Submission to Ministry of Business, Innovation and Employment on Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage (CCUS)

6 August 2024

Introduction

The Aggregate and Quarry Association (AQA) is the industry body representing quarrying companies which produce 45 million tonnes of aggregate and quarried materials consumed in New Zealand each year. The New Zealand Limestone Producers Association (NZLPA) is a sub-group within the AQA, and this submission is on behalf of our members producing limestone products.

Funded by its members, the AQA has a mandate to increase New Zealanders' understanding of the need for aggregate, improve our industry and users' technical knowledge of aggregate and assist in developing a highly skilled workforce within a safe and sustainable work environment.

We welcome the opportunity to provide feedback on a consultation document, Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage (CCUS).

Submission focus

This submission concerns the issue of CO_2 emissions from the calcination of limestone in burnt lime and hydrated lime manufacture, and their subsequent recarbonation during their use in certain industrial processes. This is not recognised as a removal under the Climate Change Response Act 2002 (CCRA)and secondary statutory instruments; however, this is what the process is.

The concrete industry faces a related issue, the lack of recognition of carbon uptake in hardened, exposed concrete, a natural process in which atmospheric CO_2 becomes absorbed into concrete and turns into tiny calcite ($CaCO_3$) particles over time.

Recommendations

The NZLPA recommends MBIE to:

- Classify lime recarbonation as a form of CCUS
- Note the NZLPA's support of the Concrete NZ and Straterra submissions, which address the issue of recarbonation in concrete, a related processes
- Recognise this category of removal by amending the CCRA to no longer require manufacturers to report calcination emissions from lime manufacture, and, therefore, no longer require them to be ETS participants for that purpose, in respect of hydrated lime use in water treatment, food processing and in tanneries
- Investigate in more detail the use of lime in industrial and other downstream economic activities in New Zealand as part of policy development
- Engage with the NZLPA in carrying out the above

Key points

The NZLPA is seeking the following outcomes from this consultation, drawing on listed topics from the consultation document:

- **How CCUS activities should be treated under the Emissions Trading Scheme;**

Add a new category of CCUS – recarbonation of burnt or hydrated lime from its use in industrial processes, specifically in water treatment, food processing, and in tanneries.

In 2022 lime manufacture in New Zealand reported emissions of 101,252 tonnes of CO2 equivalent (Environmental Protection Authority, Emissions Returns Report 2023). These comprise both calcination emissions, and emissions related to the firing of coal in a kiln to 930°C. See below for calculations of the emissions percentage to be attributed to calcination only.

- **What type of monitoring regime should be imposed for CCUS;**

This is not necessary – overseas research shows that for water treatment, 100% of the calcination emissions from lime manufacture are almost immediately captured and stored as precipitated calcium carbonate on the use of the product. The use of hydrated lime in sugar manufacture and in tanneries has analogous features to its use in water treatment, the common factor being the neutralisation of acidity in water.

Note that the precipitated CaCO3, which is usually collected as a sludge and disposed of to landfill, has extremely low solubility.

- **How liability for CO2 storage sites should be managed;**

Given the above, not applicable.

- **How the consenting and permitting regimes should work for CCUS;**

Amend the Climate Change Response Act 2002 to recognise and provide explicitly for the CCUS that arises from the industrial use of lime, in relation to the calcination emissions from the original calcination of limestone.

- **Whether there are any barriers to enabling the utilisation of carbon captured.**

Given the above, not applicable. The process in New Zealand concerns CCUS

Answers to consultation questions

1. Do you agree that the government should establish an enabling regime for CCUS? Please provide any further information to support your answer.

Yes. This regime should recognise the 100% and immediate CCUS arising from the industrial use of burnt or hydrated lime, in water treatment and food processing, and in relation to the original emissions from lime calcination.

Our reasoning is based on overseas research. In November 2023 the European Lime Association (EuLA) developed a policy position on carbonation. The use of lime is best described in EuLA's words:

