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NEW ZEALAND INSTITUTE OF
ECONOMIC RESEARCH

Research on emissions and the New Zealand Emissions Trading Scheme

NZIER report to the Ministry for the Environment

July 2026

About NZIER

The New Zealand Institute of Economic Research is an independent, not-for-profit economic consultancy that has been informing and encouraging debate on issues affecting Aotearoa New Zealand for more than 65 years.

Our core values of independence and the promotion of better outcomes for all New Zealanders are the driving force behind why we exist and how we work today. We aim to help our clients and members make better business and policy decisions and provide valuable insights and leadership on important public issues affecting our future.

We are unique in that we reinvest our returns into public good research for the betterment of Aotearoa New Zealand.

Our expert team is based in Auckland and Wellington and operates across all sectors of the New Zealand economy. They combine their sector knowledge with robust economic logic, models and data, and an understanding of the linkages between government and business to help our clients tackle complex issues.

Authorship

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How to cite this document:

NZIER. 2026. Research on emissions and the NZ Emissions Trading Scheme. A report for the Ministry for the Environment.

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Key points

Purpose

This report seeks to understand the effectiveness of the ETS on gross emissions reductions. The research was done in two parts: a qualitative part via stakeholder interviews and a quantitative part via updated marginal abatement costs curves (MACCs).

The primary objectives were to:

- assess how projected abatement potentials and costs have shifted since the 2020 MACC
- identify the main drivers of these changes (particularly energy prices, capital costs, experience with the ETS and regulations, and macroeconomic parameters)
- compare realised emissions reductions to the abatement potential originally identified
- examine the extent to which the updated abatement potential lies below the current ETS price signal
- understand the strength and efficacy of the ETS in driving emissions reduction
- obtain perspectives on the ETS from participants.

Research included interviews and re-analysis of MACCs

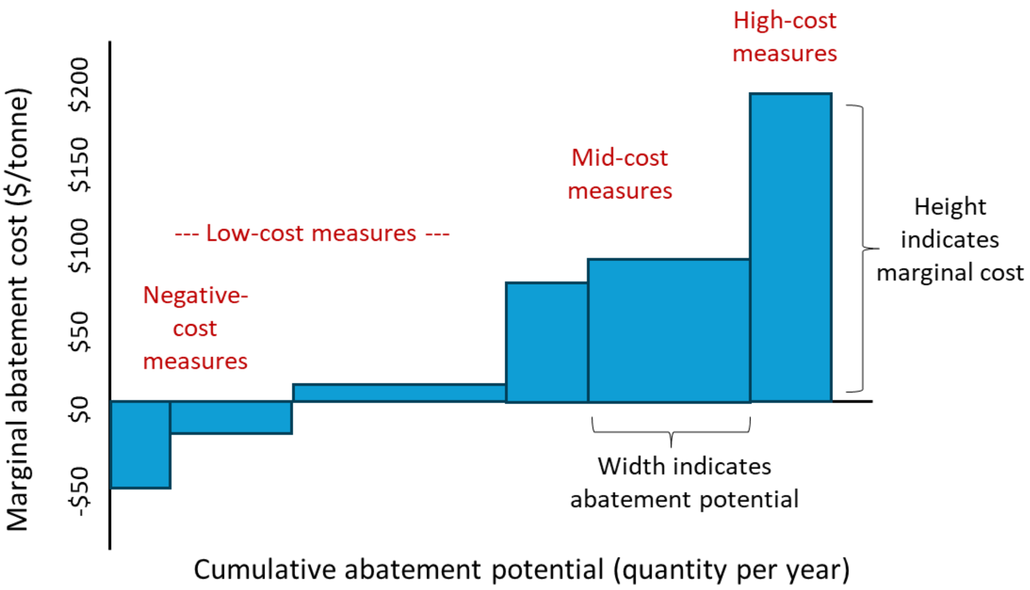
Interviews – The interviews were undertaken across 14 firms operating across six sectors and captured approximately 30 percent of the total gross emissions of firms reporting to the ETS. The interviews sought to explore the relationship between the ETS and abatement behaviour. This part of the project drew on similar research by MfE in 2016.

