leads to an exponential type of investment growth pathway which does not help develop wood fuel supply chains in a more orderly manner.

Q4 – In our view no, probably quite the opposite. In this respect, we concur with the Productivity Commission recommendations and this reports conclusions that the NZ ETS settings must be enduring and ensure that emissions price signals and emissions unit allocation settings are set at levels that reasonably reflect the renewable alternatives investment costs.

Barriers to improving energy efficiency and the uptake of renewables in process heat systems

Q5: To what extent does your business ring-fence capital for energy related projects?

Q6: To what extent are objectives such as sustainability incorporated into your organisations investments, i.e. is sustainability included in your KPIs?

Q7: Are these objectives considered secondary to risk and return?

Q8: Do you agree that energy efficiency or renewable projects are often not implemented as they are not core business investments?

Q9: Is your business limited by access to capital for energy related investments? Is this due to lender appetite or are these limits self-imposed?

Q10: To what extent do hidden costs or co-benefits (as described above) hinder or progress process heat investments?

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

Q5 - In Pioneers specific case, all new capital assets built on customer sites are ring-fenced and run as profit centers. However, most industrials will treat their energy assets as cost centers and not attribute business margins from growth or product value to converting those assets from fossil to renewables. We concur with the reports assumptions on capital allocation priorities.

Q6 – Sustainability criteria are driving management to consider renewable options but are generally not yet influential enough to support conversion at costs above non-renewable alternatives. Those with clear sustainability policies are more likely to consider renewable options, but the relative market costs of energy options will generally win-out in investment decisions.

Q7 – we believe yes, these sustainability objectives are secondary to risk-return criteria, at least for larger capital investment projects. More discretion may be applied to management for smaller incremental investment decisions.

Q8 – No, we believe that any energy plant investment is likely to be core business i.e. as the business cannot run without process heat energy. The issue is more likely to be priorities for capital in the core business and the boiler plant often has the more extendable life cycle compared with manufacturing plant and equipment that are more often continuously improved in both efficiency and functionality. Processing equipment investment also has a more obvious and immediate beneficial outcome in terms of improving product quality, throughput and productivity, so would naturally get first billing on capital allocations. Management are likely to be more incentivised to improve factory floor productivity than emissions performance, which is more likely to be considered a compliance management investment. Pioneer has had as many heat plant investments built due to customers' air emissions or process waste issues than for renewable energy conversions.

Barrier C: Access to capital

Q9 - We believe this issue is more or less a part of Barrier B – i.e. that access to capital is not the primary barrier but prioritization of available capital is the primary barrier. For example, Pioneers heat business has prepared perhaps 100 or more different outsource (Build Own

Operate) proposals across almost all process heating sectors in New Zealand over more than a decade. In every case the required capital (usually between $3m and $15m per proposal) was accessible to customers through Pioneers own balance sheet. In our experience, the decisions were more to do with the cost of capital vs cost of debt and the long-term contract commitments required, as opposed to access to capital.

Barrier D: Aversion to production disruption

Q10; Under normal market circumstances disruption due to energy system upgrades is an accepted part of operations. That is, 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.

- Under abnormal circumstances, such as converting existing boilers that are not at end of life, then production loss and opportunity costs will be a contributing factor to businesses lowering their carbon emissions. One form of technology change will likely be easier and quicker to change than another and that technology may then be preferred, provided it does not impose materially higher life cycle costs.

- The lack of adequate wood fuel supply chain depth and reliability is often quoted in this respect. Pioneer set up its own wood fuel business in 2008 to address this perceived risk and has met its contractual wood fuel supply obligations ever since. In our view, these risks are manageable using the same engineering and procurement standards as are applied to any other fossil fuel solution.

- Pioneers wood and waste fueled industrial process heat plant are contracted over many years and many have operated for more than 15 years with the same availability (>95%) and reliability (>98%) KPI's as for any standard coal or gas boiler.

