Ballance agri-nutrients

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CCUS team

Ministry of Business, Innovation and Employment

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SUBJECT: Submission on the Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage

Ballance Agri-Nutrients Limited ("Ballance") would like to thank the Ministry for Business, Innovation and Employment (MBIE) for the opportunity to make this submission on the Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage (CCUS).

Ballance owns and operates the Kapuni ammonia urea plant. The proposed regulatory regime for CCUS is directly relevant from three perspectives:

- as a significant natural gas user, CCUS may enhance gas availability and affordability from high CO2 fields;
- as a potential exporter of CO2 from captured plant emissions for storage; and
- as a potential importer of CO2 for utilisation in conjunction with electrolytic hydrogen.

The manufacture of urea is an emissions-intensive, trade-exposed activity under the emissions trading scheme (ETS); integration of a CCUS regulatory regime with ETS industrial allocation policy is required. Our detailed submission is attached.

Should you require further clarification, please feel free to contact Mr Shane Dufaur.

[redacted]

Kelvin Wickham

Chief Executive Officer

Cc	Shane Dufaur	(GM Operations & Supply Chain)
	Joanne Mahon	(GM External Relations)
	Philip Barron	(Kapuni Asset Programme Manager)

Submission to MBIE on the

Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage

from

Ballance Agri-Nutrients Limited

Commercial Sensitivity: Attachment 3 contains commercially sensitive information.

1 Summary of Submission

1. Ballance Agri-Nutrients Limited ("Ballance") would like to thank the Ministry for Business, Innovation and Employment (MBIE) for the opportunity to make this submission on the Proposals for a Regulatory Regime for Carbon Capture, Utilisation and Storage (CCUS).
2. Gas supply concerns are very real and Ballance supports policy measures, including CCUS, that may prolong and/or increase the supply of affordable natural gas.
3. Ballance urges consideration of a broader national perspective for policy and legislation that can enable affordable, abundant, and reliable energy:
    a. Gas and electricity are highly interrelated.
    b. For Ballance's ammonia-urea facility, the greatest energy dependency is currently natural gas, as both fuel and feedstock. However, this dependency could transition towards electricity. This "electrification opportunity" is likely to be common for other gas users but may be hindered by high prices and risks of outage or need for (mandated) demand response.
4. The policy proposals for CCS, with focus on natural gas, are pragmatic and supported. Should a single operator of sequestration emerge, consideration is required of the need for a regulated rate of return for CCS facilities (including transmission).
5. The policy proposals for CCUS are less detailed and increased complexity of options is recognised.
    a. Ballance could be both an exporter and an importer of CO2.
    b. Policy proposals need to recognise that the source of CO2 may not be fossil fuel derived. The proposed ETS policy approach (NZUs issued or offset against liabilities) may not be sufficiently broad to provide incentives.
6. The technical and economic challenges of industrial process CCUS are higher than CCS in natural gas processing as highlighted in our submission.
7. For EITE firms including Ballance, CCUS policy will overlay industrial allocation policy. Clarity is required to ensure CCUS investment returns are not undermined by withdrawal of allocation.
8. Careful integration of a CCUS regulatory regime with ETS industrial allocation policy is therefore required to provide the right signals for investment.
9. Also important is that associated policy and enabling legislation are robust and enduring for all parts of the CCUS supply chain.
10. Ballance notes that the recently issued Draft Emissions Reduction Plan[1] relies on a significant contribution from application of CCUS technologies and infrastructure. Over-reliance on CCUS reductions in policy assessment should be avoided as:
    a. It may create an infeasible emission reduction plan.
    b. It could create false expectation of decarbonisation potential and timings for emitters.
11. Conclusion
    a. We support rapid development of legislation for CCUS.
    b. We support more in-depth study of CCUS policy requirements to ensure opportunities are enabled and expectations are realistic.

[1] Discussion Document – New Zealand's second emissions reduction plan; Ministry for the Environment; July 2024

2 Context of the Submission

2.1 Introduction

Ballance owns and operates the Kapuni ammonia-urea plant for the primary purpose of manufacturing nitrogen fertiliser in the form of urea, for domestic use. The plant also produces diesel exhaust treatment additive and raw material for industrial resins.

For Ballance, the proposed regulatory regime for CCUS is directly relevant from three perspectives:

a. as a significant natural gas user, CCUS may enhance gas availability and affordability from high CO2 fields;

b. as a potential exporter of CO2 from captured plant emissions for storage; and

c. as a potential importer of CO2 for utilisation in conjunction with electrolytic hydrogen.

Ballance Kapuni is classified as an emissions-intensive, trade-exposed ("EITE") participant under the ETS for the manufacture of urea, and accordingly receives an allocation of New Zealand Units to cover a proportion of its ETS cost exposure from purchased natural gas and electricity.