Marginal abatement costs curves (MACCs) – MACCs visualise the abatement potential of different technologies and the relative costs associated with each measure. MACCs were last produced by MfE in 2020, and this report details the findings of a 2025 update.[1]

Figure 1 provides a stylised MACC graph. The horizontal axis indicates abatement potential, and the vertical axis indicates cost. Each abatement measure is graphed, showing its cost and abatement potential. The left-most measures are the least expensive; they include "negative-cost" measures that might save money as well as other low-cost measures below the price of NZUs. In the middle are mid-cost measures, roughly between the price of NZUs (\$56.90/tCO_2-e for this analysis) and \$100 per tonne of carbon abated. To the right are high-cost measures, which are those with marginal costs over \$100 per tonne. This report focuses on the low-cost (including negative-cost) and mid-cost zones, areas that are most relevant for understanding where non-price barriers and ETS prices are likely to have a larger impact.

1 MACCs provide a macro-economic view on technology that assumes no non-cost barriers to implementation, and thus is not a market predictor of varying ETS prices.

Figure 1 Stylised MACC



Source: NZIER

Key findings from updated MACCs and interviews

Updated MACCs show a redistribution across cost zones

- Relative to 2020, the 2025 MACC shows a larger share of abatement potential in the low-cost zone, a smaller share in the mid-cost zone, and a slightly larger share in the high-cost zone.
- The weighted average cost of abatement is lower in the low-cost zone in 2025; it is now, on average, twice as low as in 2020. The mid- and high-cost zones have average costs that are now slightly higher.
- The largest difference between the 2020 MACC and the 2025 MACC, and the largest upward cost shifts in the updated MACC, occurs in transport and energy-intensive industries.

Of the 27.92 MtCO_2-e of abatement potential, 19.45 MtCO_2-e has costs below the average 2025 ETS price of $56.90

- The average ETS price in 2025 ($56.90) was high enough that 19.45 MtCO_2-e of the abatement potential (69.7 percent) had a cost below that price.
- The ETS price declined in 2025, which is not reflected in the average, and interviewees cited carbon prices in the $30s and $40s. At those prices, less abatement potential is below the ETS price.

Real-world abatement lags techno-economic potential

- Observed abatement has lagged behind the technical potential implied by both the 2020 and 2025 MACCs.
- MACCs are constructed based on technical and economic data. However, they do not account for the full costs facing decision-makers, including transition costs (the

physical and personnel costs of making changes) and opportunity costs (alternative uses of time and money, which may produce more value for businesses).

The ETS impact is limited by price level and volatility

- The impact of the ETS on business performance was tied to differences in the materiality of emissions costs, the capacity of organisations to pass through emissions costs in their prices, and exposure to competition from overseas suppliers.
- The ETS was one of several factors that encouraged businesses to make decarbonisation decisions, but it was typically not the primary driver.
- Interviewees consistently expressed that the ETS would need higher, more stable, and more predictable prices to drive greater abatement.

Abbreviations

BEV	Battery electric vehicle
CCRA	Climate Change Response Act 2002
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalents
CRM	Customer relationship management
EDGS	Electricity Demand and Generation Scenarios
EECA	Energy Efficiency & Conservation Authority
ETS	Emissions trading scheme
EV	Electric vehicle
FTE	Full-time equivalent
GDP	Gross domestic product
GHG	Greenhouse gas
GIDI Fund	Government Investment in Decarbonising Industry Fund
GJ	Gigajoules
ICE	Internal combustion engine
IPPU	Industrial processes and product use
LACs	Levelised abatement costs
LCV	Light commercial vehicle
LPV	Light passenger vehicle
LULUCF	Land use, land-use change and forestry
MAC	Marginal Abatement Cost
MACC	Marginal Abatement Cost Curve
MBIE	Ministry of Business, Innovation and Employment
MfE	Ministry for the Environment
MoT	Ministry of Transport
MPI	Ministry for Primary Industries
MtCO_2-e	Million tonnes of carbon dioxide equivalents
MWh	Megawatt-hours
NDCs	Nationally determined contributions
NZD	New Zealand dollar
NZGA	New Zealand Geothermal Association
NZIER	New Zealand Institute of Economic Research
NZTA	New Zealand Transport Agency Waka Kotahi
NZU	New Zealand unit
$PM_{2.5}$	(fine) particulate matter (with a diameter of less than 2.5 micrometres)
QP	Quarterly Predictions
VKT	Vehicle kilometres travelled

