GRAYMONT

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Energy Markets
Ministry of Business, Innovation, and Employment
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Submission on the Process Heat in New Zealand (2019): Technical paper

Graymont would like to thank the Ministry for the opportunity to present its views on the recently released Process Heat: Technical paper.

Graymont recognises the challenge climate change presents and supports New Zealand taking action to mitigate its impacts. Graymont has been engaging with Government agencies on climate change matters. In October 2017 Graymont made a submission[1] on the Productivity Commission's Low-emissions economy: Issues paper; and made a further submission on the draft report. Graymont has also made submissions in response to the Zero Carbon Bill discussion documents, and the Improvements to the Emissions Trading Scheme.

A global leader in the supply of lime[i] and limestone products, Graymont serves major markets throughout the United States and Canada and has extended its reach into the Asia-Pacific region. Graymont also has a significant investment in Grupo Calidra, the largest lime producer in Mexico. Professionally managed and family owned, the company has roots stretching back more than 70 years.

On the 1st of July 2015, Graymont purchased the assets of New Zealand's McDonald's Lime and Taylor's Lime. These operations are located at Otorohanga and Te Kuiti in the North Island and Dunback, Otago in the South Island. Through this acquisition Graymont became a participant in the New Zealand Emissions Trading Scheme (NZ ETS) for the production of burnt lime.

Lime is one of the most trade exposed industries globally and this is recognised locally through the NZ ETS where the production of burnt lime is an eligible activity for industrial allocation.

[1] https://www.productivity.govt.nz/sites/default/files/sub-low-emissions-33-graymont-308Kb.pdf

In respect of greenhouse gases Graymont does its utmost to meet the requirements in the respective jurisdictions where we operate and work proactively to reduce our GHG emissions intensity.

Graymont's main product, lime, is indispensable for many industrial processes and applications. Uses range from the manufacturing of steel, glass and paper to construction and agriculture.

More importantly, lime products are also a big part of the solution for a multitude of crucial environmental applications — everything from water and sewage treatment to acid rain reduction, environmental remediation and power generation. Simply put, lime has increasingly become a product of choice for addressing complex environmental issues and challenges, both naturally occurring and man-made. In some applications lime is known to re-absorb carbon dioxide.

Graymont's submission is attached. Graymont has elected to only answer the specific questions where it can add the most value.

If there are any questions on this submission my contact details are provided below.

Yours sincerely,

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Introduction

Lime Industrial Process

As indicated in our cover letter, as the most readily available and inexpensive alkali, lime plays an essential part in a wide range of applications.

The production of lime, calcium oxide, releases carbon dioxide through the application of intense heat to limestone (calcium carbonate). This is known as calcination:

$$\mathbf{CaCO_3 + heat \leftrightarrow CaO + CO_2}$$

The industrial process emission of carbon dioxide is a function of the chemistry and is responsible for 60 – 70% of CO_2 emissions from lime production. Calcination occurs in a kiln, at temperatures of 900 – 1200°C, requiring thermal energy. This energy is sourced from fossil fuels, and currently accounts for the remainder of the CO_2 emissions from the process. Thermal efficiency and fuel sources are managed closely to ensure fuel and emissions are minimised while still providing the kiln temperatures required to ensure complete conversion.

The industrial process emission component is common to all lime plants regardless of location and fuel type and hence represents an unarguable carbon leakage risk if domestic production is displaced offshore.

Thermal energy is currently supplied by the following fuel sources:

- Coal
- Waste oil
- Natural gas (but geographically constrained to the Te Kuiti plant)
- Electrical energy is used for other processes (motive power; crushing and grinding; pumps etc.)

Of these, natural gas has the lowest carbon intensity.

Carbon Leakage

For Emissions Intensive Trade Exposed (EITE) industry, until such time as a more level playing field is achieved through other nations placing a price on carbon, industrial allocation remains the most appropriate policy measure to prevent carbon leakage and mitigate against premature closure of manufacturing.

Lime is internationally recognised as one of the most trade exposed industries:

- In Europe, it is deemed to be exposed to a significant risk of carbon leakage[2] with free allocation to be continued until 2030[3].
- In Canada, as part of their objective for establishing a federal Output-Based Pricing System (OBPS) to provide a price signal that incentivises reductions while minimising competitiveness and carbon leakage risks for EITE industries, the Government of Canada revised the baseline for output-based standards from 70% to 80% for all sectors. In some cases, further adjustment of sectoral standards have been made for sectors that are assessed to be at relatively higher risk. Lime is one of the two sectors assessed to be at a very high risk and the standard has therefore moved to 95%.
- In Alberta, an assessment of trade exposure by Canada's Ecofiscal Commission and Navilus Research found lime to be the most trade exposed industry.[4]
- Graymont's New Zealand operations face international competition in both its export and domestic markets.