Careful integration of a CCUS regulatory regime with ETS industrial allocation policy is required to provide the right signals for investment.

In this section we highlight Ballance's focus on:

a. the importance of domestic urea manufacture,

b. climate change, and

c. industrial allocation policy.

Please refer to

a. **Attachment 1** Company Overview for background information on the business, and

b. **Attachment 2 -** Kapuni Ammonia-Urea Plant Details.

2.2 The Importance of Domestic Urea Manufacture

Nitrogen fertilisers such as urea are vital for farm productivity. Around half the world's population depends upon food grown with nitrogen fertiliser.

The Ballance ammonia-urea manufacturing facility based at Kapuni (Taranaki) is dedicated to domestic production. It satisfies approximately 30% of New Zealand's urea requirements, supplies significant volumes of diesel exhaust treatment additive (AdBlue®/GoClear), as well as acting as a key input into the manufacture of industrial resin adhesives for fibreboard, particle board, and plywood.

Domestically manufactured urea contributes directly to New Zealand's comparatively low-emission, primary industries sector, and provides significant supply security for our farmers. In particular:

a. Domestically manufactured urea has one of the lowest carbon emissions profiles for nitrogen fertilisers.

b. Recent geopolitical events underscore the strategic importance of surety of supply for domestic urea production in New Zealand.

Ballance submits that substitution of locally produced urea for imported urea from higher-emitting producers, is counter-productive.

Please refer to **Attachment 2** – Kapuni Ammonia-Urea Plant Details, for information on the current manufacturing route.

2.3 Climate Change

Ballance supports New Zealand's commitment to reduce emissions through the development of manufacturing decarbonisation programmes and within our science-based initiatives to help farmers and growers produce more sustainably.

Reducing greenhouse gas emissions in New Zealand is fundamental to climate change mitigation and emissions reduction commitments. Such commitments reflect the social, economic, and environmental aspirations of the nation, and contribute directly to the vision of being internationally pre-eminent as a producer of high-quality, high-value, low-carbon food.

Delivery of this vision requires an end-to-end transformation in the way New Zealand's industries, including primary production, function and operate. Decarbonisation is intrinsic to this transformation, and, in many cases, will require fundamental changes in the manufacturing, production, and distribution processes of industry participants.

2.4 The Importance of Industrial Allocation Policy

As noted above, Ballance is classified as an EITE participant, and operates in a market open to urea imports from nations that do not place a price on carbon emissions from manufacture of urea.

In the absence of a global carbon price on urea manufacture, NZ ETS industrial allocation remains a critical policy to address trade exposure and emissions leakage. Ongoing certainty as to the availability of this allocation is also necessary to support continued investment in emissions reduction programmes and technologies, including CCUS.

3 Ballance Decarbonisation Pathways

3.1 Decarbonisation Evaluations

Between 2020 and 2024, Ballance completed a comprehensive review of decarbonisation options for its ammonia-urea plant. The purpose of the review was to seek a pathway to ultimately abate more than 90% of manufacturing CO2 emissions, estimated to be (on average) approximately 180,000 tpa.

The review program addressed a wide range of options and involved support from local consultants and leading international ammonia technology providers. In parallel, Ballance applied EECA's 'Energy Transition Accelerator' approach to help define potential decarbonisation pathways.

Options considered included; plant efficiency programs, plant electrification, hydrogen production from electrolysis with electricity supplied from renewable energy sources, and carbon capture.

3.2 Potential CCUS Use-Cases

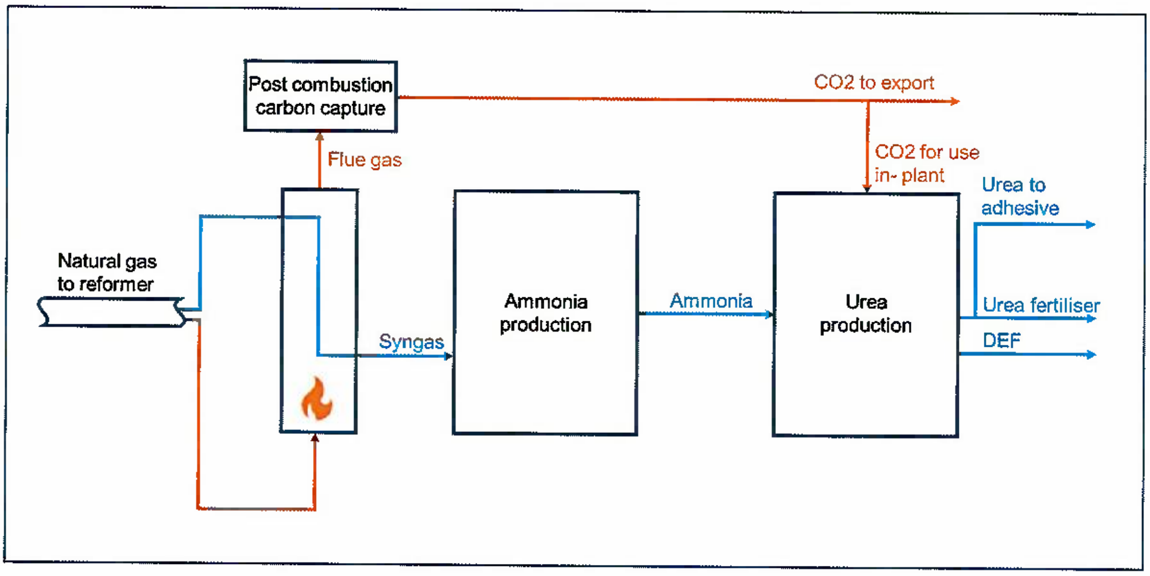
CCUS opens up alternative decarbonisation pathways to Ballance.