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1 Introduction

1.1 Scope of the project

The MfE commissioned NZIER to investigate the New Zealand ETS and emissions from the economy. The project investigated the extent to which the ETS has affected the level of gross emissions to date. The research was divided into two parts. The qualitative research involved semi-structured interviews of entities (mainly companies) that participate in the ETS. The interviews explored experiences with the ETS and emissions reductions, expectations for future directions of the scheme, and thoughts on improving it. The quantitative research involved updating a MACC analysis for 2035, developed as part of the 2025 refresh of New Zealand's MACC evidence base. The analysis updated key assumptions from a 2020 MACC study and compared projected abatement with realised emissions outcomes over 2020-2025 across major emitting sectors.

The primary objectives were to:

- assess how projected abatement potentials and costs have shifted since the 2020 MACC
- identify the main drivers of these changes (particularly energy prices, capital costs, experience with the ETS and regulations, and macroeconomic parameters)
- compare realised emissions reductions to the abatement potential originally identified
- examine the extent to which the updated abatement potential lies below the current ETS price signal
- understand the strength and efficacy of the ETS in driving emissions reduction
- obtain perspectives on the ETS from participants.

The agriculture and forestry sectors were mostly out of scope for this project. These land-based sectors were not included in the updating of the MACC analysis. The interviews included a few ETS participants from the forestry sector and the wider agricultural sector, but did not explore issues related to carbon accounting, afforestation, or other technical and policy details.

1.2 Structure of the report

The report starts with some background on the ETS, especially key changes in the ETS over recent years. This is not a comprehensive history of the scheme, which can be found elsewhere. The report then discusses the two parts of the project separately. It provides the methods, data and results for the MACC analysis, then presents the method and results for the interviews. The final section discusses the results, connecting the findings from the two parts. The section also considers the limitations of the research and provides suggestions for future work.

The report includes a technical discussion of the MACC analysis that summarises methods, data inputs, results, and key insights. It is intended to be read alongside the original 2020 MACC report (Ministry for the Environment 2020), which remains the primary reference for detailed sector methodologies. In addition, the project team has produced a workbook file for the MACC analysis and a supplemental file detailing data sources. Those outputs from the research are available separately.

2 Background on the ETS

2.1 Evolution of the ETS

The New Zealand ETS has been in operation since 2008, when it was introduced to place a price on carbon emissions to encourage emission reductions and help New Zealand achieve its targets for net emission reductions under the Kyoto Protocol. It has undergone various reviews and refinements since then, but it remains the Government's primary tool for meeting international obligations on climate change emissions under the 1992 UN Framework Convention on Climate Change and the Paris Agreement in 2016.

New Zealand's position on greenhouse gas emission reductions is distinct internationally, with almost half its reported greenhouse gas emissions attributable to agriculture, most of the rest to energy-related emissions and smaller shares to industrial processes and waste management. It is committed to contributing to international efforts to reduce emissions and curb climate change. However, given its relatively small population, high share of electricity generation already obtained from renewable sources (hydro, geothermal, wind and solar), and the economic significance of primary industries, it lacks options for low-cost emission reduction available to other countries which have lower current renewable energy use and less prominent agricultural sectors.

The ETS allows removers of CO_2 to earn NZUs and requires emitters of CO_2-e[2] to surrender NZUs to cover their CO_2-e emissions. The ETS has two main impacts on decarbonisation activities:

- Creating an incentive for the planting of forests to absorb CO_2 from the atmosphere through the additional value that can be earned by selling surplus NZU to CO_2 emitters, and the potential increase in the value of parts of the tree crop that are currently sold at a loss or waste, to the extent that they are economically viable feedstock for biomass fuel.
- Imposing a cost on activities for CO_2 emissions as an incentive to adopt decarbonisation. (This incentive is modified by the selection of industries that are required to meet decarbonisation costs and the proportion of their emission obligation for which they are required to purchase NZU.)