Barrier E: Hidden costs and benefits of energy improvements

Q10 – Hidden costs or co-benefits are reasonably common outcomes of any new plant business case;

- One example would be the treatment of depreciation between an internal vs and outsourced plant investment. Another would be how internal operating costs and overheads are allocated, with an outsourced heat plant proposal probably carrying higher overheads due to contract ring-fencing.

- Another example is a customer is likely to be more critical of a new wood fuel supply and quality than they have been for a coal fuel, which is likely in our experience to have had similar supply quality issues from time to time.

- Performance based contracting and shared savings contracts are two means by which hidden costs and benefits can be commercially addressed, however the main difficulty is establishing an agreed BAU baseline for existing older plant that often do not have adequate historic record keeping.

- Customer consultants are more likely to compare a new renewable option against a generic industry level performance benchmark for existing coal or gas fired plant, even if that existing plant is more than 30 years old and operating below industry benchmarks. It can be difficult to get like-for-like comparisons when engineering advisors see more risk in one solution than the "tried and true".

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

> **Q11:** Does your organisation actively monitor its energy use and/or its emissions?
>
> **Q12:** Do you think that there would be benefits from publishing individual emissions data reported by NZ ETS participants and/or large process heat users?
>
> **Q13:** Do any of the informational barriers described above have an impact on your organisation's decision to invest in process heat technologies, and if so, to what extent?
>
> **Q14:** Could you please rank the three informational barriers as listed directly above this box in order of impact on your organisation?

Q11; Yes, Pioneer actively monitors its boilers energy use and emissions performance, often as a necessary part of contracting of that plant to a customer.

Q12; Unsure, as any information helps better understand market benchmarks. Whilst reporting emissions from individual larger process heat users would ensure greater transparency, it might only be appropriate if that organisation has procured some advantage from government e.g. through ETS or other concessions. Where a business is being subsidised by tax payers through such concessions then we believe there should be transparent reporting of net costs and benefits attributed to that subsidy. Rather than reporting emissions data we would prefer to see a more comprehensive reporting covering the net benefits conferred to that business against a set of agreed performance criteria and KPI's set with that deal. Any concessions may then be ratcheted up or down according to those actual KPI outcomes.

Q13; We see no material impact on decisions to invest in new process heat technologies as these decisions are undertaken in a very disciplined manner through design and due diligence.

Q14; Three informational barriers would be ranked by Pioneer in order as G, H, F with G – Customer information as being dominant. Technology information is generally readily available and emissions information is a subset of customer information.

Barriers to the electrification of production

> **Q15:** Has your organisation considered electrifying part or all of a given site's heating process?
>
> **Q16:** If so, to what extent do you agree with the barriers I to K listed above?
>
> **Q17:** What does your organisation consider are the largest barriers to the electrification of its production?
>
> **Q18:** Are there any costs or co-benefits of electrification that we have not included that your organisation has identified?

Q15; Pioneer has considered electrifying process heat sites with direct heating and with heat pump technologies. It has also undertaken extensive investigation of opportunities to integrate

electric heating into Christchurch hospital and the city CBD and it has built a small electric district energy heating/cooling scheme in one Christchurch city precinct.

- We concur with the report that in our experience also the primary barrier to direct electrical heating within industry is the much higher cost of electricity as a heating fuel.
- For lower temperature heating applications, we concur also that heat pumps are a preferred option to reduce these higher fuel costs. However, even heat pump delivered energy costs are near double existing coal or natural gas fuel costs.

Q16; We do not believe that electricity production is more complex and thus creates a cost barrier. Generation, delivery and conversion of electricity to heat is relatively simple and has been delivered in the same way more or less for decades. We believe electricity is just more expensive due to the level of capital employed compared to on-site heating using gas or biomass. For example:

- We estimate for every $1/MW capital employed to deliver biomass heat has an equivalent electricity cost of $3/MW capital employed.
- This capital ratio difference then increases over time with higher % renewables as renewable generation (with less than 50% capacity factors for most assets) naturally have lower average asset capacity factors than do biomass boilers (>90% on industrial sites)
- Similarly, gas can be delivered for much lower capital investment costs than renewables and converted with similar boilers as direct electrical heating.