During its review of decarbonisation options, Ballance evaluated the potential for post-combustion carbon capture from key process components. The relative merits of the options depend on factors such as technology maturation, energy costs, equipment costs, carbon costs, and climate change policy settings.

For Ballance, the contemplated CCUS framework is relevant for two distinct pathways: those involving CO2 export for sequestration; and those involving CO2 import for nutrient production.

Examples are illustrated in the block diagrams below.

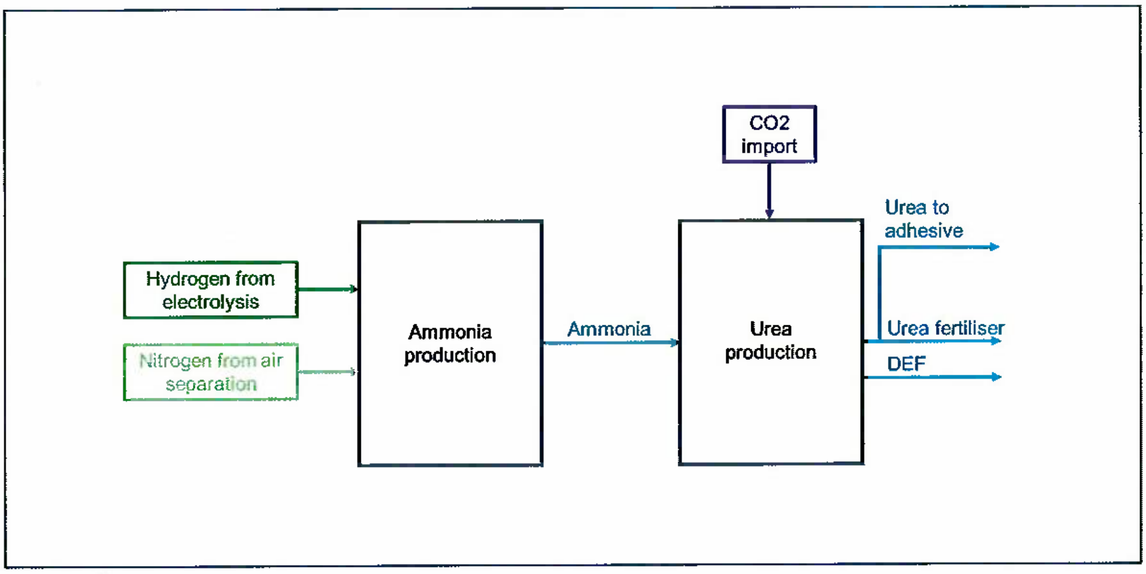
Figure 1 : Scenario 1 – Post-Combustion Carbon Capture



Note: Gas feedstock could be natural gas, biogas, or a blend.

In the first scenario, synthesis gas (a blend of hydrogen, carbon monoxide and carbon dioxide, with traces of residual methane and water) is generated in the primary reformer. Natural gas is used on the process side to produce the synthesis gas, while a separate gas stream is combusted to provide heat for this energy-intensive process. The flue gas from combustion contains CO2 and is treated in a CO2 capture process. A portion of the captured CO2 may be used on-plant for urea production, while the remainder is available to export for sequestration.

Figure 2 : Scenario 2 – Green Ammonia and CO2 Import



In the second scenario, "green" ammonia is produced using hydrogen generated via electrolysis with electricity supplied from renewable resources. Urea production requires a CO2 stream, which in this case is imported from a third party.

The CCUS policy needs to support both such scenarios.

4 Submission Points

4.1 Technical Considerations

CCUS is technically more challenging and less mature for application in the petrochemical industry than in gas production.