Forest owners and managers have to alter their forest management processes and may need to invest in additional equipment to provide feedstock for biomass fuel.

2.2 Incentive for decarbonisation

Emitters of CO_2 can acquire NZU either by purchase on the secondary market, or from government auctions or through free allocation from the New Zealand Government. Alternatively, emitters can choose to reduce their NZU obligations by making investments in their production processes to reduce emissions by:

[2] While CO_2 is the most common greenhouse gas by volume from transport, industrial processes and electricity generation, other gases such as methane and nitrous oxide are emitted and have a much higher global warming potential than CO_2.

- Capturing CO_2-e and avoiding the liability – examples include the capture and destruction[3] of methane from decomposing organic waste at landfills, re-injection of CO_2 into geothermal reservoirs for geothermal electricity generation. In these cases, the emitter has an obligation to surrender units, and the potential savings in NZU costs are a primary driver of the business case for the decarbonisation measure.
- Reducing the use of fossil fuels – fossil fuels are a key source of emissions. Reductions in their use tend to be led by energy or feedstock efficiency measures.
- Replacing energy from fossil fuels with electrical energy or biomass, to the extent such substitution is technically feasible and economically viable in high-emitting applications like process heat and transport fuel.[4]

Each option requires the emitter to invest in capital equipment, either to adapt a process or, more often, to replace it. To justify this investment, the emitter needs to convince its shareholders that the cost of the investment (upfront capital costs plus required return on capital) will be recovered from the net cash flow improvement generated by the investment (which would include the difference in energy cost and reduced NZU costs). Customer and shareholder expectations for reduced emissions are also drivers of decarbonisation in some industries, alongside concerns about the reliability and future cost of natural gas supplies. In addition, the timing of decarbonisation decisions is often linked to asset lifecycles. In addition, replacement and upgrading of capital assets needs to be justified in terms of return on investment and also fit into asset management planning.

2.2.1 The ETS has undergone numerous adjustments…

The New Zealand ETS was set up with the ambition of trying to cover all economic sectors emitting six major greenhouse gases over time, including agriculture, which accounts for around 48 percent of New Zealand's emissions, mostly methane and nitrous oxide from pastoral farming and manure management. Currently, there is no planned date for including agriculture in the ETS. In other industries, companies with assigned points of obligation must acquire and surrender emission units or credits to offset their reported annual emissions.

Points of obligation have generally been placed upstream on the sources of emissions in New Zealand (e.g. mines and well-head operators for domestic fossil fuel production, and importers of fossil fuels), so the costs of emissions are passed down the supply chain into prices of goods and services paid by their customers. New Zealand Emission Units held by the government under international agreements are distributed through a mix of free allocation to emitters based on historical emissions and auctioning. Emitters can realise value by selling units not needed by emission reductions, and credits can be created by carbon sequestration in new forestry.

Unlike conventional cap-and-trade schemes that set a limit on total permitted emissions and allow emitters to buy and sell permits to create a market price that incentivises low-cost emission reductions, the ability to develop offsetting credits through new forestry sequestration adds flexibility to the ETS cap. While total emission permits may be reduced,

[3] Options for destruction of methane include, flaring, use as fuel for either electricity generation or blending with reticulated natural or processing to convert the methane into food manufacturing grade CO_2

[4] Limits to opportunities for substitution include electrical energy being technically unsuitable for high temperatures for process heat, volumes of biomass with coal-like properties being widely dispersed and costly to gather and challenges in replacing either natural gas or coal used as feedstock or oil or gas used as fuel with synthetic replacements manufactured from green hydrogen.

expansion of sequestration credits may allow total emissions to increase until price reductions check the rate of new afforestation.

The ETS was originally linked to the international carbon market under the Kyoto Protocol, which had a high supply of emission permits (including "hot air" credits from Eastern Europe following contraction of their economies after the fall of the Berlin Wall) relative to demands from market participants, resulting in low-priced credits entering New Zealand. Access to this market for ETS participants was discontinued in 2015, so the ETS became focused on the domestic market, increasing permit prices.