Submission Points

General Points

The paper highlights a number of barriers to reducing process heat CO_2 emissions. However, important points should be considered about how industrial plants are managed (paragraphs 26, 30, 31). There is a suggestion that the only means to reduce thermal CO_2 emissions for large plant is to shut it down after it reaches its end of life. This is not the case for a lime plant. Although financial justifications would need to be met, lime plants could be envisaged to be retrofitted to use other fuels. At the Graymont Otorohanga site, Kiln 2 has been retrofitted to co-fire waste oil with coal – an example of a kiln retrofitted for a new fuel.
In addition, thermal energy monitoring and management systems have been added over time which have improved thermal energy efficiency. Energy efficiency and emissions intensity reduction are already key management drivers.

Carbon leakage is recognised as an issue in the technical paper. Graymont is therefore keen to see New Zealand adopt clearly defined objective criteria as to if and when withdrawal / phase out of industrial allocation should commence and at what rate. This would provide the necessary conditions for preventing early plant closures during the transition period until carbon pricing is more internationally widespread.

[2] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0746&from=EN (refer Annex)
[3] https://ec.europa.eu/clima/policies/ets/allowances/leakage_en
[4] https://ecofiscal.ca/reports/provincial-carbon-pricing-competitiveness-pressures/alberta/

Elements of the criteria should include:

- Assessment on an activity by activity basis and not be a blanket "all EITE activities" decision. It is quite likely that for some activities a level playing field will be established ahead of others.
- For each activity the assessment of trade competitor jurisdictions should take into account:
    - The level of carbon-pricing, through trading or a carbon tax;
    - The level of allocation/subsidy; and
    - Other support mechanisms including non-tariff barriers
- Phase out of allocation should only commence when competitor trade incorporates an auditable and internationally acceptable carbon price in-line with that of New Zealand.
- The rate of phase out of allocation should align with trade competitors.

Graymont has previously submitted to the Productivity Commission on their Low-emission economy: Issues paper on the specific question of barriers to reducing CO_2 emissions from fossil fuels. As this is relevant to the current paper, the following is extracted from that submission.

Graymont's manufacturing sites already have in place the energy efficiency technologies that are quoted in the Issues paper and the assessment of options for the calcination of lime is valid (refer extract below).

> Opportunities and challenges for reducing emissions
>
> Better energy efficiency (at the same time raising productivity) and a shift away from fossil fuels are the main options for reducing emissions from energy used in industry.
>
> Manufacturers could improve energy efficiency through employing technologies such as:
>
> - integrated control systems, using sensors to adapt process conditions;
> - sub-metering (monitoring energy used by specific equipment or parts of a plant); or
> - better flue-gas monitoring for boilers and dryers.
>
> Yet the benefits of lower emissions will not materialise without substantial further innovation and commercialisation effort (ICF International, 2015).
>
> Broad scope exists to switch from fossil fuels to renewable energy to generate process heat...
>
> Yet providing adequately high process heat from renewable energy is a major challenge for some manufacturing. The calcination of lime to make cement, for example, requires very high heat (in excess of 850ºC), making the use of electricity impractical. Biomass, waste and other renewable sources can produce high process heat of up to 1,300˚C. Yet, to be cost competitive with fossil fuels, such technology requires "major technology and supply chain improvements"

Source: Issues Paper p26 (Productivity Commission: Low-emission economy)

Looking at the options in more detail:

Energy Efficiency

- There is always potential for incremental improvements, particularly with computing power increases in control systems, but the low hanging fruit has been grabbed a long time ago.
- Smaller manufacturers may still have scope but there is a risk of overestimation of emission reduction potentials in manufacturing unless proper data is collated.

Renewables

- Woody biomass has a low energy density and so efficiency and transportation (e.g. increased truck movements) can be a barrier to implementation. Pre-processing of biomass into a high(er) energy density fuel is one option to be considered but availability and cost are currently prohibitive.