CCUS processes for carbon abatement as considered in this policy are still becoming established. As per paragraph 27 of the Regulatory Impact Statement[2], there are only approximately 45 commercial capture and sequestration plants in operation globally.

More specifically, CCUS technologies in *post-combustion* service (as would apply at the Kapuni plant) are significantly less mature and more complex than for pre-combustion. Pre-combustion CO2 removal is a very well-established process in gas processing, with many operational plants worldwide. By contrast there are relatively few operational post-combustion CO2 removal plants. The complexities relate to:

- Low pressures – post combustion emissions are generally at or near atmospheric pressure and require compression prior to and after treatment, increasing the cost and energy intensity[3].
- Low concentrations – CO2 only typically constitutes <10% of flue gases. This requires large pre-compression and CO2 removal equipment.
- Contaminants – combustion products in the flue gas can lead to contamination of the CO2 removal solvent, requiring additional process steps.

4.2 Economic considerations

Compared to natural gas processing, the costs are correspondingly higher for CO2 recovery in industrial processes, and more specifically for petrochemical processes such as the Kapuni plant. This is illustrated in Figure 2 in the Regulatory Impact Statement, sourced from the International Energy Agency[4]. The figure shows cost ranges for CO2 capture for both "Ammonia" and "Hydrogen (SMR)" (Steam Methane Reforming of natural gas) applications. The upper end of the Hydrogen (SMR) cost bar is applicable for Kapuni, as explained in a footnote to the figure on the IEA website which states that the upper end "applies to CO2 capture from the more diluted stream coming out of the SMR furnace", as per the Kapuni application in **Figure 1** above[5].

Furthermore, for industrial emissions, where it is likely that a third party would provide the storage service, the associated CCS costs would involve an additional tariff not included in the costs as presented by IEA.

4.3 Implementation Considerations

Due to the relative technical complexity, economy of scale, and access to gas storage reservoirs, gas producers will likely be able to utilise CCS more cost effectively, and earlier, than industrial consumers can apply either CCS or CCUS.

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[2] Regulatory Impact Statement: Policies for Carbon Capture, Utilisation and Storage, 2024.

[3] The Wood Beca report only estimates costs for compression from 3 bar to 120 bar. An additional stage of compression is required to recover gases from atmospheric pressure to 3 bar.

[4] IEA website, "Levelised cost of CO2 capture by sector and initial CO2 concentration, 2019".

[5] The footnote in the IEA website also states, "the lower end of the cost range applies to CO2 capture from the concentrated "process" stream". (Presumably this is also the case for the lower costs shown for ammonia production.) In the Kapuni case CO2 removed from this concentrated and higher pressure stream is utilised on-site in the urea manufacturing process so is not a candidate for CCS.

The Government's Climate Implications Assessment assumes petrochemical reductions commencing in 2030. We note the Regulatory Impact Statement paragraph 170 states "*early 2026 could be the earliest time for such regulations to be introduced*". We consider that the lead time for such a program would be at least five years.

Given the activities required to support a final investment decision (e.g. technical assessments, consenting activities, commercial agreements), as well as the time to physically procure and install facilities, it could be considered ambitious to expect emissions reductions from CCUS facilities to commence in early 2030.

Please refer to Attachment 3 for a commentary on the third-party reports referenced in the Consultation Document.

5 Detailed Response to Submission Questions

New Zealand Government's Position on CCUS

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

Yes

- Establishing an enabling regime for CCUS, with a clear regulatory framework and due consideration for integration with the ETS, would signal to investors, operators and users that the Government sees CCUS as an important and valid emission reduction methodology.
- CCUS will require significant investment (capex) and ongoing operating costs and compliance costs. Legislative durability is therefore critical to enable CCUS.

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

Ballance agrees with the three stated objectives.

- *Efficient emissions abatement* – The clear recognition of CCUS may enable further options for Ballance and other businesses to reduce emissions.
- *Environmental integrity* – This is an important objective to ensure legislative durability and acceptance from wider stakeholders. The enabling regime should not offer benefits for the development and use of CCS without adequate regulation and controls of the CO2 storage facility.
- *Energy security* – New Zealand is facing significant natural gas supply shortages, with demand expected to outstrip supply for the next three years and longer-term prospects significantly more uncertain. As a significant gas user for feedstock and fuel, Ballance supports measures that can enable full availability of known gas reserves, through storage or utilisation of high CO2 gas fields, supporting New Zealand's transition to a low-emissions economy (alongside development of further renewable energy generation).

Treatment under the Emissions Trading Scheme (ETS)

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

Ballance supports modifying the ETS to account for CCS.

