Regulatory Impact Statement: Policies for Carbon Capture, Utilisation and Storage

Coversheet

Purpose of Document	
Decision sought:	*Release a public consultation document on policies for carbon capture, utilisation and storage*
Advising agencies:	*Ministry of Business, Innovation & Employment*
Proposing Ministers:	*Minister for Energy*
Date finalised:	*24 June 2024*

Problem Definition

Carbon capture, utilisation and storage (**CCUS**) could reduce the emissions intensity of industries, such as natural gas production, steel production and cement production. Natural gas is a key fuel for the energy transition but supply is struggling to meet demand. CCUS has the potential to improve the economics of natural gas production, thereby facilitating a smoother transition towards a low emissions future.

However, due to regulatory uncertainty, CCUS is not on a level playing field with other emission-reduction options, which could prevent businesses from reducing emissions at the least cost. The Emissions Trading Scheme (**ETS**) does not provide economic incentives for CCUS activities (other than those in the forestry and geothermal sectors) and there are no clear emission accounting and monitoring rules for them. The existing consenting and permitting regimes are not well suited for CCUS, e.g. there are potential inconsistencies in consenting decisions for CCUS and a lack of clarity about who bears the long-term liabilities for the carbon dioxide (**CO_2**) storage sites.

Executive Summary

This RIS is not intended to cover forestry CO_2removals. The regulatory regime covering these is already fully developed and implemented.

CCUS could be deployed to remove emissions and reduce the emissions intensity of industries, such as natural gas production, steel production, and cement production. CCUS outside forestry involves capturing CO_2 from point sources or the atmosphere, transporting and storing it in sites like depleted oil and natural gas reservoirs. To store CO_2, captured CO_2 must be injected into underground geological reservoirs, which prevent release of the stored CO_2.

CCUS deployment has been growing in some countries, such as Norway. In New Zealand, up to 4.653 million tonnes in total could be stored underground through CCUS projects in the period 2026 – 2035. However, CCUS uptake in New Zealand is low, as its regulatory treatment means it is not on a level playing field with other options for reducing or removing emissions.

CCUS provides an opportunity to reduce emission costs, thereby improving the economics of industries, particularly natural gas production. It could potentially help improve the security of our natural gas supply. Natural gas remains a key fuel for electricity generation

and other industries during our transition to a low emission economy. However, natural gas supply is not keeping up with demand. This could affect our electricity supply and other industries reliant on natural gas.

Impediments to CCUS in New Zealand

The ETS is limiting incentives for removing emissions through CCUS. There are no ETS regulations for recognising and rewarding emissions removed and sequestered through CCUS activities, apart from those in the forestry and geothermal sectors. There is also no monitoring and liability regime to provide assurance about emissions sequestered by CCUS projects.

Subject to further consultation, we note some concern that the existing consenting and permitting regime for resource management is not well-suited for CCUS in the following respects:

- It is unclear who would bear the long-term liabilities for the CO_2 storage sites after the completion of the CO_2 injection.
- Although consent conditions and bonds provide a possible method of regulating CCUS in the post-injection period, there is some uncertainty in the stringency of the conditions, and how effectively those conditions are enforced.
- There are no guiding principles for consenting decisions for CCUS projects, and what conditions might be appropriate for managing the CO2 storage sites.
- Due to the definition of "dumping" under the *Resource Management Act 1991* (**RMA**), CO_2 injection into an underground natural gas reservoir could be prohibited in the Coastal Marine Area.

Options for ETS treatment of CCUS

We have considered the following options for creating economic incentives for CCUS in this interim RIS:

- Option 1: status quo
- Option 2: allowing all ETS participants to receive New Zealand units (**NZUs**) through CCUS
- Option 3: allowing subtraction of emissions captured and stored from ETS liability
- Option 4 (preferred): a combination of options 2 and 3
- Option 5: recognising and rewarding CCUS through a separate carbon credit scheme, which could target the energy and industrial sectors only.

Our initial analysis suggests that option 4 would be the preferred option for providing economic incentives for CCUS. As option 4 would allow CCUS operators to receive and trade NZUs, it would effectively create a level playing field for all CCUS operations (both forestry and non-forestry CCUS) where businesses consider the least-cost approach to reducing emissions. It could encourage CO_2 storage for third parties, thereby improving the chance of developing large-scale hub models of operation for CCUS. By giving the choice to deduct emissions from ETS liability instead of receiving units, option 4 would also allow businesses carrying out small-scale CCUS projects to avoid brokerage fees for emissions trading.

Options for monitoring emissions relating to CCUS activities

We have considered the following options for monitoring emissions removed or sequestered through CCUS in this interim RIS:

- Option A: status quo
- Option B: voluntary reporting on removal or sequestration activities in emissions calculations (i.e. ETS participants could choose not to report the CCUS-related data if they chose not to factor in CCUS in their emissions calculations; those factoring in CCUS could choose their own emission accounting method)
- Option C (preferred): creating regulations on the monitoring, verification and reporting regime for CCUS activities under the ETS
- Option D: creating a separate carbon accounting regime for CCUS operators (outside the ETS).

Our preferred option in this interim RIS is option C, as it would provide a credible monitoring regime for CCUS and would be less complex to administer than option D. The costs in monitoring could be in the range of tens of thousands of dollars to hundreds of thousands of dollars per survey, depending on the monitoring technology deployed.

Options for assigning the long-term liability for CO_2 storage sites

We have considered the following options for assigning the long-term liability for CO_2 storage sites in this interim RIS:

- Option I: status quo (rely on existing consent conditions)
- Option II: create a permit regime for CCUS activities, including requirements for monitoring CO_2 storage sites and completing a financial capability assessment (if requested)
- Option III: create a permit regime for CCUS activities, including information disclosure requirements, transfer of responsibility to government after site closure, and financial security
- Option IV: the government takes over the long-term liability and sets up a post-closure stewardship fund with contributions from CCUS operators
- Option V (preferred): create a permit regime under option II and require CCUS operators to cover the liability until government opts to indemnify.

In this interim RIS, we consider that option V would be the most balanced. Under option V, there would be some assurance about the integrity of the CO_2 storage sites, while CCUS operators' financial liability for these sites might not be significantly different from the status quo — if the site does not leak, there would not be any cost associated with site remediation. During public consultation, we will seek stakeholders' views on the merit of requiring financial security from CCUS operators.

This is an interim RIS prepared before public consultation on CCUS policy options. While we have had some preliminary discussions with the natural gas industry about the regulatory barriers to CCUS, and publicly consulted on CCUS in the Gas Transition Plan Issues Paper, we have not yet consulted on specific policy options. The result of the

coming public consultation will be used to design the final policy options, which will be presented with a full RIS.

Limitations and Constraints on Analysis

The Government's coalition agreements include the following commitments:

- to future-proof the natural gas industry by restarting offshore exploration and to repeal the offshore oil and gas exploration ban (under the National-NZ First coalition agreement)
- to repeal the ban on oil and gas exploration to reduce New Zealand's reliance on imported coal and ensure gas can be used as a transition fuel as we move towards Net Zero 2050 (under National's 100-point economic plan).

We have developed policy options in accordance with these commitments and based on the assumption that natural gas will continue to be a transition fuel important to electricity generation[1] and manufacturing.

This interim RIS does not discuss the following policy options:

- changing the regulatory settings that directly regulate petroleum exploration and mining activities (this work is being progressed separately)
- government funding arrangements for investment in CCUS (the Government has ruled these out due to the tight fiscal environment)
- mandating the use of CCUS technologies in industries, such as power plants and natural gas plants (our objective is to reduce emissions at least cost and CCUS may not always be the least-cost abatement option)
- options to remove barriers to create new electricity generating capacity or switching to lower emissions fuels (there is other policy work in relation to addressing these barriers, e.g. the reform of the resource management regime).
- options for the consenting regime under the RMA. (Subject to public consultation, we note some aspects of the consenting regime could be clarified, such as the treatment of CCUS in the Coastal Marine Area. However, we do not propose options for amending the RMA or developing associated regulations at this stage, given the Government's resource management work programme that is underway)
- options for the consenting regime under the *Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012* (**EEZ Act**) (Subject to public consultation, our preliminary assessment suggests that it is broadly neutral to CCUS)
- forestry CO_2 removals, the regulatory regime covering these is already developed and implemented.

We have not been able to quantify with confidence the potential impacts of the CCUS policy options on businesses at the firm level and the flow-on mitigating effects on fluctuations in natural gas and electricity prices[2] in this interim RIS due to:

- a lack of access to commercial information held by businesses that could be interested in investing in CCUS

1 Natural gas is currently a source of energy for electricity generation and co-generation.

2 As natural gas is used for electricity generation, natural gas prices affect electricity prices to some extent, particularly when electricity demand peaks in winter months.

- uncertainties in carbon price and how future technological developments could impact the relative costs of CCUS and other methods for reducing net emissions
- the complexity of the factors affecting electricity and natural gas prices.

We have not quantified the environmental risks of CO_2 leakage from CO_2 storage sites in New Zealand, and the potential costs of remediating these sites in case CO_2 leakage from these sites in this interim RIS. The environmental risks and potential remediation costs would depend on a range of factors, such as the geological features or engineering design of the sites concerned, the location, and the extent of the leakage. They could be considered through the consent decision-making process and any permit regime that could be set up to keep oversight of CCUS activities and CO_2 storage sites.

The CCUS work has estimated the amount of CO_2 that could be stored out to 2035 based on a series of assumptions. These assumptions are transparent and will be tested during consultation and revised as needed later this year. The impact of CCUS on the long-term operation of the ETS will be complex and need additional analysis to understand. For example, more analysis is needed to determine:

- if there would be emissions impacts from gas production or use additional to those already considered, and
- how an increase in CCUS (in combination with other actions in the second emissions reduction plan (ERP2) which is still being developed) could change the NZU supply and demand outlook.[3]

We intend to complete this analysis in conjunction with the Ministry for the Environment (**MfE**) and the Environmental Protection Authority (**EPA**) as part of the design of the regime post consultation. We will also work with MfE to incorporate our updated understanding of the potential emissions impact of CCUS into the whole of economy modelling.

This interim RIS provides our initial assessment of CCUS policy options to facilitate public consultation, rather than a full RIS for final policy decisions. While we have had some preliminary discussions with the natural gas industry about the regulatory barriers to CCUS, we have not yet consulted on specific policy options. The results of the coming public consultation will be used to design the final policy options, which will be presented with a full RIS.

Responsible Manager(s) (completed by relevant manager)

Dominic Kebbell

Manager, Gas and Fuel Policy, Ministry of Business, Innovation and Employment

24 June 2024

3 All emissions in the gas sector are covered by the ETS. The ETS is considered to have a "soft cap" due to there being a cap on the emissions through government provisions of units, but not a cap on the number of units able to be generated through forestry. The effect of this soft cap is any additional emissions reductions in the gas sector attributed to CCS may not decrease emissions below the cap in the long run. However, enabling CCS could allow earlier emission reductions (e.g. in the second emissions budget for the period 2026-2030) than would otherwise occur.