Traditional Fuels

- For lime making coal / gas is required to achieve the high temperatures required to achieve calcination. It can be partially supplemented / displaced by waste fuels but their availability is restricted in quantity and availability.
- Graymont encourages the Commission to recognise natural gas as a significantly lower emissions alternative to coal, however its availability in New Zealand is currently geographically constrained in the North Island (through a limited distribution network) and is unavailable in the South Island.

To enable significant long term investments in fuel switching and/or energy efficiency to be made, greater policy certainty is required in respect of the NZ ETS, the Resource Management Act (RMA) and the future role of gas - including supportive policy for exploration / production and distribution infrastructure investment.

Specific Points

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

Yes, as every tonne of emissions saved retains the full value of the emission price. This is because the opportunity value of being able to sell a unit instead of having to surrender it remains. This issue was discussed during the development of the NZ ETS and the decisions on an appropriate EITE sector allocation regime.

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

Although Graymont is a privately-owned business, it publishes an annual Sustainability Report, which includes Social, and Economic performance data, and Environmental Performance data[5], including:

- Carbon intensity
- Other emissions metrics
- Compliance and other environmental impact metrics

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

Certainly not. From the 2017 Sustainability Report:

"Central to Graymont's corporate philosophy is a long-term approach to business, built on a solid commitment to sustainable growth and strict adherence to responsible environmental, workplace and operating practices."

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

Graymont supplies major customers who supply essential services or large-scale operations in NZ. These include Watercare, NZ Steel and many construction projects around the country. Any change to the process, including changes to fuels used, must be carefully considered and managed so that ongoing supply of quality product is not disrupted. This is in addition to items identified in Barrier E.

***Q11:** Does your organisation actively monitor its energy use and/or its emissions?*

Yes. As seen above in Q7, this is reported annually, but also monitored on a daily and monthly basis at a kiln production unit level. Thermal energy is a major cost to lime production so is monitored closely.

***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?*

No – this information is commercially sensitive and would provide competitors with insights into Graymont's business.

***Q15:** Has your organisation considered electrifying part or all of a given site's heating process?*

High temperature process heat is needed for the calcination process. There is no technology available that would enable use of electrical energy as this heat source.

Questions 19 – 21 answered below.
***Q19:** Has your organisation considered biomass as a fuel source? If so, what did you conclude and why?*

5 http://www.graymont.com/sites/default/files/brochures/pdf/gra_sustainability_report2017_ang_07022019.pdf

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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?*

- We agree with the barriers listed. Graymont has extensively tested the use of biomass at one of its plants in Canada. The main challenges were the lower energy density of biomass, the variability in price, quality of the feedstock and problems to ensure continuous and reliable supply. In NZ, Golden Bay Cement carried out an assessment of the challenges of biomass. Graymont's rotary kiln operations at Otorohanga and Makareao are analogous to the Golden Bay cement kiln. An added challenge for lime production is that as lime kiln products are used to treat drinking water and potentially food products, they are particularly sensitive to quality. Copper-chrome-arsenate treated timber would not be likely to be usable in a lime kiln for this reason. This raises an additional concern for use of wood biomass in a lime kiln.
- The summary of Golden Bay Cement findings is the following[6]:

Case Study 2: Golden Bay Cement

Golden Bay Cement uses wood biomass to generate heat. It uses sawdust, woodchip and wood shavings from timber mills and processors, and demolition timber from the Auckland and Northland regions.

There can be supply chain issues arising from limited supply. This is driven from factors such as competition from saw-mills, farmers for livestock wintering and feed pads, factories that can use wood chip as a raw material, mulch and compost producers, and landscapers. Limited supply is also created because there are lower-cost disposal options available, such as landfills.

There is also inconsistency in supply. The different materials are heterogeneous: they have a wide range of moisture contents, bulk densities and therefore energy values, and vary between one source supplier and another. This can impact the way in which it is transported, meaning transportation costs can vary.

Distance is a major factor in wood waste fuelling decisions. Golden Bay Cement generally sources wood biomass from within a 20 to 30 kilometre radius of the plant. Supply from further away can become uneconomic as the transport costs begin to outweigh the cost savings from using wood waste. The economics depends on the delivered cost. Maximum distance is dependent on factors such as the specific wood-waste stream, moisture content, energy value and bulk density, all of which are variable. Given that the materials are low density and high volume, specialised transportation units are often required which adds to transport rates.

Q25: *Does your organisation have the potential to use direct heat from geothermal?*
No.

ENDS

[i] Lime synonyms include quicklime and burnt lime. Lime predominantly consists of calcium oxide or CaO.