- The proposal set out in the Consultation Document and the associated Regulatory Impact Statement (RIS) is option 4: *"a combination of option 2 (receiving NZUs for removals under ETS) and option 3 (allowing subtraction of emissions captured and stored from ETS liability)"*
- This is supported as it provides for a 3rd party operation of a CCS facility to receive NZUs as well as for a gas miner or other liable party to directly offset its unit surrender liability should it directly capture and store a portion of its own emissions.

Although such a mechanism is intuitively simple and appropriate for CCS in the upstream gas sector, wider consideration is required for other potential applications:

- The Climate Change Response Act 2002 (CCRA) Schedule 4, Part 2, Subpart 2 currently in force would enable CCS through an Order in Council. Paragraph (a) restricts CCS recognition to where "*(a) a person is required to surrender units under* *this Act in respect of the emissions that would result if the carbon dioxide was not captured and stored*".

- This could block CCS opportunities such as:
    - Bioenergy CCS (BECCS) noting that forestry is deemed out of scope in the consultation document and not all forestry is captured by the NZ ETS (e.g. pre-1990 harvest and post-89 non-opted in forestry);
    - Biogas emissions; and
    - in the longer-term, potential direct air capture (DAC) technologies.
- Ballance recommends that the legislation should be agnostic to the source of the CO2.

For Ballance, clarity is required on how direct receipt of NZUs will be treated for its own CCS activity, or indirect receipt of NZUs or funds from a 3rd party CCS service provider.

- The ETS legislation currently provides NZUs for the export of products with embedded carbon under CCRA Schedule 4, Part 2, Subpart 1.
- In the case of an EITE activity exporting a product with embedded carbon in it, precedent is that there is a deduction of the Removal Activity NZUs received in the calculation of industrial allocation. In this situation, it may be appropriate as no additional capex is required to receive Removal Activity NZUs.
- In the case of industrial CCS or CCUS, substantive capex and opex will be required, noting that as shown in RIS Figure 2 (CO2 capture costs for different industrial processes) the costs are materially higher than those for gas processing.
- Investment in CCUS is therefore unlikely unless there is legislative clarity that industrial allocation will not be undermined (through a reduction in allocative baseline, accelerated level of assistance phasedown, change in eligibility or other mechanism).

**Ballance acknowledges the important amendment to legislation made in 2023 which now deems externally sourced CO2 as an eligible emission source in the assessment of industrial allocation (CCRA s161E(2)(a)(i)(G).*

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

Yes, however as highlighted above, the current CCRA provisions may be restrictive.

5. *Do you think there should be a separate non-ETS mechanism for providing economic incentives for CCS? If so, what would this mechanism be?*

Alternative non-ETS mechanism for providing economic incentives may be required in the following circumstances:

- Should the proposed regulatory regime not recognise all potential CO2 sources such as biogas, bioenergy and direct air capture (refer Q3 above).
- Should the proposed regulatory regime undermine CCUS investment returns for EITE firms through post-investment reduction of industrial allocation (refer to Q4 above), or
- Should the Government wish to accelerate the implementation of CCUS at a faster pace than the firm's economic assessment could otherwise justify.

Incentive measures could include grant funding, investment tax credits, or specific agreements on ETS treatment.

Monitoring regime for CCS activities
6. *In your opinion, which overseas standards for monitoring, verification and reporting of CCUS-related information should New Zealand adopt?* 7. *Is there any other information that CCS project operators should be required to verify and report? Please reference the relevant overseas standards where applicable.* 8. *What methods should be used to quantify CO2 removal and storage in CCUS projects?* 9. *Are additional mechanisms required to ensure compliance with monitoring requirements?* 10. *What level of transparency and information sharing is required?* 11. *Do you consider there should a minimum threshold for monitoring requirements so that small-scale pilot CCS operators would not have to comply with them? If so, what should be the threshold?* In respect of Q6-Q11, Ballance recommends that: • International precedents from developed countries with comparable environmental and economic policies should be adopted. • IPCC methodologies for quantification of CO2 removal and storage should be used where available. • That the current ETS principles of self-reporting with EPA governance and reporting should apply.
12. *Should a monitoring regime extend to CCU activity?* Where externally sourced CO2 is used, this should be tracked as an input. However, in the case of internally sourced CO2 this is not warranted: • At the Kapuni ammonia urea site, CO2 generated in the steam methane reformer is separated from the main gas stream and later reacted with ammonia to make urea. (Ref Figure 4 and Figure 5 in Attachment 2) • This is fully managed within the plant boundary and no separate monitoring is required.
Liability for CO2 storage sites
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?* 14. *Is the proposed allocation of liability consistent with risks and potential benefits? Are there other participants that should share liability for CCS operations?* 15. *Should liability be the same for all storage sites if projects are approved? Or should liability differ, depending on the geological features and characteristics of an individual storage formation?* 16. *Do you consider there should a minimum threshold for CCUS operators being held responsible for liability for CO2 storage sites so that small-scale pilot CCS operators would be exempt? If so, what should be the threshold?*