Quality Assurance (completed by QA panel)	
Reviewing Agency:	Ministry of Business, Innovation and Employment
Panel Assessment & Comment:	A Quality Assurance panel with representatives from the Ministry of Business, Innovation and Employment has reviewed the Interim Regulatory Impact Statement (RIS) for Policies for Carbon Capture, Utilisation and Storage. The panel has determined that the RIS partially meets the quality assurance criteria. The panel appreciated the document was an interim RIS prior to consultation, and as such some aspects are by necessity partially complete, but we feel that there is more than enough to generate meaningful discussion during consultation.

Section 1: Diagnosing the policy problem

What is the context behind the policy problem and how is the status quo expected to develop?

Natural gas is critical to our economy for industrial use and as a transition fuel

1. The natural gas sector plays a critical role in the New Zealand economy. Although natural gas is a fossil fuel, it has the least CO_2 content among the fossil fuels. It will remain a key energy source during our transition to a low emissions economy. Our major industries remain reliant on natural gas and have limited fuel-switching opportunities.
2. Our demand for natural gas comes from:
    - industrial users
        i. Methanex, to produce methanol – 36 per cent
        ii. Ballance, to produce urea (which is widely used as fertiliser) – 5 per cent
        iii. Other industrial users, like Fonterra, NZ Steel and Oji Fibre – 20 per cent
    - electricity generation and co-generation – 26 per cent
    - residential and commercial users, like households and businesses – 10 per cent.
3. As a source of energy for electricity generation and co-generation, natural gas is used to help meet both baseload demand and demand peaks in the electricity sector ('peaking and firming'). The proportion of electricity that was generated from natural gas was 9.9 per cent in 2022.[4] Natural gas-fired peaking electricity is generally required when generation from renewables is constrained and cannot meet demand. A higher renewable energy mix that relies on variable renewables like wind and solar will increase the need for the peaking and firming capacity that natural gas currently provides, especially during winter.
4. In the absence of renewable alternative fuels to natural gas, constrained supply currently results in increased burning of coal and demand response by large industrial users.

Natural gas is in tight supply

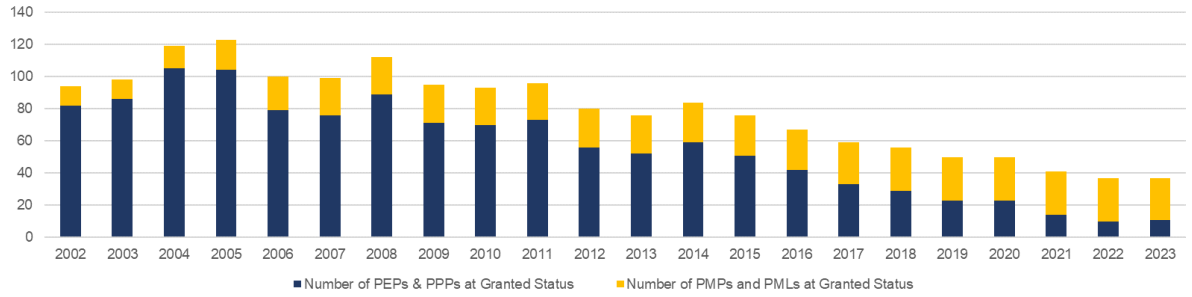
4 https://www.mbie.govt.nz/assets/energy-in-new-zealand-2023.pdf

5. New Zealand has a closed natural gas system with no ability to supplement supply through imports. As a result, supply needs to match demand. If supply cannot meet demand, demand must reduce. For example, in 2021, when natural gas production was lower than expected and hydro storage was low, major gas and electricity consumers reduced demand at an economic cost. Methanex idled its Waitara plant at a cost of approximately 70 jobs and brought forward a planned maintenance outage on its Motunui plant, which enabled some natural gas to be diverted to Genesis.[5] The Waitara Valley plant has not reopened.

6. Natural gas supply has been tight and declining for some time, with about 70 per cent of natural gas demand being met by aging fields (OMV – Maui, Pohokura, Todd – Kapuni, Mangahewa, McKee, Pohokura). Recent forecasts from the Gas Industry Company (**GIC**) published in its March 2024 Quarterly Report suggest gas supply could be getting tighter than we had thought and that insufficient natural gas is available to meet all contracted demand. The report showed that the 2023 natural gas supply is around 12 per cent lower than forecast. Using the first quarter of 2024 as a baseline GIC estimated 2024 production would be 28 per cent lower than the last forecast.

7. Natural gas reserves in existing fields are declining. In 2022, the overall natural gas reserves that are deemed to be "Proven plus Probable (2P)" (i.e. reserves that can be commercially produced under current economic conditions) decreased by 17 per cent.[6] The number of active petroleum exploration permits since 2014 has also been declining.

Figure 1: Number of permits and licences granted for prospecting, exploration and mining of petroleum (2002 to 2023, MBIE)



8. As upstream exploration declines, according to the most recent GIC supply and demand study, natural gas supply will likely not meet demand sometime between 2025 and 2027 at the earliest and between 2028 and 2034 (if reserves are developed) at the latest.[7]

The Government has a wider work programme on gas security

9. The Government has a wider work programme on gas security, and has been working with the industry to explore options for addressing investor confidence in the natural gas industry, diversifying natural gas supply and switching to alternative fuels.

10. In particular, the Government has committed to:

- 'future-proof the natural gas industry by restarting offshore exploration' and 'repeal the offshore oil and gas exploration ban'

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5 https://www.stuff.co.nz/business/300237857/taranaki-methanol-plant-closure-disappointing-but-not-unexpected-business-leaders-say and https://businessdesk.co.nz/article/policy/methanex-investment-indicates-a-desire-to-stay-in-nz

6 https://www.mbie.govt.nz/about/news/petroleum-reserves-data-shows-decline-in-gas-reserves

7 https://www.gasindustry.co.nz/assets/CoverDocument/Gas-Supply-and-Demand-Study-December-2023.pdf

- update the *Crown Minerals Act 1991* (**CMA**) to clarify its role as promoting the use of Crown minerals
- repeal the ban on oil and gas exploration to reduce New Zealand's reliance on imported coal and ensure gas can be used as a transition fuel as we move towards Net Zero 2050.

11. To give effect to these commitments, legislative amendments to the CMA are being developed. This interim RIS does not cover those amendments.

Reducing natural-gas-related emissions could help New Zealand meet its New Zealand emission targets

12. Under the Paris Agreement[8], New Zealand has committed to a 50 per cent reduction of net emissions below our gross 2005 levels by 2030. The Government also has a legislated target for net zero greenhouse gas (**GHG**) emissions by 2050 (other than for biogenic methane) under the Climate Change Response Act 2002 (**CCRA**). To achieve this target, businesses and households will need to make behavioural changes and adopt a mix of technologies and practices to reduce the amount of greenhouse natural gases released into the atmosphere.
13. Natural gas production and consumption represents a sizeable share of New Zealand's total emissions. New Zealand total emissions in 2022 were 78.4 Mt (gross) and 59.2 Mt (net of offsets achieved through forestry and other removal activities).[9] Emissions associated with natural gas production in New Zealand account for about 0.7 million tonnes (**Mt**) of CO_2 a year, while emissions associated with natural gas consumption in New Zealand are just below 8 Mt of CO_2 a year.[10] As natural gas production is expected to decline [11], emissions associated with natural gas production and consumption are expected to decline over time, unless significant new gas reserves are found and developed in New Zealand.
14. In the long term, reducing natural gas consumption could lower carbon emissions over the period out to 2050, but the pace of decarbonisation will depend on what fuels consumers convert their energy consumption to, the emissions intensity of those fuels, and the energy efficiency of appliances. There are also opportunities to reduce the emissions-intensity of natural gas production and consumption.
15. Transitioning away from natural gas before renewable alternatives are in place can be counter-productive. To illustrate, in 2021, when natural gas production was lower than expected and hydro storage was low, Genesis imported coal to use at the Huntly power station for thermal generation. Coal use for electricity generation increased 29.5 per cent in 2021[12] and emissions in the first half of 2021 rose with the increased use of coal (up 1.4 per cent in the March 2021 quarter and 4.8 per cent in the June 2021

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8 The Paris Agreement is a legally binding international treaty on climate change. Its overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels." Since 2020, countries (including New Zealand) have been submitting their national climate action plans, known as nationally determined contributions (NDCs), to communicate actions they will take to reduce greenhouse gas emissions to reach the goals of the Paris Agreement.

9 https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-19902022-snapshot/

10 https://www.mbie.govt.nz/dmsdocument/27264-review-of-CCUS-CCUS-potential-in-new-zealand-march-2023-pdf

11 https://www.mbie.govt.nz/dmsdocument/27344-energy-in-new-zealand-2023-pdf

12 https://www.mbie.govt.nz/dmsdocument/23550-energy-in-new-zealand-2022-pdf

quarter).[13] Burning coal generally results in twice the amount of CO_2 emissions than natural gas.[14]

Carbon capture and storage reduce emissions and improve the economics of gas production

16. CCUS involves the capture of CO_2 from large point sources (such as upstream fossil natural gas extraction and production facilities, power generation and industrial facilities) or direct capture of CO_2 from the atmosphere. CCUS could help us remove and sequester emissions that would otherwise be released into the atmosphere when producing and using natural gas. Captured CO_2 can be used on-site, compressed and transported to be used in a range of applications or injected into CO_2 storage sites, such as depleted oil and natural gas reservoirs.

17. The availability of infrastructure to transport CO_2 safely and reliably is essential to CCUS deployment. Options for the large-scale transport of CO_2 are via pipeline and ship, while small volumes of CO_2 can also be transported by truck or rail.

18. Storing CO_2 involves the injection of captured CO_2 into a deep underground geological reservoir of porous rock and sealing it with an impermeable layer of rocks. There are several types of reservoirs suitable for CO_2 storage, with deep saline formations and depleted oil and natural gas reservoirs having the largest storage capacity.

Potential of CO_2 storage

19. According to the International Energy Agency (**IEA**), the trapping mechanisms for reliable and effective CO_2 storage are well-understood internationally, as the oil and gas industry already has experience in injecting CO_2 for enhanced oil recovery. Geological conditions of a site would be a key determinant of its suitability for CO_2 storage and the design of the trapping mechanisms.

20. The Intergovernmental Panel on Climate Change (**IPCC**) has also argued that the fraction of CO_2 retained in appropriately selected and managed reservoirs is "very likely to exceed 99 per cent over 100 years, and is likely to exceed 99 per cent over 1000 years." Similar fractions retained are likely for even longer periods of time, as the risk of leakage is expected to decrease over time as other mechanisms provide additional trapping.

CCUS cost varies by technology and industry, and is relatively low in the natural gas sector

21. There is growing international support for CCUS. Both the IPCC[15] and the IEA[16] consider it could play an important role in reducing global emissions. There are a range of carbon capture technologies, with varying degrees of usage and technological maturity.