2.2.2 …and targeted emission reductions and ETS pricing have markedly changed

Before the recovery in emission prices had progressed far, in 2016, MfE conducted a survey to review the operation of the ETS. That review found no sector other than forestry made emission changes during the Kyoto Protocol Commitment Period (2008–12) that could be attributed to ETS obligations, and most affected businesses interviewed indicated the ETS had provided no incentive to look at how to reduce their emissions.

Internationally, the Kyoto Protocol had limited uptake by signatory countries and little effect in reducing global emissions. New targets were set under the Paris Agreement in 2016, which aimed at limiting global warming to well below 2°C, ideally 1.5°C, above pre-industrial levels by cutting greenhouse gas emissions. Such emission reductions were to be met by countries voluntarily submitting NDCs every five years, which reduce emissions, build resilience, and provide climate finance.

The Climate Change Response (Zero Carbon) Amendment Act was passed in 2019, building on the legal basis for the ETS in New Zealand established in the Climate Change Response Act (2002). This Zero Carbon Act set new emission reduction targets for biogenic methane emissions to be reduced below 2017 levels by at least 10 percent by 2030 and by 24–47 percent by 2050. All other greenhouse gas emissions were to reach net-zero carbon by 2050. The Zero Carbon Act also established an independent advisory Climate Change Commission and provided for the government to prepare 5-year emission budgets and emission reduction plans.

New Zealand's first NDC was to reduce net greenhouse gas emissions to 50 percent below gross 2005 emission levels by 2030 (Ministry for the Environment 2026). That target would entail an emissions budget of 575 Mt CO_2-e over 2021–30. The second NDC announced in January 2025 was a reduction by 2035 of 51 to 55 percent compared to 2005 levels.

The date of agriculture's entry into the ETS has been repeatedly deferred, first to negotiations between government and industry bodies, then to a partnership called He Waka Eke Noa, but this was disbanded and the future ETS entry date removed in 2024. In late 2025, the target emission reduction from agriculture by 2050 was reduced from 24–47 percent below 2017 levels to a less challenging 14–24 percent reduction, placing greater importance on effective price incentives for emission reductions by industries that are covered by the ETS.

Table 1 lists recent adjustments to ETS settings. The table focuses on enacted changes that affect the market price for carbon and volumes. Not included are proposed changes, such as those currently proposed to the CCRA, as well as prior reviews and judicial holdings.

Table 1 Prior changes to ETS settings that affect carbon prices and volumes

For the period 2020 to 2025

Date	Policy change
1 Jan 2020	Fixed Price Option (FPO) increased from \$25 to \$35 and will be phased out by 2022
2 Dec 2020	Declaration of Climate Emergency
1 Jan 2021	Penalties introduced for emitters that fail to meet surrender obligations
	Averaging accounting introduced for forestry NZU
17 Mar 2021	NZU auction price floor of \$20 and ceiling of \$50
	Increased transparency: EPA commits to the publication of participants' emissions and removal data
1 May 2022	Climate Change Commission (CCC) Emissions Reduction Plan Advice: Outlined a comprehensive decarbonisation policy for the economy
15 Dec 2022	New ETS Unit Settings: The Government rejected CCC advice and reduced ETS auction price settings Announced intention to reduce industrial allocations of NZU
1 Dec 2023	Change to the NZU auction reduces supply, increases the floor price of NZU auction units and triggers the price for cost containment reserve auctions of NZU Data collection for EITE (emission-intensive and trade-exposed) participants to update the baseline used for free allocation of NZU to EITE participants
31 Aug 2024	Auction volumes reduced from 2025 to 2029 to reduce NZU supply and encourage a price rise. Price control settings (NZU floor price and cost containment trigger prices) were left unchanged.
31 Oct 2025	Restrictions on the conversion of farmland to forestry were implemented Auction volumes for 2026–2030 are left unchanged at 16.9 million for the period. All NZUs offered in the failed auctions in 2025 have been cancelled and are not available for future auctions.