17. *Should the government indemnify the operator of a storage site once it has closed? If so, what should be the minimum time before the government chooses to indemnify the operator against liabilities for the CO2 storage sites?*

18. *Are additional insurance mechanisms or financial instruments required to cover potential liabilities from CO2 leakage in CCS projects?*

19. *What measures should be implemented to monitor CCS projects for potential leakage and ensure early detection?*

20. *Do you agree that trailing liability provisions are needed? How do you think they should be managed?*

In respect of Q13-Q20, Ballance recommends that where possible New Zealand adopts the same approach on liabilities for CO2 storage sites as Australia, its closest trading partner and competitor for capital.

On Q14, Ballance recommends that the liability should reside with the CCS site operator and not shared with CO2 producers for whom the site operator is providing the storage service.

Consenting and Permitting for CCUS

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

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.*

In respect of Q21 and Q22, currently, different rules and policy frameworks apply across regions, and multiple consents or permits under different pieces of legislation are required, making certainty of investment challenging and unduly inefficient and time-consuming.

To enable CCUS to proceed within the timeframes envisaged in the consultation documents and the draft Second Emission Reduction Plan, Ballance recommends that the Government considers:

- Amendment to the purpose of the EEZ Act to acknowledge renewable energy and climate change commitments.
- The development of a national direction on CCUS activities under the RMA and EEZ Act.

23. *Should CCS project proponents be required to submit evidence that proposed reinjection sites are geologically suitable for permanent storage, in order for projects to be approved? If so, what evidence should be provided to establish their suitability?*

Ballance considers this an appropriate requirement and that international and industry precedents for the nature of the evidence required should evaluated.

24. *Should there be separate permitting regime for CCU activity if there is no intention to store the CO2?*

Ballance recommends against such a separate permitting regime:

- The list of existing carbon capture and utilisation in New Zealand on p12 of the consultation document are all end use applications with their own individual compliance requirements.

• Underneath that list, manufacture of chemicals is described under "emerging uses of CO_2" yet in Ballance's case urea manufacture is current and operating under an existing permitting regime. No benefit from a CCU specific regime is foreseen and it could instead add additional compliance costs and obstacles to decarbonisation.
Carbon capture and utilisation
25. Are there regulatory or policy barriers to investment and adoption of CCU technologies?
26. What potential markets for CO_2 derived products do you see as most critical in New Zealand? Ballance notes that the discussion document is largely silent on the current use of internally generated CO_2 in the manufacture of chemicals e.g. urea and methanol. It is important that the proposed regulatory framework does not inhibit existing activities.
27. Are there any specific barriers to transportation of CO_2? For large industrial users, the primary barrier is the availability of suitable pipelines and the energy required to transport the CO_2. An economic barrier could emerge should CO_2 transport pricing be subject to excessive pricing power, in which case a regulated pricing regime should be considered. This concern would also extend to CCS site operators providing storage services to 3rd parties.

6 Table of Acronyms and Abbreviations

CAPEX	Capital expenditure costs
CCRA	Climate Change Response Act
CCS	Carbon Capture and Storage
CCUS	Carbon Capture Utilisation and Storage
CMA	Crown Minerals Act
CO2	Carbon Dioxide
CO2e	Carbon Dioxide equivalent
DAC	Direct Air Capture
EECA	Energy Efficiency and Conservation Authority
EEZ	Exclusive Economic Zone
EITE	Emissions-Intensive, Trade-Exposed
EPA	Environmental Protection Agency
ERP	Emissions Reduction Plan
ETS	New Zealand Emission Trading Scheme
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MfE	Ministry for the Environment
NPV	Net Present Value
NZU	New Zealand Units
RIS	Regulatory Impact Statement
RMA	Resource Management Act
SMR	Steam Methane Reformer
t	tonne
tpa	tonnes per annum
tpd	tonnes per day