22. CCUS operators typically aim to capture and store 90 percent of the CO_2 in the emissions stream. Some projects (such as the Sleipner and Snøhvit CCUS operations in Norway) have shown success, meeting the 90 per cent capture rate target with no signs of leakage. However, there are also some CCUS projects that have failed to meet the capture rate target (such as the Boundary Dam carbon capture for enhanced

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13 https://www.stats.govt.nz/news/greenhouse-gas-emissions-rise-in-june-2021-quarter/

14 https://www.eia.gov/environment/emissions/co2_vol_mass.php

15 https://www.ipcc.ch/report/sixth-assessment-report-cycle/

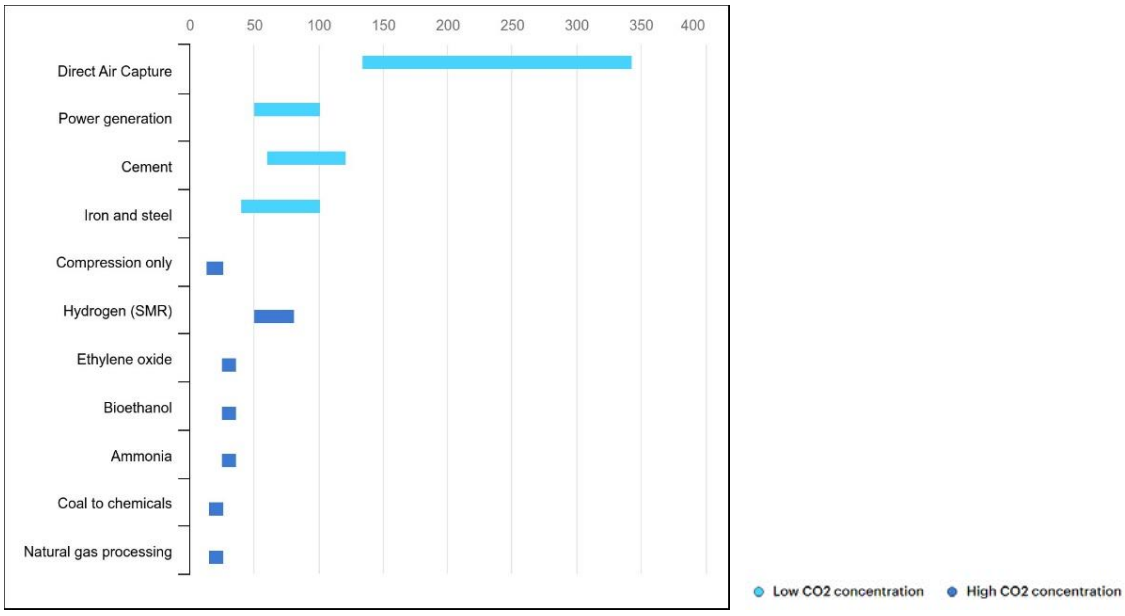
16 https://www.oecd-ilibrary.org/energy/energy-technology-perspectives-2020-special-report-on-carbon-capture-utilisation-and-storage_208b66f4-en

oil recovery facility in Canada) or have encountered technical difficulties with injecting their captured CO_2 (such as the Gorgon Natural gas Field CCUS facility in Australia).

23. Cost is one of the main barriers that has limited CCUS uptake. The cost of CCUS varies considerably by process type, capture technology, CO_2 concentration in the emissions stream, CO_2 transport, and storage location (i.e., geological deposits).

24. Typically, the cost of CCUS is highest in industries which have a relatively low concentration of CO_2 in the emissions stream, such as coal-fired power plants[17], steel production, cement production and some forms of hydrogen production. The cost is lowest in industries which produce an emissions stream with a relatively high concentration of CO_2, such as natural gas processing and ammonia production.

Figure 2: CO_2 capture costs for different industrial processes (in USD per tonne)



Source: IEA (2019)[18]

25. As shown in Figure 2, the potential of deploying CCUS in the natural gas sector looks quite promising, as CCUS abatement cost is relatively low in this sector.

26. For sectors and applications which have a higher CCUS abatement cost (such as power generation, cement, and steel production), higher carbon prices are needed to incentivise CCUS development.

CCUS deployment is growing in countries with policy support

27. The global rate of CCUS deployment has been slow but has been increasing in countries where governments provide an enabling regulatory framework or clear

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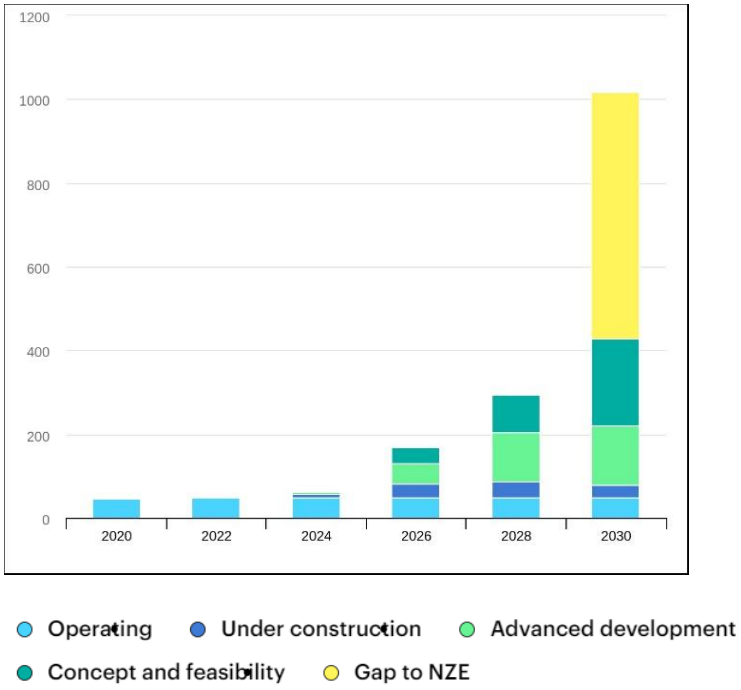
17 Flue gas from coal-fired power 100 plants typically contains around 12-14 per cent CO2. To capture CO2, the flue gas is pumped into a chamber containing chemical "scrubbers" that bind to CO2 molecules. It is technically easier and therefore less costly to capture carbon from a gas with a higher concentration of CO2 because more molecules of carbon dioxide are flowing past the scrubbers. See https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2592945/changingfluegas_paper_final_6.pdf and https://climate.mit.edu/ask-mit/how-efficient-carbon-capture-and-storage

18 https://www.iea.org/data-and-statistics/charts/levelised-cost-of-co2-capture-by-sector-and-initial-co2-concentration-2019

incentives. There are now around 45 commercial capture facilities in operation globally, with a total annual capture capacity of more than 50 Mt CO_2.

Figure 3: Capacity of current and planned large-scale CO_2 capture projects vs. the Net Zero Scenario, 2020-2030



Source: IEA (2024), CCUS Projects Database.

Note: NZE means the IEA's net zero emissions by 2050 scenario.

28. The level and type of support for CCUS varies from country to country. Governments in some countries, such as the US and the UK, have provided direct funding for CCUS. The US government is providing USD 12 billion across the CCUS value chain under the *2021 Infrastructure Investment and Jobs Act*, and more than US$70 billion in funding and loans for CCUS and favourable CCUS tax credit changes under the *2022 Inflation Reduction Act*. The UK government committed 20 billion pounds in funding for the deployment of CCUS projects in its Spring Budget 2023.

29. Some countries, such as Canada and Indonesia, are focusing on developing regulatory and permitting frameworks for CCUS. The European Union, Norway and Australia are taking a more mixed approach, providing funding for CCUS projects and developing enabling regulation.

30. Norway contributed significant capital to the build of its flagship 'Northern Lights' CO_2 transport and storage solution. Since 1991, Norway has also imposed some of the highest carbon taxes in the world, which have incentivised two world-leading CCUS projects (Sleipner in 1996, and Snøhvit in 2008).

CCUS development is still nascent in New Zealand

31. The CCUS sector in New Zealand is in its very early stages. The only operational use of CCUS in New Zealand has been successful pilots to capture and store CO_2 from geothermal fields. Upstream oil and natural gas producers, particularly those mining natural gas wells with high CO_2 concentration, and midstream chemical companies are also investigating CCUS opportunities here.

32. Some sites in New Zealand, including some natural gas fields in Taranaki, would likely be suitable for CO_2 storage and could potentially be commercially viable. It is estimated

that CCUS at an onshore facility in Taranaki could cost $30 – $110 per tonne of CO_2, depending on location, reservoir depth and concentration of CO_2, while an offshore CCUS project could be much more expensive.[19]

33. This suggests that, if emissions sequestered through CCUS projects in the natural gas industry are valued at more than $30 per tonne of CO_2, the industry would have the commercial incentive to invest in CCUS.

The ETS does not specifically provide for CCUS activities other than in the forestry and geothermal sectors

34. The ETS, which provides financial incentives for industries to reduce emissions in New Zealand. It requires businesses that are ETS participants to surrender one 'emissions unit' (known as a New Zealand Unit (**NZU**)) to the Government for each one tonne of emissions they emit. The ETS does not acknowledge emissions removal achieved through CCUS, apart from those relating to forestry and geothermal activities.

35. Under the CCRA, forestry activities receive NZUs, and the accounting method for carbon stock changes for forests is set out in the *Climate Change (Forestry) Regulations 2022*. Under *the Climate Change (Unique Emissions Factors) Regulations 2009*, a geothermal fluid user may apply for approval to use a unique emissions factor (**UEF**) for a particular geothermal plant. Through the use of the UEF, a geothermal ETS participant can subtract CO_2 reinjected into geothermal fields from its ETS liability.

The RMA, EEZ Act and CMA have some effect on managing environmental risks associated with CCUS

36. There are environmental risks associated with CO_2 injection activities and CO_2 leakage from storage sites. Leakage of CO_2 could affect nearby groundwater and soil quality, posing hazards to human health and ecosystems. According to the IPCC, these environmental risks can be managed and leakage from "appropriately selected and managed reservoirs" is extremely unlikely.

37. In New Zealand, there are currently some regulatory regimes for managing environmental risks, namely those relating to resource management. However, they are not specifically designed for CCUS.

38. Consenting for CCUS is considered under the *Resource Management Act 1991* (**RMA**) for onshore and coastal marine area (out to 12 nautical miles from the coast) and the *Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012* (**EEZ Act**) for the exclusive economic zone and extended continental shelf.

39. Under the RMA, CO_2 injection activities onshore or in the Coastal Marine Area (up to 12 miles from the coast) would require resource consents from the regional councils and territorial authorities concerned. CO_2 injection activities off the coast in the EEZ would require marine consents under the EEZ Act from the Environmental Protection Authority.

40. Beyond the consenting regime under the RMA and the EEZ Act, the CMA, which sets out the broad permitting regime for prospecting, exploring and mining Crown-owned minerals in New Zealand, may also be relevant. The permits issued under the CMA for mining operations do not give their holders the right to carry out CCUS operations except where they are related to mining operations.

Significant changes to the consenting regime are underway

41. A significant reform of resource management laws is underway. The overall goal of the reform is to reduce unnecessary regulation and unlock development and investment in

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19 Gas Industry Company and Wood Beca Limited (2003), *Review of CCUS/CCS Potential in New Zealand*.

infrastructure, housing and primary industries, while continuing to protect the environment.