Source: NZIER

2.3 History of NZU prices – long plateau interspersed with resets

By setting a price for NZUs (primarily through the secondary market), the ETS provides a basis for estimating the current and future value of potential future savings in NZU costs. The main source of variability in ETS participants' emission costs is the price of NZUs. The gross volume of NZU required is predictable as it is linked to output. The free allocation of NZU to EITE businesses is based on output and a baseline allocation factor. For example:[5]

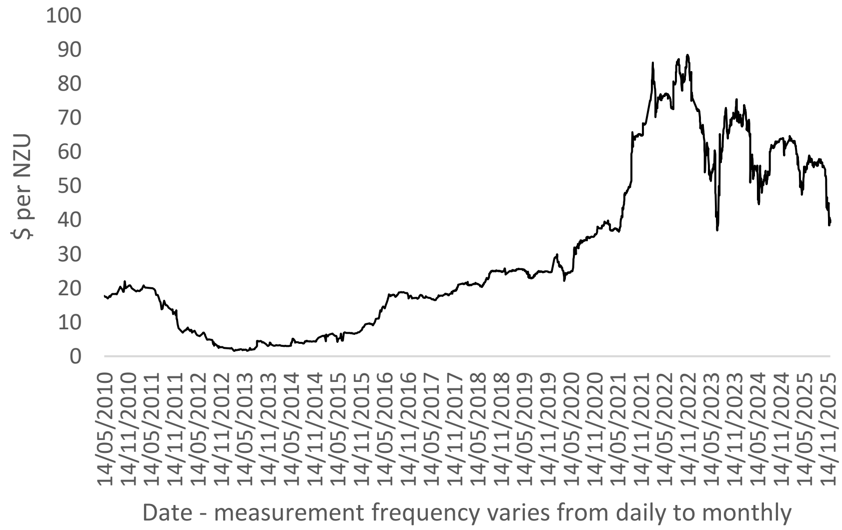
- *'in 2024, highly emissions intensive firms face NZ ETS costs of 14% of their emissions, and moderately emissions intensive firms face 36% of NZ ETS costs'.*
- In 2025 '*highly emissions intensive activities*' and '*moderately emissions intensive activities*'[6] receive industrial allocation that covers 85 percent and 55 percent respectively, of the emissions for the activity.

5 https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/participating-in-the-nz-ets/overview-of-industrial-allocation/

6 Activities with emissions greater than 1,600 tCO_2-e / NZ\$ 1 million of revenue are defined as '*highly emissions intensive*' and activities with emissions greater than 800 tCO_2-e / NZ\$ 1 million of revenue are defined as '*moderately emissions intensive*'.

The free allocation is also subject to an annual phase-out[7] rate of 1 percentage point until 2030 (increasing to 2 percentage points over 2031 to 2040 and 3 percentage points after 2040).

Figure 2 Indicative NZU prices



Source: theecanmole/nzu[8]

Figure 2 indicates the following main phases in NZU prices since mid-2010. A rough, stylised banding of the prices into periods of plateau and movements between plateaux is presented in Table 2 below.

[7] 'Climate Change Response Act 2002 - Version as at 31 October 2025' Section 81(2)(a). Downloaded from https://www.legislation.govt.nz/act/public/2002/0040/latest/whole.html#DLM158584

[8] Downloaded on 12 December 2025 from https://github.com/theecanmole/nzu/blob/master/nzu-edited-raw-prices-data.csv