7 Attachment 1 – Company Overview

1. Ballance Agri-Nutrients (Ballance) is a farmer-owned co-operative. It has approximately 16,800 shareholders, 800 staff throughout New Zealand and in the last financial year had a turnover of $1.2 billion and total sales of 1.2 million tonnes of nutrient products and industrial ingredients.
2. Ballance owns and operates super-phosphate manufacturing plants located in Mount Maunganui and Invercargill, and New Zealand's only ammonia-urea manufacturing plant located at Kapuni, South Taranaki. Ballance also owns and operates SuperAir, an agricultural aviation company with high precision technology SpreadSmart, along with a network of fertiliser storage and dispatch facilities across the country.
3. As a co-operative, Ballance places a strong emphasis on delivering value to its farmer shareholders and on the use of the best science to inform and deliver sustainable nutrient management, including supporting improvements in on-farm environmental performance.
4. Ballance has a proud history of innovating to support its purpose of *Together, creating the best soil and food on earth*. It was the first in New Zealand to coat urea with our SustaiN product, reducing on-farm nitrogen losses by more than 10%. Our SurePhos product is a first in the world in single super phosphates (SSP), reducing phosphate losses by up to 75% compared to regular SSP.
5. Ballance's in-house industrial engineering and science expertise actively engages with others with global expertise in low emissions nutrient manufacturing to create opportunities for a co-development pathway on new technologies.
6. Its approach to innovation is also well demonstrated by the Sustainable Food and Fibres Futures (SFFF) Program, focused on improving water quality, reducing GHG emissions and decreasing agricultural chemical use. Estimates show that annual benefits in excess of $1 billion could be achieved by Year 10 of the SFFF for the sheep and beef, dairy, forestry, horticulture, and arable sectors.
7. Complementing this, Ballance is a proud sponsor of the Ballance Farm Environment Awards (BFEA). These awards have been running for over 25 years and learnings from the awards themselves, along with decades of scientific research are passed on to over 20,000 farmers and growers via our Science Extension Team. This team offers significant expertise and advice to farmers and helps them deliver on their productivity goals while achieving a lighter environmental footprint.
8. Ballance also has a dedicated Farm Sustainability Services Team that helps farmers develop tailored sustainable nutrient management plans, ensuring efficient performance from the land, whilst leaving it in good condition for future generations. This team also help farmers meet their compliance requirements and respond to rapidly changing regulations. As well as supporting New Zealand farmers, Ballance also supplies products to a range of domestic applications:
    - Urea is used in the production of formaldehyde based resins, a key ingredient in the wood processing sector for the manufacture of particleboard and MDF.
    - An extremely high purity urea solution is used to produce GoClear (sold as AdBlue) at the Kapuni plant. GoClear is an exhaust system additive and scrubbing agent that reduces harmful nitrogen oxide (NOx) emissions from diesel engines, breaking the NOx down into harmless water vapour and nitrogen gas. GoClear has been supplied to the largest vehicle fleets in New Zealand for many years.
    - Other products important to non-farming industries including: ammonia; sulphuric acid used in the dairy, pulp and paper, and power generation industries; and hydrofluorosilicic acid, both used in drinking water treatment processes.

Attachment 2 – Kapuni Amonia-Urea Plant Details

Ballance owns and operates New Zealand's only ammonia-urea plant located on a 32.4 hectare site at Kapuni in South Taranaki.

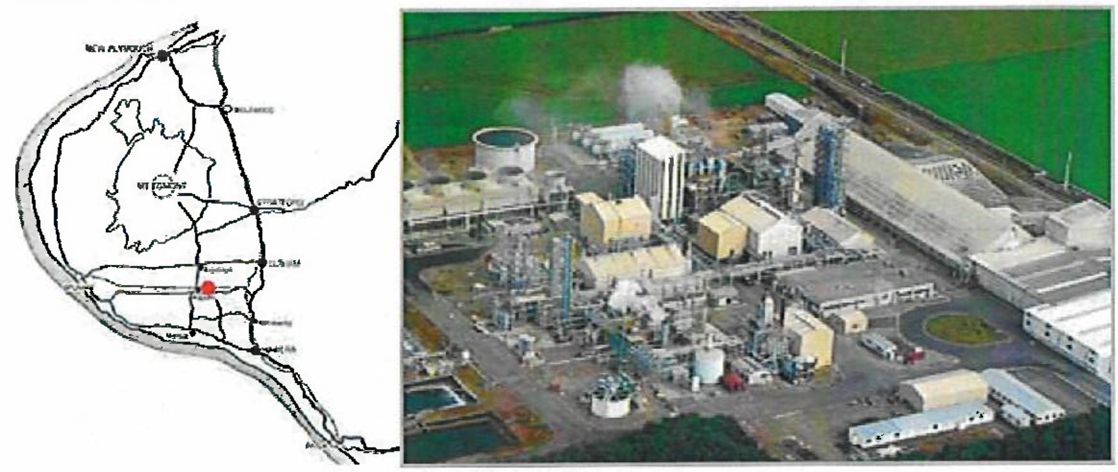
The facility consumes approximately 7 petajoules (PJ) of natural gas annually and has a maximum demonstrated rate of 475 tpd ammonia to support production of 825 tpd of granular urea. Urea is used as a nitrogen-rich fertiliser in the agricultural, horticultural, and forestry sectors, and as a component in the manufacture of diesel emissions fluid and resins.

Today, urea production at Kapuni satisfies about one third of New Zealand's total demand for urea. Remaining demand is met through imports sourced primarily from the South-East Asia, Middle East, and China. Ballance is therefore in direct competition against countries with less stringent international climate change obligations.