42. The Government has introduced the Fast-Track Approvals Bill, which will allow projects of regional or national significance to become eligible for fast-track through a referral by Ministers of Infrastructure, Transport and Regional Development, or by being listed as a project in Schedule 2A of the Bill. An eligible project will be considered by an expert panel for a maximum of six months. Ministers will make final consent decisions for these projects.

43. The Government also plans to make other targeted changes to the resource management policy framework, including an integrated process to amend, review or develop national direction instruments under the RMA.

44. These coming changes to the resource management regime could be relevant to the consenting process for CCUS activities, particularly those considered to be of regional or national significance. However, they do not specifically aim to facilitate the development of CCUS.

What is the policy problem or opportunity?

Industries remain reliant on natural gas during our transition to a low emissions economy but natural gas supply is not keeping up with demand

45. There is a need to reduce emissions to meet New Zealand's climate change targets and emission budgets. To reduce emissions, renewables need to increase as a share of our energy use from 28 per cent to 50 per cent by 2035, and to an even higher proportion by 2050.[20] To achieve a smooth transition to a low emissions economy, we not only need to reduce emissions, but also ensure that our energy supplies remain secure, reliable and affordable. Industries need to have cost-effective abatement options available. Otherwise, as highlighted by the current natural gas supply constraints, our businesses and economy could suffer.

46. Natural gas will remain a key energy source during our transition to a low emissions economy. As well as industrial and commercial uses, it is needed for electricity generation and co-generation to compensate for the intermittency of renewable electricity generation. However, natural gas supply is not keeping up with demand in New Zealand.[21] Globally, upstream oil and gas investment peaked in 2014 when the oil price crashed, and has not returned to the same levels, as the clean energy transition and COVID-19 created uncertainty over demand for fossil fuels (including natural gas).

47. New Zealand's upstream oil and gas investment has also been declining since 2014, as shown in Figure 1 in the last section. The following domestic factors have also contributed to the decline:

    - difficulty in obtaining resource consents
    - the relatively high cost of developing oil and gas fields in New Zealand
    - difficulty in obtaining finance for fossil fuel operations due to uncertainty over future demand and policy.

48. The economics of gas field development is complex and depends on demand for natural gas and, in some fields, the return from oil production. Many gas fields are developed primarily for their oil potential, with gas as an associated product. However, New Zealand's gas market is relatively small and is a closed system as we do not export, with only one major individual user (Methanex) able to enter into long-term contracts to underpin production. This undermines the incentive to invest in natural gas production and exploration here.

49. If under-investment in production persists, the price of natural gas and electricity could rise, given that natural gas remains a key energy source for electricity generation and industrial activities, such as methanol and urea production. There may also be a risk of reduced economic activity, as large industrials (particularly those with limited fuel-switching opportunities) may have to reduce their production or even shut down because of difficulties in securing natural gas supply. This could affect the security of our wider supply chains that natural gas facilitates. For example, if domestic natural

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20 https://www.mbie.govt.nz/dmsdocument/26910-advancing-new-zealands-energy-transition-pdf

21 Recent forecasts from the GIC published in its March Quarterly Report suggested that there is insufficient gas is available to meet all contracted demand. Previous, EY's study, https://www.gasindustry.co.nz/assets/CoverDocument/Gas-Supply-and-Demand-Study-December-2023.pdf , suggested that, in all the scenarios considered, the best estimate of commercially viable future natural gas production (known as 2P reserves) is estimated to be insufficient to meet demand at some stage between 2025 and 2027. Even if production from 2C resources (i.e. estimate of contingent resources that may be extracted in the future), which are not currently commercially viable, comes online the results still show natural gas production from all sources as being insufficient to meet demand at some stage between 2028 and 2034.

gas is constrained, local urea production and steel production could be reduced, which could indirectly affect agriculture (which relies on urea as a fertiliser) and building and construction.

50. To ensure sufficient natural gas supply between now and the mid-2030s, the natural gas sector will need to invest in field development far enough in advance. New gas field developments can take at least seven years from discovery to first production, so a gas field discovered in 2024 is unlikely to come online before 2031.

Regulatory uncertainty regarding CCUS may affect businesses' ability to choose the least cost transition pathway

51. CCUS provides credible routes to reduce the emissions intensity of processes that underpin many industries, including natural gas production, steel production and cement production. However, businesses need to have financial incentives before they would invest in CCUS projects. There are significant financial incentives for CCUS in the forestry sector, but they are very limited for CCUS in other sectors.

52. Businesses' primary objectives when considering investments are based on risk and return. Risk-and-return objectives might be magnified if firms face future uncertainty in their industry. The business environment for the oil and gas industry has become more uncertain in light of the global and domestic plans to transition towards low emissions. OMV, for example, is planning to divest its oil and gas business in New Zealand to roll out its 2030 strategy to reduce oil and gas production over time. For industries, particularly the oil and gas industry, to invest in CCUS, they would want to make sure that their investments would provide adequate returns that would outweigh the risks.

53. At present, the financial risks of CCUS projects (excluding forestry) outweigh their potential returns. From a regulatory perspective, there are two main barriers to CCUS:

- The ETS does not reward emissions captured and sequestered through CCUS projects apart from those in the forestry and geothermal sectors.
- There is some concern that the consenting regime is not well-suited for CCUS, particularly assigning the long-term liability for CO_2 storage sites.

54. If these barriers remain, we could underutilise opportunities to capture and store CO_2, which would reduce both the emissions and costs associated with natural gas production and use. This would affect our ability to choose the approach to achieve the least-cost transition pathway for reducing emissions. As a result, we could be paying more than necessary to achieve our 2050 emissions target.

Regulatory barrier 1: The ETS does not reward CCUS activities apart from those in the forestry and geothermal sectors

55. The ETS does not reward emissions removals from CCUS activities apart from in the forestry and geothermal sectors. This is limiting the uptake of CCUS as a removals strategy for New Zealand.

56. CCUS was included in Subpart 2 of Schedule 4 of the CCRA as a removal activity. However, the Subpart has never been brought into effect and no regulations have been made to prescribe accounting rules in relation to the Subpart. This contrasts with the detailed regulations on the treatment of forestry removal activities, and the ability to

develop and use UEF to estimate emissions removal/sequestration associated with geothermal CCUS activities.

57. The lack of ETS regulations on CCUS activities (other than those in the forestry and geothermal sectors) means that:

    - There are no clear rules on how to record, calculate and report the emissions removal or sequestration achieved through these CCUS activities.
    - Businesses outside of the forestry and geothermal sectors, such as natural gas producers and natural gas-fired electricity generators, have no clarity about how CCUS activities would benefit them in terms of reducing their ETS liability.

58. This affects industries' ability to assess the business case for investing in CCUS activities, thereby reducing the financial incentive to undertake CCUS activities. The lack of official rules or direction on what emissions accounting methods would be deemed to be acceptable could undermine the transparency and credibility about the environmental integrity of these projects. For example, estimates of the emissions sequestered by a CCUS project would come from the CCUS operator, and there might not be a third party who could verify these estimates.

Regulatory barrier 2: Concern that the consenting regime is not well-suited for CCUS, particularly assigning the long-term liability for CO_2 storage sites

59. We have yet to consult widely on the challenges in obtaining consents for CCUS projects. However, we note some concern that the existing consenting and permitting framework is not well-suited to CCUS, particularly for the post-CO_2 injection phase of a CCUS project.[22] It does not establish a clear framework for monitoring the environmental risks of the CO_2 storage sites and assigning the long-term liabilities for those sites. These liabilities may arise where CO_2 leaks from the storage sites. In addition to the emissions liability, potential health concerns and property damage need to be considered. Without clarity about who bears these liabilities, it would be difficult to ensure effective monitoring, maintenance, remediation and clean-up of CO_2 storage sites after CO_2 injection.

60. Under the RMA, a resource consent (more specifically a discharge permit) is required for CO_2 injection, but not required for the post-injection phase after the CO_2 is stored in a geological formation, such as an underground natural gas reservoir. This discharge permit could be subject to a condition for a bond, which may continue after the expiry of the permit. Once the operator has stopped injecting CO_2, it can no longer be compelled to hold a discharge permit.

61. Like the RMA, the EEZ Act does not require a marine consent to be held for the post-CO_2-injection, and a marine consent could also be subject to a condition for a bond.

62. The CMA requires petroleum exploration and petroleum mining permit and licence holders to meet the full financial costs of decommissioning activities and have financial securities that may be accessed if they fail to carry out or fund decommissioning. However, these requirements for meeting decommissioning costs would not apply to CCUS projects unrelated to mining operations.

63. Overall, the current consenting and permitting framework does not provide certainty about who would bear the long-term liabilities for the CO_2 storage sites. Although consent conditions and bond provide a possible method of regulating CCUS in the post-injection period, there is some uncertainty in the stringency of the conditions,

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22 https://www.waikato.ac.nz/assets/Uploads/Research/Research-institutes-centres-and-groups/Centres/CEREL-Centre-for-Environmental-Resources-and-Energy-Law/Carbon-Capture-and-Storage-Taking-Action-Barton-Aug-2023.pdf

which would be set by a consent authority on a case-by-case basis. It is also unclear how effectively the consent authorities would monitor and enforce those conditions.

64. Uncertainty about long-term liabilities for the sequestered CO_2 and the CO_2 storage sites would not only undermine confidence in investment in CCUS projects, but could also create a risk for the Crown, who might need to assume the liability as a last resort. We have heard from stakeholders from the natural gas industry that uncertainty over the ultimate abandonment obligations is an impediment to investment in sequestration.

65. Apart from lack of clarity about long-term liabilities for CO_2 storage sites, there are some uncertainties about whether CCUS activities, particularly storing CO_2 from third parties, would be consented in the first place because:

- Different consent authorities may take different approaches to granting resource consents for CCUS activities. There are no guiding principles for consenting decisions, and what conditions might be appropriate for managing the CO_2 storage sites.
- Under the RMA, resource consent decision-makers have to have regard to climate change effects, but there are no direction on how decision-makers should have regard for the benefits of CCUS as a means of reducing GHG emissions.
- It is unclear if CO_2 reinjection operations (e.g. a natural gas field operator reinjecting CO_2 from its own operation into its underground natural gas reservoir) in the Coastal Marine Area are discretionary or prohibited under the RMA. The way "dumping" is defined under the RMA and the associated regulations (which is not entirely consistent with the latest version of the London Dumping Protocol, the international treaty on marine pollution) has caused this uncertainty.
- Due to the definition of "dumping" under the RMA, injection of CO_2 from a third party (e.g. a natural gas field operator injecting CO_2 from a natural gas-fired power plant into an underground natural gas reservoir) appears to be prohibited in the Coastal Marine Area under the RMA.[23]

What objectives are sought in relation to the policy problem?

66. The policy objectives of the proposals for providing a more enabling regulatory environment for CCUS are:

    a. **Efficient emissions abatement** — creating a level playing field for emissions reduction/removal technologies to enable businesses to reduce/remove emissions at least cost.
    b. **Environmental integrity** — ensuring that the CO_2 storage sites and the emissions sequestered in those sites are monitored and accurately reported, the risk of CO_2 leakage from these sites is mitigated, and the liability for the storage sites is appropriately assigned.
    c. **Energy security** — supporting security of energy supplies during transition towards a low-emission economy.