We do not believe that electricity is fundamentally more difficult to deliver and manage. In fact, for either reliability and/or heating continuity purposes electricity can be stored in batteries or more specifically in hot or cold water storage tanks. There are ample examples of the effective use of hot water storage in New Zealand for industry and for commercial buildings. Earlier designs of building system often incorporated day-night tariff driven heating storage for low temperature HVAC applications and Pioneer has itself installed industrial hot water storage for customers at its Washdyke and Christchurch district heating facilities. MW scale batteries are also not commercially available at economic costs.

Q17; Largest electricity barrier is delivered cost - The issue for electrical heating is not complexity but simply higher delivered costs. As a mature industry, using relatively mature technologies that are well down the cost learning curves, it is difficult to foresee how delivered electricity costs would become a lot lower (i.e. bridging the current heating market cost gap). For example, as the electricity system heads towards 100% renewable it naturally becomes more capital intensive and also requires system over-capacity to cope with seasonal supply risks. Transpowers recent white paper (Te Mauri Hiko report futures report – November 2018) illustrates these system trends through scenarios that show a +30% system overcapacity with massive growth in distributed solar PV and battery storage.

Q18; The Process Heat report identifies transmission and network connections as potential barriers, including regulatory risks. We concur that there is too much uncertainty in the regulatory environment to commit to large scale long life electrical heating assets. In the last two years the electricity regulatory authority has promoted new policy that have entailed wealth transfers between different market participants, some of which are consumers and all of whom are investors, in the billions of dollars. Whilst the risk of wealth interventions of this scale exist, alternatives to electricity will likely be preferred – i.e. the heating fuel of last choice.

Barriers to the use of woody biomass

> **Q19:** Has your organisation considered biomass as a fuel source? If so, what did you conclude and why?
>
> **Q20:** To what extent do you agree with the barriers L to M listed above?
>
> **Q21:** What does your organisation consider to be the largest barrier(s) to the use of biomass for supplying heat?
>
> **Q22:** Has your organisation identified any costs or co-benefits of using biomass that we have not included above?

Q19; Pioneer is both a user of biomass fuels, supplying customers with heat, and as a competing supplier of biomass in the fuels market. We have been doing both business for more than a decade and have invested more than $60m in biomass fired heat and power facilities. We have thus demonstrated that:

- Biomass wood fuels can be used to replace most existing solid fuel coal boiler installations.
- Wood fuels are higher cost than most other fuels but are cheaper than electricity heating.
- Wood fuel supply chains can be developed and can be made as reliable as most other fuel supply options.

Q20; Barriers to use of biomass:

Barrier L: The economics of biomass fuels is situationally dependent and complicated
It is true that biomass supply is more complex than electricity or gas fuels. These complexities are able to be overcome, but each has an investment cost. In Europe for example, there are thousands of biomass fired boilers across most process heating segments and in power stations. In the UK, wood pellets are imported in vast numbers from North America and used in large coal fired power stations. The material difference between Europe and New Zealand is the environmental law, which requires 20% carbon emissions reductions by 2020.

Barrier M: Biomass supply chains are undeveloped and face development difficulties
To the extent that larger process heat users consider biomass supply chains undeveloped, lacking depth or not sufficiently competitive we believe a part of the responsibility for this sits with the processor. That is, currently most large processors expectations of what wood fuel costs and quality costs are somewhat unrealistic. Some of those processors have in the past acquired coal mines to ensure low cost supply and supply quality, but none to our knowledge have yet acquired forests or forest cutting rights.

Barrier N: Air emissions regulations – we concur with the report.