The company makes a significant economic contribution to the local economy, employing about 150 full time staff and contractors.

The location and scale of Kapuni site is illustrated in Figure 3 below.

Figure 3 – Kapuni Ammonia-Urea Plant



The Kapuni Ammonia-Urea Plant

The plant commenced operation in 1983 and was designed as a single site integrated ammonia-urea plant, ammonia being an intermediate product in the conversion of natural gas to urea.

The development was one of a several "Think Big" projects instigated by the Government of the day. It was envisaged that the plant would help New Zealand's balance of payments by exporting urea. However, growth in domestic demand means that today, all sales are for domestic consumption.

A major upgrade was carried out in 1996 to increase production and reduce energy use through closer heat integration of the ammonia and urea sections of the plant. Figure 4 and Figure 5 below show the primary chemical reactions and plant configuration for the manufacture of each of ammonia and urea.

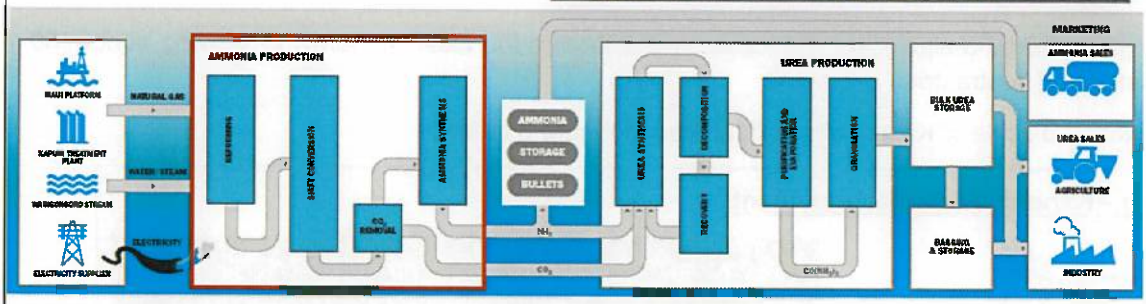
Figure 4 – Ammonia Production Step

$$CH_4 + 2H_2O \Leftrightarrow 4H_2 + CO_2$$

gas + steam ⇔ hydrogen + carbon dioxide

$$N_2 + 3H_2 \Leftrightarrow 2NH_3$$

nitrogen + hydrogen ⇔ ammonia



Notes

- *Nameplate capacity : 475 tpd;*
- *Manufacturing CO2 emissions : ~195,000 tpa.*

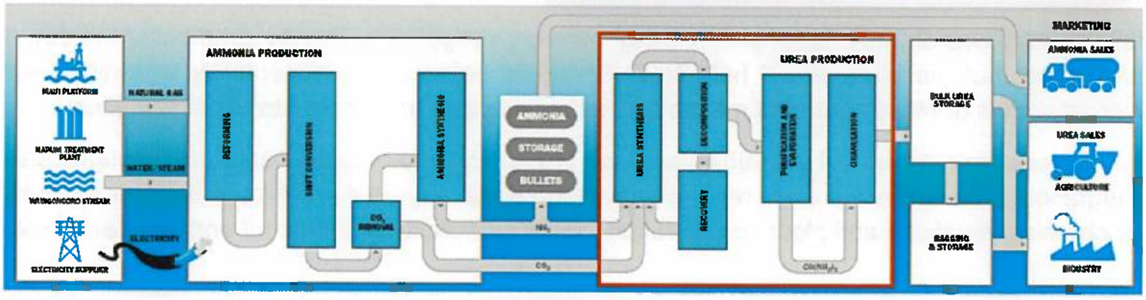
Figure 5 – Urea Production Step

$$2NH_3 + CO_2 \Leftrightarrow NH_2COONH_4$$

ammonia + carbon dioxide ⇔ ammonium carbamate

$$NH_2COONH_4 \Leftrightarrow H_2O + NH_2CONH_2$$

ammonium carbamate ⇔ water + urea



Notes:

- *Ammonia and carbon dioxide from the ammonia production step is converted to ~825 tpd of urea.*
- *Urea is produced in granular form allowing easy and safe storage and transportation.*
- *Approximately 15 million litres pa of 'GoClear' is produced.*

[redacted]

[6] Review of CCUS/CCS Potential in New Zealand; Wood Beca for the Gas Industry Company, 28 March 2023

[7] Based on a simple discounted cashflow analysis using the same capex, opex and discount factor assumptions as the Wood Beca case studies and calculating a 'real terms' CO2 price that would offset the CAPEX expenditure and create a breakeven NPV position. As per the Wood Beca assessment, tax and depreciation factors were not considered.