67. Efficient emissions abatement is the primary objective. The environmental integrity objective would support the achievement of emissions abatement. The CCUS policy options could contribute to achieving the energy security objective, but energy security

[23] Two of the most promising CO_2 storage sites, the Kapuni and the Maui gas fields, are on land and in the EEZ beyond the Coastal Marine Area respectively.

would depend on factors and other policy tools that are well beyond the CCUS policy options presented in this RIS. Other policy tools, such as CMA settings and electricity and gas market regulation, would have a more direct impact on energy security.

Section 2: Deciding upon an option to address the policy problem

68. The proposals will be assessed against the criteria in the table below, which have been derived from the above policy objectives.

Criteria	Questions to guide application of the criteria
Efficient emissions abatement	Would the option be effective in creating a level playing field for emissions reduction/removal technologies to enable businesses to reduce/remove emissions at least cost?
Environmental integrity	Would the option ensure that the CO_2 storage sites and the emissions sequestered in those sites is monitored and accurately reported? Would the option ensure that the risk of CO_2 leakage from these sites is mitigated? Would the option ensure that the liability for the storage sites is appropriately assigned?
Energy security	Would the option support security of energy supplies during transition towards a low-emission economy?
Implementation complexity	Would the option be complicated or costly for central and local government to implement? Would the option effectively manage risk to the Crown in relation to long-term liability for carbon sequestration? Would the option create a significant compliance burden for businesses?
Te Tiriti o Waitangi outcomes	Does the option take into account the principles of Te Tiriti o Waitangi and Māori rights and interests?

What scope will options be considered within?

69. The policy options considered focus on creating a regulatory environment where CCUS activities could compete with other emissions reduction technologies on a level playing field when industries consider options for reducing emissions into the atmosphere at least cost. As part of the options analysis, we have examined overseas regulatory regimes for emissions accounting, monitoring CCUS and managing long-term liabilities for CO_2 storage sites, particularly those in Australia, Canada, the EU and Norway.

70. As discussed in the *Limitations and Constraints on Analysis* section, we have not considered options for mandating the use of CCUS technologies, fiscal measures, and options relating to the RMA and EEZ Act.

71. Nevertheless, during public consultation, we intend to seek stakeholders' views on whether there are any consenting issues that are affecting CCUS development significantly. There will likely be future opportunities to review our consenting regime's consistency with the international framework for environmental management and climate change. Furthermore, as part of the integrated process for developing and updating national direction instruments under the RMA, government agencies will

consider how these instruments interact with each other, and the prioritisation of issues that might be addressed through national direction instruments.

72. It is possible that, during public consultation, stakeholders could suggest other options that are not discussed in this RIS. We will investigate these when considering submissions.

Section 2.1 Treatment of CCUS activities under the Emissions Trading Scheme

What options are being considered?

73. Options for the ETS treatment of CCUS include:

- Option 1: status quo
- Option 2: allowing all ETS participants to receive NZUs for removals through CCUS
- Option 3: allowing ETS participants (including natural gas mining operators) to subtract emissions captured and stored from ETS liability
- Option 4 (preferred): a combination of option 2 (receiving NZUs for removals under ETS) and option 3 (allowing subtraction of emissions captured and stored from ETS liability)
- Option 5: recognising and rewarding CCUS through a separate carbon credit scheme.

Option 1 – status quo

74. There are no regulations for CCUS activities other than those relating to forestry and geothermal sectors. Businesses in other sectors undertaking CCUS activities would not be able to gain NZUs. There would be no clear carbon accounting rules for CCUS activities outside of the forestry and geothermal sectors.

Option 2 – allowing all ETS participants to receive NZUs through CCUS

75. Under this option, all CCUS activities would be included as removal activities under the ETS (unless they fall below a threshold). This would allow businesses carrying out CCUS projects to receive NZUs for every tonne of CO_2 they capture and sequester, which they could then either trade on the secondary carbon market or use to meet their ETS liabilities.

76. To be eligible to receive NZUs, a business would have to provide evidence for its legal right to carry out the CCUS projects on the sites concerned, and a lawful and exclusive right to receive those NZUs. It would also have to show evidence that the CO_2 has been stored.

77. This option would be similar to Australia's carbon capture and storage method, which allows companies to receive Australian Carbon Credit Units[24].

[24] The Australian Carbon Credit Units (**ACCUs**) are issued to individuals or businesses who run eligible projects under the ACCU Scheme. Participants can earn ACCUs for every tCO2-e their project avoids emitting or stores. They can sell ACCUs on the carbon market or to the Australian Government.

Option 3 – allowing ETS participants (including natural gas mining operators) to subtract emissions captured and stored from ETS liability

78. Under this option, regulations would:

- expressly allow a ETS participant to subtract emissions from its own activity that have been captured and stored through CCUS projects, for the purpose of estimating its ETS liability
- set out the relevant emission accounting and reporting rules.

79. This would allow ETS participants to reduce their ETS liability through undertaking CCUS projects.

80. This option is similar to the current settings of the EU Emissions Trading Scheme. Under the EU scheme, CO_2 stored in the EU and the European Economic Area will be considered as "not having been emitted", and industrial point-source emitters can subtract the captured emissions from their compliance obligations. CCUS and more broadly carbon removal activities cannot currently receive units, although the EU is looking into developing a framework for certification of carbon removal units.

Option 4 (preferred) – a combination of option 2 (receiving NZUs under ETS) and option 3 (allowing subtraction of emissions captured and stored from ETS liability)

81. Under this option, the ETS would include mechanisms to recognise and therefore reward emission captured and stored through CCUS activities, including:

- ETS participants carrying out CCUS activities would be able to subtract emissions from their own activity that have been captured and stored through CCUS projects, for the purpose of estimating their ETS liability (as is currently the case for geothermal energy productions).
- Alternatively, businesses deploying CCUS technologies could choose to capture CO_2 to receive New Zealand emissions units (NZU) (as is currently the case for forestry). The captured CO_2 would have to be sequestered securely.

82. To avoid double-counting, ETS participants deducting emissions captured by CCUS activities would not be allowed to receive NZUs for removal activities for those captured emissions.

83. During public consultation, we will seek feedback on who should be eligible for each mechanism. For example:

- who would be allowed to deduct emissions captured and stored through CCUS projects, particularly whether only ETS participants who sequester their own emissions would be allowed to do so
- whether the NZU mechanism should only be available to those who remove emissions from the atmosphere, versus those who reduce and sequester emissions that result from an emissions intensive activity.

Option 5 – recognising and rewarding CCUS through a separate carbon credit scheme

84. Under this option, emissions captured and sequestered through CCUS projects would not be recognised in the ETS. A CCUS operator would instead be able to receive carbon credits for CCUS projects in a separate carbon credit scheme, which could target the energy and industrial sectors only.

85. In Canada, there is a carbon credit scheme specific to the fuel industry. The *Clean Fuel Regulations* there require upstream fuel industry participants to reduce the lifecycle carbon intensity of fuels they produce or import. These fuel industry participants can trade credits for compliance with carbon intensity targets under the regulations, and

can gain credits through CCUS projects, among other things (such as supplying low-carbon-intensity fuels like biofuels).

How do the options compare to the status quo?

Efficient emissions abatement

86. Options 2, 3, 4 and 5 would all be better than the status quo (option 1). The four options would all improve the incentive to explore CCUS activities as a means to reduce net emission reduction at least cost.

87. Our provisional estimate in the draft climate implications of policy assessment (**CIPA**) suggests that, overall, CCUS could potentially enable up to 4.653 million tonnes in total to be stored underground in New Zealand in the period 2026 – 2035.[25] This would include capturing and storing all the emissions from natural gas production from the Kapuni and Maui East fields, 35 per cent of emissions from the petrochemical industry, and five percent of emissions for industries such as cement and steel production. The CCUS potential of the natural gas sector is expected to be relatively bigger, as CCUS cost in that sector is relatively low, as shown in figure 2.

88. As discussed in the "Limitations and Constraints on Analysis" section, we will need to undertake further analysis after public consultation to finalise the assessment of emissions sequestration through CCUS and its long-term impact on the ETS operation.

89. Options 2 and 4 would be better than option 3 because options 2 and 4 would allow ETS participants undertaking CCUS activities to receive and trade NZUs from those activities. The ability to receive and trade NZUs would place all CCUS activities (not only those in the forestry sectors) on the same footing. This ability would give these participants more flexibility in managing their ETS liability and encourage the development of CCUS operations, particularly CO_2 storage for third parties. This could improve the chance of developing large-scale hub models of operation for CCUS, thereby facilitating emission reduction at least cost.

90. Option 5 would be less effective than options 2 and 4 in encouraging efficient emissions abatement, as the carbon credit scheme would be sector-specific. This would limit the pool of businesses that could purchase carbon credits received through CCUS and use them to offset their emissions. This would undermine some businesses' ability to explore efficient options for mitigating emission cost to some extent.

Environmental integrity

91. The criterion of "environmental integrity" is not relevant to assessing the options regarding the ability to receive NZUs or reduce ETS liability through undertaking CCUS activities. These options would not address how emissions removal/sequestration and environmental risks associated with CCUS activities would be monitored and how liability for CO_2 storage sites would be assigned. The options for addressing these issues are discussed in sections 2.2 and 2.3.

Energy security

92. Options 2, 3, 4 and 5 would all be better than the status quo from the perspective of energy security, as these three options would provide more regulatory certainty for CCUS activities and allow emissions sequestration associated with CCUS activities to be accounted for under the ETS. Natural gas-fired electricity generators and natural gas mining operators could face lower carbon costs as a result. This could improve the business environment for natural gas production and natural gas-fired power plants,

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25 Detailed assumptions underlying the provisional estimates are discussed in the Climate Implications of Policy Assessment, which is to be published alongside this RIS for public consultation.

which can back up intermittent electricity supply from renewable sources to maintain stability in the electricity markets. This would help improve energy security for so long as natural gas remains a key energy source, while we transition to a low-carbon economy.

93. Under options 2 and 4, CCUS operators would be able to receive and trade NZUs for CCUS activities. Natural gas producers could also seek new revenue streams for storing CO_2 for third parties. This would provide a more conducive business environment for CCUS activities, natural gas production and electricity generation, compared to option 3.

94. Option 5's effect on the business environment for CCUS and energy security could be similar to or slightly worse than options 2 and 4, depending on the settings of the carbon credit scheme under option 5. As the carbon credits issued under option 5 would be traded within a smaller pool of businesses in targeted sectors, there could be less liquidity in the market for these carbon credits. However, should the carbon credit scheme under option 5 have a tight cap on the volume of carbon credits, the commercial value of the carbon credits received through CCUS could be high.

Implementation complexity

95. In terms of implementation complexity, the status quo would be best because there would be no new policies for the Government to administer and for business to comply with. Option 3 would be the second best, option 2 and option 4 the equal third best, and option 5 the worst.

96. Option 5 would be worst because, on top of the existing ETS, a new separate carbon credit scheme would have to be implemented and complied with. In contrast, options 2, 3 and 4 would be implemented within the ETS regime.