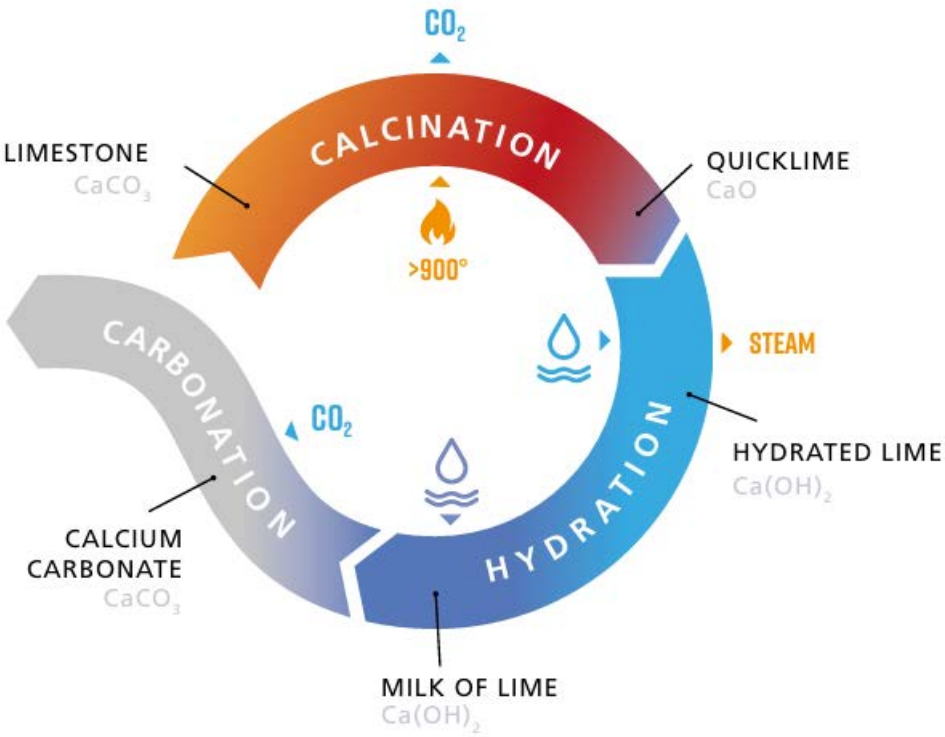
> *"Lime is one of those usually unseen products that has a profound effect on our daily lives. It is used in numerous industrial processes including steel manufacturing, building/ construction, food industry, agriculture, and many environmental applications to name just a few. It has been used all throughout history, such as when the Romans used lime mortar to build their empire. Today its*

> *versatile and unique characteristics help the construction and manufacturing industries optimise their products and it plays an important role in farming, food production and water treatment."*

*EuLA r*efers to literature research it commissioned in a paper titled Lime as a natural carbon sink. This says in its introduction of the industrial use of lime products:

> *"Studies show that in applications like purifying drinking water,* ***the carbonation rate amounts to 100 %****, meaning the full amount of process CO2 generated during lime production, is captured when this lime is used to produce drinking water. This CO2 is permanently captured and is not released to the atmosphere as the lime has reverted to limestone – CaCO3."*

EuLA provides a process diagram for the life cycle of limestone – lime manufacture – and the CCS of calcination emissions during the industrial use of lime.



It is important to note that not all industrial processes deliver 100% recarbonation of calcination emissions.

The literature review carried out by PoLiMi found the following rates of recarbonation in the following industrial processes:

- Aluminium, 12%, over time
- Steelmaking, 5-18%, over 3-6 months
- Mixed air lime mortars, 20%, over the life of a building
- Flue-gas treatment, 32%, immediate
- Hemp lime bricks, 55%, over the life of the building
- Air lime mortars, 80%, over the life of the building
- Pulp and paper, 93%, immediate

Note that processes concerning metals manufacture, and the exposure of hardened lime mortar to air are fundamentally distinct to the processes at issue in New Zealand, i.e. water treatment, and the closely related pH neutralisation processes in water in food processing industries such as sugar manufacture, and in tanneries.

2. Do you agree with our objectives for the enabling regime for CCUS? Please provide any further information to support your answer.

Yes. In particular, the objective of "environmental integrity" which we interpret to mean accurate carbon accounting for lime manufacture and subsequent industrial use, and recarbonation of the calcination emissions from lime manufacture, in respect of water treatment and in related processes.

3. Should the ETS be modified to account for the emissions reductions achieved using CCUS? If so, how do you think it should be modified?

Yes. A new section in the Climate Change Response Act 2002 is needed to codify:

- CO2 emissions from the calcination of limestone to produce lime (see calculations provided under the answer to question 8)
- CO2 capture and storage during the industrial use of lime, in water treatment and related industries, which produce precipitated CaCO3 as a waste sludge, collected and disposed of to landfill

The legislative or regulatory response should be to require lime manufacturers to account only for the fossil fuel component of the lime kiln operation (which already occurs), provided the product is used in water treatment or related industries.

That would minimise the administrative burden in fully and appropriately accounting for the dynamics of carbon in the limestone – lime – CCUS life cycle.

4. Do you agree that all CCUS activities should be eligible to receive recognition for the emissions captured and stored? If not, why not?