Q21; The largest barrier to use of biomass fuels, as noted earlier in this report, is the lack of an adequate externality cost on emissions. That is, renewable fuels have not yet reached cost parity with fossil fuels and will not without market interventions. Policy advisors have indicated >$150 t-c emissions prices are required in the market to achieve Net Zero policy goals and we estimate this cost-parity gap requires a minimum carbon emissions cost on fossil fuels of $50 /t_c and would achieve market supply depth at $100 /t_c.

Q22; A common issue raised by customers is that biomass or electrical heating costs will make them uncompetitive in export markets. This is a major local investment barrier and one that we believe was contemplated in the drafting of the Paris Agreement. We also understand there is

no international carbon trading market until ratified by agreement on trading quality through bi-lateral carbon trading between governments. Thus, the policy pathway seems quite clear for New Zealand to become Net Zero by 2050 - only trade carbon units with countries that buy our export goods with embedded renewable or equivalent carbon emissions costs.

Self-generation from renewable sources - wind or solar

> **Q23:** Has your organisation considered building onsite generation? If so, why did the project go ahead or not go ahead?
>
> **Q24:** Are there any barriers to, or co-benefits from, the use of onsite generation that we have not included that your organisation has encountered?

Q23; Pioneer has built and owns/operate on-site generation for its customers. These projects include biogas generation, natural gas fired cogeneration and solar PV. The natural gas cogeneration plant was built for a larger hospital and has run economically for more than a decade interfacing between electricity market spot and contract prices and providing heat at the alternative boiler marginal heating costs. The strongest incentive for on-site and embedded generation were provisions put into the Electricity Code in 2009 for payment at peak generation for avoided transmission costs (ACOT). ACOT payments were derived from the transmission pricing methodology (TPM) and its peak transmission pricing methodology and these payments provided local generators with the equivalent cost-benefit of not creating peak transmission demands i.e. Transpowers marginal investment costs. In December 2016, the Electricity Authority controversially removed ACOT payments from the Electricity Code for any future on-site generation – thus increasing the investment and pricing risks for consumers looking to reduce their exposure to future grid costs. This change in Code has effectively re-instated the barrier that was first identified in 2006 and was fixed in 2009.

Q24; The Electricity Authority has signaled its intent to again revisit the application and allocation of Network common costs for embedded generation in 2019/20. Currently only incremental costs are allowed to allocated by Networks for this embedded generation. Common costs would annul the economics future embedded generation, thus effectively favouring monopoly grid and network asset investments over competing local generation investments. Whilst these monopoly services and network values are protected by regulations from technology competition there is a major barrier to consumers making individual choices on local generation. This in turn removes incentives for developing on-site electric heating technologies as they will increasingly be penalized for their peak demands.

The use of direct heat from geothermal - Pioneer has no prior experience in direct geothermal heating but has applied indirect ground-source heating and cooling at its District Energy scheme in Christchurch. It has found from this experience that the additional 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.

Switching from coal to natural gas – Pioneer operates a number of heat plant with different fuel types. Switching from coal to natural gas has been a North Island trend for some time. The report seems to park cogeneration as an option but Pioneer believes there is potential over the medium term for more cogeneration. In particular we would like to see some further consideration of how industrial cogeneration could also provide network reinforcement (through Transmission or Network Alternatives) and thus reduce the increase in system peak demands that will come with electrifying heating and transport.

As noted in the report, the South Island has only LPG gas is available and switching from coal fuel to LPG has been happening in recent years, with some larger process heat plant using high cost LPG for heating. The attractions of LPG are a cleaner operating environment well suited to food processing, with less boiler space required and lower trucking traffic within close proximity to factory operations. Diesel fuel oil has similar attractions and is also used quite extensively. Both LPG and diesel however are expensive fuels and will grow in cost with carbon emissions costs. For those sites with lack of space the natural switch would be to electricity and for larger sites with space, then wood fuels will provide the better long run economics.

Hydrogen as a low emissions fuel for process heat – it is acknowledged in the report and Pioneer concurs that hydrogen is unlikely to meet the required price point in the process heating market.

Answers were completed by Pioneer Energy Ltd