97. In terms of government administration, options 2 and 3 would likely be less complex than option 4. Because option 4 allows a ETS participant to choose between receiving NZUs and deducting emissions sequestered from ETS liability, more checks and balances would have to be in place to minimise the risk of double-counting emissions removal/sequestration associated with CCUS activities.

98. In terms of business compliance burden, options 3 and 4 could be less onerous than option 2 from the perspective of businesses carrying out small-scale CCUS projects. Under option 2, a ETS participant undertaking CCUS activities would have to report the amount of emissions sequestered every time it wishes to receive NZUs. In contrast, under options 3 and 4, businesses undertaking CCUS activities would not have to receive NZUs to benefit financially from those activities. They could just reduce their ETS liability, thereby allowing businesses undertaking small-scale CCUS projects to avoid brokerage fees for emissions trading, which could be up to 5-10 per cent of the transactional value.[26]

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26 https://www.theaustralian.com.au/business/business-spectator/news-story/nz-carbon-market-gets-an-exchange/68eb84c1e076bb27f3136c9a2a29c7f3

Te Tiriti o Waitangi outcomes

99. Subject to feedback from further iwi engagement, it is unclear whether options 2, 3, 4 and 5 would deliver better, similar or worse Te Tiriti o Waitangi outcomes relative to the status quo.

100. It is difficult to establish a clear single view from Te Ao Māori (The Māori World) on CCUS. Ara Ake's engagements with iwi[27] suggest that:

- Some are comfortable with returning CO_2 from where it has come and restoring the balance between Ranginui and Paptūānuku.
- Others, however, found the concept of transferring pollution from one atua (demi god) to another as offensive.
- For iwi with a commercial interest in the land concerned, CCUS operators could potentially enter into an agreement on easement and lease with iwi. There could also be opportunities for iwi concerned to gain royalties, and employment opportunities to Māori who have experience in the geothermal and oil and gas industries.

101. Nevertheless, we expect that consent authorities would take into account principles of Te Tiriti o Waitangi and Māori rights and interests when granting consents to CCUS projects.

Overall assessment

102. Our initial analysis suggests that option 4 would be the best option, as it could provide a level playing field for all CCUS activities (both forestry and non-forestry CCUS) when businesses consider the least-cost approach to reducing emissions. At the same time, option 4 would give businesses carrying out small-scale CCUS projects more flexibility in how they manage their ETS-related costs—they can choose to deduct emissions captured and stored from their ETS liability or receive NZUs.

103. During public consultation, we will consider stakeholders' feedback on the pros and cons of various options, and the issues that would need to be considered when developing more detailed regulatory design (e.g. who can receive NZUs through CCUS).

[27] https://www.araake.co.nz/assets/Ara-Ake-Report-Carbon-Dioxide-Removal-and-Usage-in-Aotearoa-New-Zealand.pdf

Criteria	Option 1: status quo	Option 2: receiving NZUs under ETS	Option 3: allowing subtraction of emissions captured and stored from ETS liability	Option 4: A combination of options 2 and 3	Option 5: recognising CCUS through a separate carbon credit scheme
Efficient emissions abatement	0	++	+	++	+
Environmental integrity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Energy security	0	++	+	++	+ or ++, depending on the cap on carbon credits in the separate scheme.
Implementation complexity	0	--	-	--	---
Te Tiriti o Waitangi outcomes	0	Unclear	Unclear	Unclear	Unclear
Overall assessment	0	++ Pro: Strong incentive for CCUS Con: Small-scale CCUS operators could face relatively high transactional cost (brokerage fees for NZU trading)	+ Pro: Relatively simple to administer Con: Less likely to encourage large-scale hub models for CCUS	++ Best option, as option 4 provides a strong incentive for CCUS and more flexibility than option 2	0 Pro: Incentive for CCUS Con: Less carbon market liquidity Additional administration and compliance costs

Key for assessing option against criteria:

++ much better than status quo

+ better than status quo

0 about the same as status quo

- worse than status quo

-- much worse than status quo

--- worst

Section 2.2 Monitoring regime for emissions removal/sequestration relating to CCUS activities

What options are being considered?

104. Should CCUS be rewarded under the ETS, the emissions removal or sequestration achieved through CCUS activities would need to be monitored to ensure their integrity. Options for monitoring CCUS-related emissions include:

- Option A: status quo
- Option B: no or voluntary reporting on emission removals/sequestration in relation to CCUS activities
- Option C (preferred): creating regulations on the monitoring, verification and reporting regime for CCUS activities under the ETS
- Option D: creating a separate carbon accounting regime for CCUS operators (outside the ETS)

Option A – status quo

105. In the status quo, businesses carrying out CCUS activities (apart from those in the geothermal and forestry sectors) would not be regulated in terms of whether and how they monitor and report emissions removal/sequestration associated with CCUS activities.

Option B – voluntary reporting on emission removals/sequestration in relation to CCUS activities

106. Under option B, ETS participants would be allowed to include emission removal/sequestration achieved through CCUS activities in their emissions calculations. However, they would be able to choose not to report the CCUS-related data if they chose not to factor in CCUS in their emissions calculations.

107. If they chose to factor in CCUS, they could use their own emission accounting method to record the emission removal/sequestration, and design their own way of monitoring, verifying and reporting on sequestered CO_2 and leakage from storage sites. The legislation or officials' guidance could provide some principles for CCUS-related emission reporting but would not set out the specific rules for the monitoring, verification and reporting regime in the legislation.

Option C (preferred) – creating regulations on the monitoring, verification and reporting regime for CCUS activities under the ETS

108. Under Option C, the Government would create regulations to require a CCUS operator (e.g. an owner of an underground natural gas reservoir repurposed for storing CO_2) to

collect and report relevant information (e.g. CO_2 captured, stored and leaked) in a similar way to Australia and the EU.

109. The regulations would also set out the relevant accounting and reporting rules, as well as the regime for inspection of CO_2 storage sites for verification purposes, and authorising verifiers who would confirm the accuracy of emissions data.

110. The CCUS operator would be obliged to be a participant in the ETS until it is no longer deemed to be responsible for a CO_2 storage site.

111. In case of CO_2 leakage from a storage site, the CCUS operator would be liable to surrender NZUs. It could also opt to compensate by storing an equal amount of CO_2 without receiving NZUs.

112. Note that, in the EU and Australia, the emission monitoring and reporting rules for CCUS are set out in regulations associated with their carbon markets and national greenhouse natural gases reporting systems.

Option D – creating a separate carbon accounting regime for CCUS operators (outside the ETS)

113. Under option D, CCUS activities would not be part of the ETS regime. Rather, there would be a separate carbon credit scheme that would allow credits to be received through undertaking CCUS projects (as per option 5 in section 2.1). The credits would be used and traded by businesses that have to meet industry-specific emission targets.

114. Under this separate scheme, businesses undertaking CCUS projects would be required to follow monitoring, verification and reporting rules that apply to emissions removal/sequestration associated with CCUS. The emission changes associated with CCUS and leakage from storage sites would still be reflected in the national greenhouse natural gases accounting.

How do the options compare to the status quo?

Efficient emissions abatement

115. Both options C and D would be better than the status quo in terms of creating a level playing field for reducing net emissions at least cost. Options C and D would create a credible carbon accounting regime for CCUS activities, thereby providing more confidence in CCUS activities as a potential way to reduce New Zealand's net emissions.

116. Option B would be worse than the status quo. Under option B, the lack of stringent monitoring requirements could present a risk of CCUS operators over-reporting the amount of emissions removed/sequestered, and undermine confidence in the integrity of CCUS activities. This might deter investments in CCUS activities that could otherwise help reduce New Zealand's net emissions.

Environmental integrity

117. Both options C and D would be better than the status quo, as they could improve oversight of emissions sequestered in CO_2 storage sites. Detection of any CO_2 leakage from those sites could prompt further investigation into the broader environmental impacts of such leakage, such as the quality of nearby groundwater and soil. These two options would provide assurance to IPCC and other international organisations about carbon sequestration in New Zealand, which would be critical to compliance with international climate change obligations and international business transactions (which could be subject to cross-border carbon tax systems in the future).

118. Under option B, because of the lack of stringent monitoring requirements, the veracity of emissions removal/sequestration associated with CCUS activities could be questionable. The environmental outcomes of option B could be worse than the status

quo, especially if there are a significant number of CCUS projects after the ETS treatment of CCUS is changed.

Energy security

119. Both options C and D would be better than the status quo, and they would provide more certainty for investment in CCUS projects, thereby providing a more conducive business environment for natural gas production and electricity generation during our transition towards a low-emission economy.

120. Option B would be similar to the status quo, as businesses could continue to dismiss CCUS as a means for abating emission costs due to a lack of regulatory certainty. This would not improve outcomes for energy security.

Implementation complexity

121. Option B would be similar to the status quo in terms of government administration and business compliance costs because there would be no strict rules on carbon accounting for CCUS.

122. Option C would be worse than the status quo and option B as a new compliance system for monitoring emissions removal/sequestration would need to be set up. The costs in monitoring could be in the range of tens of thousands of dollars to hundreds of thousands of dollars per survey, depending on the monitoring technology deployed.[28]

123. Option D would be the worst option in terms of implementation complexity. CCUS operators would have to set up compliance systems. Some CCUS operators (e.g. electricity generators and natural gas mining operators) are ETS participants already and could find it burdensome to have to comply with another regulatory regime, which is separate from the ETS. It could also be more burdensome for government to run an additional regulatory regime.

Te Tiriti o Waitangi outcomes

124. It is not expected that there would be significant difference between the options in delivering Te Tiriti o Waitangi outcomes. Options C and D would provide a monitoring regime to help enable environmental stewardship but their potential impacts on Māori rights and interests would likely be indirect and insignificant.

Overall assessment

125. Option C would be the best option, as it would provide a credible monitoring regime for CCUS and would be less complex to administer than option D.

126. During public consultation, we will seek stakeholders' feedback on the information and methods that would need to be used for monitoring emissions removed/sequestered through CCUS.

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28 https://climit.no/app/uploads/sites/4/2020/05/2020-01-Monitoring-and-Modelling-of-CO2-Storage.pdf

Criteria	Option A: status quo	Option B: no or voluntary reporting	Option C (preferred): ETS regulations on monitoring, verification and reporting regime	Option D: creating a separate carbon accounting regime for CCUS operators (outside the ETS)
Efficient emissions abatement	0	-	+	+
Environmental integrity	0	-	+	+
Energy security	0	0	+	+
Implementation complexity	0	0	-	--
Te Tiriti o Waitangi outcomes	0	0	0	0
Overall assessment	0	- Pro: Flexibility for CCUS operators Con: Lack of credibility	++ Pro: Credibility and market confidence Con: Monitoring costs	+ Pro: Credibility and market confidence Con: Additional administration and compliance costs

Key for assessing option against criteria:

++ much better than status quo

+ better than status quo

0 about the same as status quo

- worse than status quo

-- much worse than status quo

Section 2.3 Regime for assigning the long-term liability for CO_2 storage sites

What options are being considered?