This submission concerns only the current, non-recognised CCS that occurs as an integral part of the industrial use of lime. This source of CO2 capture and storage should receive recognition, for accurate carbon accounting within the ETS system, as discussed above.

6. In your opinion, which overseas standards for monitoring, verification and reporting of CCUS-related information should New Zealand adopt?

Not necessary in the case of CCUS of calcination emissions from the industrial use of lime because the research referred to shows:

- 100% of CO2 capture and storage in the form of precipitated CaCO3 from the industrial use of lime, in water treatment and related industries
- The chemical reaction is almost immediate in its effects

7. Is there any other information that CCUS project operators should be required to verify and report? Please reference the relevant overseas standards where applicable.

In complying with the ETS, the lime manufacturer should report to the regulator, its customers of the product and tonnages, and the use to which the product will be put, i.e. water treatment or related industries. The regulator would respect the confidentiality of this information.

8. What methods should be used to quantify CO2 removal and storage in CCUS projects?

A stoichiometric approach can be taken because the chemical reactions are well understood and well documented. We provide calculations over the page, based on data from Webster's Hydrated Lime Limited:

0.3 tonnes of coal used per 1t of burnt lime (CaO)

0.6t of coal-related CO2 emissions per 1t of CaO

1t of limestone or calcium carbonate (CaCO3) contains 440kg of CO2

Associated with every 560kg of CaO is 440kg of CO2, recalculating

1t of CaO has 786kg of calcination emissions, recalculating

56% of kiln emissions from lime manufacture are calcination emissions

The policy implication of the above calculations is that lime manufacturers should have to declare only 44% of their kiln-related CO2 emissions under the ETS.

For an idea of scale, in 2022 the ETS-relevant emissions from lime manufacture were 101,252tCO2e, or approximately 0.13% of New Zealand's total gross greenhouse gas emissions.

Lime manufacturing emissions should be recognised in law (using the above figures) as:

- 44% – coal-related emissions, 44,551tCO2e (reported and eligible for industrial allocation under the ETS)
- 56% – calcination emissions, 56,701tCO2e (removed from ETS reporting requirements, as a mechanism of recognising CCUS of this component)

Note: further confirmation is required to ensure that all of the above emissions reported for lime manufacture concern the downstream use in water treatment, and related industrial processes.

13. Do you agree the proposed approach on liability for CO2 storage sites aligns with other comparable countries (like Australia)? If not, why not and how should it be changed?

Not applicable to CCUS from the industrial use of lime. Precipitated CaCO3 is a waste product that is disposed of to landfill, thereby permanently storing the captured CO2.

21. Are inconsistencies in existing legislation for consenting and permitting impacting investment?

Potentially. The risk arises of carbon leakage if fair and accurate carbon accounting for lime manufacturers (including the effects of subsequent use) is not introduced, as the level of industrial allocation under the ETS is progressively reduced over time under the CCRA.

22. Should the permit regime for CCUS operations be set out in bespoke legislation or be part of an existing regulatory regime (such as the RMA, EEZ Act, the CMA or the Climate Change Response Act 2002)? Please give reasons for your answer.

We propose targeted amendments to the CCRA to provide the following:

- Recognition of CCUS in the industrial use of lime
- Recognition that 100% of calcination emissions are captured and stored, and that this occurs almost immediately on the use of lime in an industrial process, ie water treatment and food processing, as an integral part of the process
- Require the lime manufacturer to account only for fossil-fuel related kiln emissions in the ETS

In this way, the CCUS that occurs in the limestone – lime manufacture – lime use – recarbonation life cycle is adequately recognised in the ETS system.

Concluding remarks

New Zealand's task of reducing GHG emissions, in playing our part in global climate change action under the Paris Agreement is not an easy one.

Where New Zealand can reduce emissions, we as a country should. That includes improving the accuracy of emissions accounting, and recognising permanent removals where they occur.

Recarbonation of lime is an example of a natural process, inherent in the industrial use of lime products, where the calcination emissions of lime manufacture are subsequently captured and stored, a form of CCUS.

In the case of water treatment, overseas research shows the level of recarbonation of calcination emissions is 100% and almost immediate. Food processing, e.g. sugar manufacture, and tanneries use hydrated lime for an analogous purpose, to neutralise the pH of water used in the industrial processes. Recarbonation into a calcium carbonate sludge is the process by which pH neutralisation of water occurs.

The NZLPA would welcome engagement with MBIE officials to scope how lime recarbonation can be recognised in law and other relevant statutory instruments, to appropriately reduce the exposure of lime manufacturers to the ETS, and to reduce New Zealand's GHG emissions via accurate carbon accounting.

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