127. Options for assigning the long-term liability for CO_2 storage sites include:

- Option I: status quo
- Option II: permit regime focusing on monitoring and information disclosure requirements
- Option III: permit system including information disclosure requirements, transfer of responsibility to government after site closure, and financial security
- Option IV: setting up a post-closure stewardship fund with contributions from CCUS operators
- Option V (preferred): CCUS operators to cover the liability until government opts to indemnify

Option I – Status Quo

128. Consent conditions and bond could be used for assigning long-term liability for maintenance and remediation of CO_2 storage sites. However, whether conditions and bond are included in consents would depend on the decisions of local authorities or the EPA.

Option II: Permit regime focusing on monitoring and information disclosure requirements

129. Under option II, there would be a permit system for keeping records of CCUS operations and the CO_2 storage sites. The CCUS operators who are responsible for the CO_2 storage sites would be required to:

- apply for permit for activities relating to exploring and injecting CO_2 into storage sites (like in Norway, the EU and Australia)
- submit and gain approval for their monitoring plans (like in Norway and the EU)
- monitor leakage and migration of CO_2, environmental impacts, and the safety and integrity of the storage site (like in Norway and the EU)
- notify the state in the event of leakages of CO_2 or significant irregularities (like in Norway)
- before the closure of a CO_2 storage site, record and report information on the site closure plans, closure cost estimates, a closure completion report, and evidence demonstrating that the sites can technically be used for CO_2 storage and will have no or negligible risk of leakage (like in Australia and the EU)
- complete a financial capability assessment if requested, to determine the operator's ability to meet the costs of maintaining or remediating the site (like in Australia).

130. If a CCUS operator is an owner of an underground oil or gas reservoir which has been repurposed from oil or natural gas production to CO_2 storage, it will still be subject to the requirements under the *Crown Minerals Act 1991* (**CMA**) or the *Exclusive Economic Zone and Continental Zone (Environmental Effects) Act 2012* (**EEZ Act**)

applicable to decommissioning of petroleum infrastructure on the site, unless the Minister grants an exemption.

131. Under option II, the long-term liabilities for the CO_2 storage sites would depend on the consent conditions under the RMA and EEZ Act and the conditions in the CMA permits.

Option III: permit system including information disclosure requirements, transfer of responsibility to government after site closure, and financial security

132. In addition to the information disclosure and monitoring requirements under option 2, a CCUS operator would have to provide financial security (as directed by the Minister or the regulator) that may be accessed if they fail to carry out or fund maintenance of the CO_2 storage sites.

133. Types of financial security could include insurance, self-insurance, bonds, deposits as security with a financial institution, an indemnity or other surety, a letter of credit from a financial institution, or a mortgage. The quantum of financial security required would be determined on a case-by-case basis, taking into account estimate of site remediation costs. The requirement associated with the financial security would be set out in the permit conditions for the CCUS operator.

134. Like in the EU, the CCUS operator would remain responsible for the storage sites until the responsibility is transferred to the government. It would only be transferred if there is clear evidence that the stored CO_2 will be completely and permanently contained.

135. This would be similar to the EU regime, where financial security should be made to ensure that closure and post-closure obligations for the CO_2 storage sites can be met.[29] In Norway, the costs related to CO_2 leakage is shared by the CCUS operators and the state based on an agreed ratio.[30]

Option IV: setting up a post-closure stewardship fund with contributions from CCUS operators

136. Like Alberta, Canada and some US states, a post-closure stewardship fund would be created to cover the costs associated with the long-term monitoring and maintenance of the storage sites. CCUS operators would have to make a financial contribution to the fund, with the per-tonne fee proportionate to the volume of CO_2 sequestered. In return, government would assume long-term liability and obligations for the CO_2 storage sites.

Option V: CCUS operators to cover the liability until government opts to indemnify

137. A CCUS operator would need to meet the monitoring and information disclosure requirements under option II, and would be responsible for any issues for its CO_2 storage site for a set period after the site's closure. Civil pecuniary penalties would apply to failure to comply with the monitoring and information disclosure requirements, while it would be a criminal offence not to close or remediate the CO_2 storage site in line with the closure plan submitted to the regulator.

138. After the initial period, the government could opt to indemnify the operator against any liability associated with the site if the Minister is satisfied that there is no significant risk of leakage and adverse environmental impacts.

139. This is similar to the Australian regime for governing the closure of CO_2 sites and long-term liability for these sites. In Australia, the minimum period in which the CCUS operator would be responsible for the site post-closure is no less than 15 years, and

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29 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0031

30 https://ccsnorway.com/responsibility-for-co%E2%82%82-in-the-chain/

their Minister has the discretion to extend the period. In Norway, the minimum period is 20 years before the responsibility is transferred to the state.[31]

How do the options compare to the status quo?

Efficient emissions abatement

140. Options II and V would be better than the status quo, as these options could provide some assurance that the CO_2 storage sites would be closed properly, and the CO_2 would stay in those sites. These two options would improve market confidence in CCUS as a means to reduce net emissions, while their financial liability for these sites under these options might not be significantly different from that in the status quo. Under option II, a CCUS operator would still be subject to consent conditions, which might include a bond. Under option V, it would be up to the CCUS operator to decide how to minimise the storage site's leakage risks—if it does not leak, there would not be any cost associated with site remediation.

141. Options III and IV could be better than or similar to the status quo in terms of delivering net emission outcomes, depending on the nature and extent of financial responsibilities (in the form of security or fee) on CCUS operators. While these options would provide some assurance about CO_2 sequestration and market confidence in CCUS, the extra financial responsibilities on CCUS operators could undermine the cost-effectiveness of CCUS as a means to reduce net emissions. If CCUS operators consider these financial responsibilities to be too onerous, they might be deterred from investing in CCUS projects, particularly large-scale ones.

Environmental integrity

142. Option IV would deliver the best environmental outcomes, as financial contributions from CCUS operators to the stewardship fund would guarantee that at least some funding would be readily available for recovering the cost associated with site remediation. Nevertheless, there are some challenges in predicting the future costs of site remediation accurately and therefore assessing the right level of financial contribution that might be needed for covering these costs.

143. Option III would deliver better environmental outcomes than the status quo. The financial security under option III would guarantee at least some funding for recovering site remediation costs. Depending on the stringency of the financial security arrangement under option III, it may or may not be as effective as option IV for managing the financial risk associated with the CO_2 storage sites.

144. Option V would deliver better environmental outcomes than status quo. Option V would match the cost of managing the CO_2 site to the risk of CO_2 leakage. However, there would not be residual funds for covering the risk of a CCUS operator's business failure, unless the Government steps in to take over the long-term liability for the site.

145. Option II would also deliver similar environmental outcomes to those in the status quo. Option II would not provide certainty that there would be sufficient funding for covering the site remediation costs.

[31] https://CCUSnorway.com/publication/regulatory-lessons-learned/

Energy security

146. To deliver the best outcomes for energy security, the option concerned would present the least cost to the energy sector while providing certainty in assigning long-term liability for the CO_2 storage sites.

147. Option V be the best option for energy security, as it represents a "pay as you go" approach while providing certainty about who bears the long-term liability for the CO_2 storage sites. The costs associated with maintaining and remediating CO_2 storage sites would only be required when maintenance and remediation work are needed for avoiding CO_2 leakage. This would minimise the cost for natural gas producers and electricity generators undertaking CCUS activities. Option V could also create opportunities to postpone decommissioning natural gas production sites that are to be repurposed for CO_2 storage, extend the life of existing infrastructure on those sites, and potentially free up capital for investment in further natural gas production.

148. Option II would lead to similar energy security outcomes to those in the status quo. Like the status quo and option V, option II represents a "pay as you go" approach in managing the costs associated with maintaining and remediating CO_2 storage sites. Like in the status quo, CCUS operators would still face some uncertainty in CCUS investments. CCUS operators could still face financial liabilities for remediating CO_2 storage sites, depending on conditions in consents or CMA permits.

149. Option III could be worse than the status quo in terms of energy security outcomes. As option III would require CCUS operators to provide financial security upfront (as opposed to "pay as you go"), this option might undermine the incentive of the energy sector to explore and invest in CCUS to mitigate their emission costs. If the nature and extent of the financial security mean that compliance costs are relatively high, CCUS operators might be deterred from investing in CCUS projects, and this could limit the opportunities for the energy sector to produce enough energy at reasonably low cost. Nevertheless, CCUS operators would have more business uncertainty under option III, as they would know the nature and extent of the financial security upfront.

150. Option IV could be the worst option in terms of energy security outcomes. The financial contribution the CCUS operators would have to make to the fund regularly could translate to a high cost for natural gas producers and electricity generators undertaking CCUS activities over the long run.

Implementation complexity

151. Option II would be worse than the status quo in terms of government administration and business compliance costs. There would be some government administration costs for setting up the compliance system. CCUS operators would have some compliance costs associated with meeting monitoring and information disclosure requirements.

152. Like option II, option V would be worse than the status quo because of the administration and compliance costs associated with monitoring and information disclosure.

153. Option III would have more implementation complexity than the status quo and options II and V. Under option III, government would have to assess the financial risk associated with managing long-term liabilities for CO_2 storage sites and determine the nature and extent of the financial security arrangements. CCUS operators would have to comply with the financial security requirement under option III, or the financial contribution requirement under option IV.

154. Option IV would be the most administratively complex among all the options. Government would have to administer the stewardship fund and assess the financial

risk to determine the appropriate level of financial contributions from CCUS operators to the fund. CCUS operators would have to pay a fee to contribute to the fund.

Te Tiriti o Waitangi outcomes

155. Options IV would deliver the best Te Tiriti o Waitangi outcomes. As discussed earlier, option IV would guarantee that at least some funding for recovering site remediation costs and hence provide some protection for Māori rights and interests in those areas.

156. Option III would also deliver better Te Tiriti o Waitangi outcomes than the status quo, as it would guarantee at least some funding for recovering site remediation costs. This could protect Māori rights and interests at least to some extent. Depending on the stringency of the financial security arrangement under option III, it may or may not be as effective as the financial risk associated with the CO_2 storage sites.

157. Options II and V would also deliver better Te Tiriti o Waitangi outcomes than the status quo. These options provide some assurance about site remediation but the level of assurance they provide would not be as high as option IV.

158. Option V would deliver better Te Tiriti o Waitangi outcomes than the status quo. It would provide certainty about where the long-term liabilities for CO_2 storage sites lie, except where a CCUS operator's business fails.

159. Option II would also deliver similar Te Tiriti o Waitangi outcomes to those in the status quo, as option II would not provide absolute certainty that there would be sufficient funding for covering the site remediation costs.

Overall assessment

160. Option V would be the most balanced option, achieving all policy objectives (efficient emissions abatement, environmental integrity and energy security) without creating disproportionate administrative burden.

161. During public consultation, we will seek stakeholders' feedback on:

- the merit of requiring financial security from CCUS operators, which could help recover the cost of remediating CO_2 sites if those operators fail to carry out their duty
- the nature and monetary value of financial security that would be deemed appropriate and reasonable.

Criteria	Option I: status quo	Option II: Information disclosure requirements	Option III: Information disclosure requirements and financial security	Option IV: post-closure stewardship fund	Option V: CCUS operators to cover liability until government opts to indemnify
Efficient emissions abatement	0	+	0 or +*	0 or +**	+
Environmental integrity	0	0	+ or ++*	++	+
Energy security	0	0	-	--	+
Implementation complexity	0	-	--	---	-
Te Tiriti o Waitangi outcomes	0	0	+ or ++*	++	+
Overall assessment	0	0 Pro: Relatively light business compliance cost Con: No guarantee for funding for site remediation	0 to +* Pro: Some financial assurance Con: Business compliance costs associated with financial security	- to +** Pro: Some funding guarantee for site remediation Cons: Complexities in administering fund and setting fees Business compliance costs associated with contribution to fund	+ Most balanced option There would be certainty about who bears the long-term liability for CO_2 storage sites, while business compliance cost would be relatively low

* The rating depends on the nature and extent of financial security.

** The rating depends on the level of financial contribution required from CCUS operators.

Key for assessing option against criteria:

++ much better than status quo

+ better than status quo

0 about the same as status quo

- worse than status quo

-- much worse than status quo

--- worst

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

162. We recommend a package of policy proposals that would create a more enabling regulatory environment for CCUS activities, including:

- allowing businesses carrying out CCUS activities to receive NZUs under the ETS or subtract emissions captured and stored from ETS liability (option 4)
- creating regulations on the monitoring, verification and reporting regime for CCUS activities under the ETS (option C)
- CCUS operators would be regulated under a permit regime and would have to be responsible for the CO_2 site until government opts to indemnify. While a CCUS operator is responsible for the site, it would have to monitor the site and meet information disclosure requirements regarding their site and financial capability (option V).

163. This policy package would provide certainty about the ETS treatment of CCUS activities, incentivise industries to explore or undertake CCUS as an option to reduce emissions at least cost, and put in place a monitoring regime for ensuring the environmental integrity of CCUS projects.

What are the marginal costs and benefits of the option?

Affected groups *(identify)*	**Comment** *nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.*	**Impact** *$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.*	**Evidence Certainty** *High, medium, or low, and explain reasoning in comment column.*
Additional costs of the preferred option compared to taking no action			
Regulated groups, i.e. industries undertaking CCUS activities	Costs associated with monitoring and reporting information emissions removal/sequestration associated with CCUS activities and monitoring CO_2 storage sites. The preferred options presented in this CCUS policy package would not mandate the use of CCUS. Therefore, unless a business undertakes CCUS activities, it would not face any costs associated with monitoring and reporting CCUS-related emissions.	The costs in monitoring could be in the range of tens of thousands of dollars to hundreds of thousands of dollars per survey, depending on the monitoring technology deployed.[32]	Medium The estimates are based on overseas research. The costs in New Zealand could be different.
Regulators (EPA and potentially MBIE)	Costs associated with administering new CCUS regulations, including setting up the permitting system for CCUS operations and CO_2 storage sites, compliance and enforcement regime and providing guidance to industries.	Low-medium It depends on the number of CCUS projects and how the regulator monitors and verifies information provided by CCUS operators on the storage sites and emissions. During public consultation, MBIE will seek the industry's feedback on the information disclosure and verification methods for CCUS-related emissions. The complexity and comprehensiveness of these methods would significantly influence the administration costs. If the regulator relies primarily on CCUS operators to self-monitor, government administrative cost is expected to be minimal. A more comprehensive monitoring and verification regime, which involves independent technical reports and inspection, could cost more.	Low, depending on further development detailed design of the monitoring and verification regime.
Others (eg, wider govt, consumers, etc.)	Local and central government could face increased consenting applications for CCUS projects. Iwi and landowners could have to respond to engagement enquiries regarding development of CO_2 storage sites.	Low	Medium The number of CCUS projects requiring consent could initially be low. It could increase in the future, depending on carbon costs and the relative costs of various technologies and methods for reducing net emissions.
Total monetised costs		N/A	N/A
Non-monetised costs		Low–medium	Medium
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Increased certainty to invest in CCUS projects for reducing emission costs	$233-698 million of emission cost savings, assuming a carbon price of $50-150 per tonne and that 4.653 Mt of emissions (based on MBIE's provisional estimate for CIPA) are sequestered in New Zealand in the period 2026 – 2035.	Medium. The amount of emission cost savings would depend on multiple factors, such as the timing of the CCUS projects,

[32] https://climit.no/app/uploads/sites/4/2020/05/2020-01-Monitoring-and-Modelling-of-CO2-Storage.pdf

			carbon price movements, technological developments, the economic environment, and the ability to overcome technical challenges in CO_2 injection operations.
Regulators	Gaining insights into CCUS activities, the associated emissions removal/sequestration, CO_2 storage sites, and the financial capability of companies undertaking CCUS activities. Better oversight of activities that could contribute to New Zealand's emissions targets.	Low	High
Others (eg, wider govt, consumers, etc.)	Creation or retention of local jobs. Development of technical expertise in CCUS. New economic opportunities for Māori groups should there be CCUS projects in their rohe (tribal area) Electricity and natural gas consumers could enjoy more stable electricity and natural gas prices.	Low–medium This depends on business interest in pursuing CCUS projects, and how many of the new jobs created by CCUS activities are filled by existing professionals leaving the mining industry (who would have transferrable skills for moving to a CCUS-related role). There are around 6,700 people working in the mining sector in New Zealand.[33]	Low It is difficult to predict how many CCUS projects will be undertaken, and whether and how many new jobs would be created, given the ongoing development of technologies and methods for reducing net emissions. Electricity and natural gas prices are influenced by a multitude of factors, so it would be difficult to quantify the potential impacts of CCUS activities on these prices.
Total monetised benefits		N/A	N/A
Non-monetised benefits		Medium	Medium

[33] Statists New Zealand (2024), *Labour market statistics: March 2024 quarter*, https://www.stats.govt.nz/information-releases/labour-market-statistics-march-2024-quarter/.

Section 3: Delivering an option

How will the new arrangements be implemented?

164. The policy options discussed in this interim RIS are subject to feedback from public consultation. Whether and how the CCUS policy package would be implemented would depend on Cabinet decisions on the final policy design after considering submissions. Should the Government proceed with changing the ETS settings and introducing a new permitting and monitoring regime, legislative changes would be needed.

Amendments to CCRA and ETS regulations

165. Schedule 4 of the CCRA may need to be amended to ensure that the description of CCUS is fit for purpose. The current description in Schedule 4 may not be broad enough to encapsulate some types of CCUS activities. This could be reviewed as part of the coming CCRA amendment bill.

166. ETS-related regulations would need to be made under the CCRA to:

- allow businesses carrying out CCUS activities to receive NZUs under the ETS or apply for a unique emissions factor to account for the emissions sequestered (option 4)
- set up the monitoring, verification and reporting regime for CCUS activities under the ETS (option C).

167. The Ministry for the Environment administers the ETS-related regulations, while the Environmental Protection Authority applies them in carrying out its regulatory functions under the CCRA.

Primary legislation for CCUS permit regime

168. Primary legislation would also be needed to create the permit regime for overseeing CCUS operations and managing long-term liabilities for CO_2 storage sites, and set out the relevant penalties and criminal offences (option V). Subject to legal advice and feedback from public consultation, the CCRA or the CMA could be amended to provide for the permit regime, or a separate, standalone primary legislation would have to be passed to set out these requirements. The regulation-making powers under existing statutes, such as the CCRA and the CMA, would not be broad enough to allow such requirements to be set out in regulations. The EPA and MBIE are the regulator for the CCRA and the CMA respectively.

Timing on legislation

169. Following public consultation on the CCUS policy options, the Government will make in-principle decisions on whether to include CCUS policies as part of the second emissions reduction plan.

170. The primary legislation and regulations for the CCUS policy package are expected to come into force at the same time. Given the technical nature of the regulations and the necessary consultation with stakeholders, we expect that early 2026 could be the earliest time for such regulations to be introduced. Exact timing will be confirmed on introduction of the legislation to Parliament.

171. Once the relevant legislation is promulgated, the regulator(s) concerned are expected to launch a communication campaign to raise awareness of the new legislation, and provide guidance to potential CCUS operators on the new permitting regime and emission accounting rules for CCUS operations.

Implementation risks

172. The implementation risks and how they can be mitigated are as follows:

- Risk of non-compliance with the monitoring and information disclosure requirements—this risk can be mitigated by setting the penalties and offences at a level which creates an incentive for compliance as well as through regulatory design that supports compliance.
- Risk of double-counting carbon removal/sequestration achieved through CCUS projects—CCUS operators would have to provide clear evidence they have exclusive right to claim NZUs for the project. The regulators would have a register to keep record of all CCUS projects, including details of the persons claiming the NZUs, the sites from which CO_2 is captured, and the sites where the captured CO_2 is stored. The regulators would also have the power to request the CCUS operators to provide the relevant records should there be emission data discrepancies.
- Risk of higher than anticipated compliance costs—there will be further consultation on the design of monitoring, verification and permitting regimes, with an aim to achieve the right balance between ensuring environmental integrity of CCUS activities and minimising business compliance costs. Rigorous regulatory and system design will mitigate the potential for overly burdensome compliance costs.
- Environmental risks associated with CCUS activities—environment integrity of CCUS activities could be questioned unless a credible monitoring framework is in place. Officials will consult with experts in Australia and other advanced countries to identify the best practice for monitoring and minimising environmental risks.
- Technical challenges in developing CO_2 storage sites—this will depend on the industry to address those technical issues. The industry is expected to seek expert engineering advice to undertake feasibility studies, develop the site, carry out CO_2 injection activities and decommission the site.
- Limitations of existing ETS Register—the IT system for the ETS Register may need to incorporate new functionality to implement some elements of the CCUS policy package. MBIE will discuss with the EPA the specific requirements the new IT system would need to meet.

How will the new arrangements be monitored, evaluated, and reviewed?

173. The policy options discussed in this interim RIS are subject to feedback from public consultation. The outcomes of the consultation would inform further policy development and could impact on the policy design. The details of how the CCUS policies would be monitored, evaluated and reviewed would depend on the final policy design. This interim RIS therefore only discusses the review approach at a high level.

174. The ETS is reviewed periodically. We expect that the ETS regulations on CCUS activities would be reviewed as part of any broader ETS reviews in the future. These future ETS reviews could examine the impact of new ETS rules on emissions removal/sequestration associated with CCUS activities, and survey data on industry's perception of the ETS impacts.

175. Regarding the primary legislation for the permit regime for CCUS operators and assigning the long-term liability for CO_2 storage sites, its effectiveness could be reviewed by MBIE and/or MfE with input from the EPA five years after it comes into effect. However, the review may be earlier or later, depending on any significant changes to international emission accounting and trading rules, other CCUS-related

international market developments, future government priorities and government agencies' resource availability. The review is expected to examine any significant changes to the level of CCUS investments, the rate of compliance with the monitoring and information disclosure requirements, the number of CO_2 leakage incidents, how well CO_2 storage sites are remediated after leakage, and stakeholders' perception of the permit regime. The regulator is expected to monitor and assess data on CO_2 storage sites and undertake a market study to inform the review.