Table 2 NZU price ranges

Date range			Price $ per NZU			Description
Start	End	Days	Avge	Low	High	Plateau or change
14-May-10	17-Jun-11	400	19.38	17.00	22.05	Plateau around $20
18-Jun-11	26-Oct-12	497	9.28	2.50	18.00	Decline to sub $5
27-Oct-12	23-Aug-13	301	2.21	1.60	4.55	Plateau just above $2
24-Aug-13	5-Dec-14	469	3.99	3.00	5.20	Plateau around $4
6-Dec-14	10-Jun-16	553	8.30	4.29	16.67	Gradual increase to $18
11-Jun-16	6-Oct-17	483	17.77	16.50	18.87	Plateau at $18
7-Oct-17	28-Jun-18	265	20.70	18.40	21.85	Plateau at $21
29-Jun-18	8-Jun-20	711	24.88	21.10	29.95	Plateau at $25
9-Jun-20	31-May-21	357	35.76	30.00	39.92	Plateau at $36
1-Jun-21	2-Mar-22	275	59.20	37.00	86.25	Gradual increase to $80
3-Mar-22	15-Dec-22	288	79.43	70.25	88.50	Plateau at $80
16-Dec-22	5-Jul-23	202	61.40	37.00	77.50	Decline to $62
6-Jul-23	20-Mar-24	259	66.62	38.00	75.50	Recovery to $67
21-Mar-24	20-Aug-24	153	52.92	44.63	59.30	Plateau of $53
21-Aug-24	8-Apr-25	231	62.03	54.50	64.73	Plateau of $62
9-Apr-25	5-Nov-25	211	55.41	47.50	59.00	Plateau of $55
6-Nov-25	8-Dec-25	33	41.62	38.50	46.75	Decline to $41

Source: NZIER

2.3.1 Changes in emissions and ETS performance

In the backdrop to the ETS, New Zealand's annual gross emissions of greenhouse gases have increased by 14 percent since 1990 (Ministry for the Environment 2024a). Gross emissions peaked in 2006 before the ETS was introduced in 2008, but it had been well signalled before then and may have prompted some emission reduction. Emissions troughed in 2009–2011 following the global financial crisis, rose again, then steadied before declining after 2019 during the years of COVID impact and recovery. The growth rate in gross emissions, both in aggregate and per capita, has been below the real growth in the economy, indicating some decoupling of emissions from economic growth. Net emissions have fluctuated rather more over this period, reflecting variations in the rates of afforestation and carbon credit creation, which have been incentivised by afforestation grants in some years as well as by ETS obligations.

New Zealand faces particular challenges in meeting its emission reduction targets. In response, the ETS has evolved from initially generous allowances of free Emission Trading Units in the early years to more restricted free allocation and greater reliance on auctioning more recently. The demand for emission units has fluctuated relative to supply, and recently, auctions failed to clear in 2025, indicating short-term demand was not well aligned with short-term supply.

Characteristics of the ETS include:

- Aiming for a comprehensive all-gases all-sectors coverage, including agriculture at some future date (although currently no planned date)
- Allowing for carbon credits to be created for carbon sequestration in new afforestation, which increases the supply of total emission permits and lowers their price on average
- Initial provisions to lower the cost of compliance for industry, such as emitters having access to overseas credits, free allowances of units, most of which have been removed or reduced since 2016
- Recurring adjustments to the level of units available via auctioning and to the remaining free allocations, which add some unpredictability to the ETS market.

The primary source of liquidity in NZUs and price setting is trading on the secondary market, which can take place across multiple platforms. The 2016 review of the ETS noted that the government does not monitor the number of trades or prices in the New Zealand carbon market because trades are not made through a single market. However, reforms currently progressing through the Climate Change Response Amendment Bill will introduce a market governance framework to improve transparency and oversight of the secondary market, including new reporting requirements and Financial Markets Authority enforcement.

The main sources of variability in the potential supply of units available for purchase on the secondary market are the rules governing the issuance and surrender of forestry units, the rules governing government auctions of units, and the central government's commitment to emissions reductions.

3 Method – MACC analysis

3.1 Background and recap of the original New Zealand MACC work in 2020

This update builds on MfE's earlier MACC analysis (delivered with Concept Consulting), which produced bottom-up MACCs for New Zealand as an economy-wide evidence base to compare mitigation measures on a consistent cost and abatement basis and to help identify where future policy effort could be focused.

In the original work, sector MACCs were developed and then combined into summary curves (illustrated for 2030), covering the land sector (agriculture and forestry), industry, transport, electricity generation, space and water heating, and waste, with additional sector-level detail in the supporting chapters.

Several methodological conventions from the original analysis are important for interpreting both the earlier results and this update:

- Economic framing: costs were assessed primarily from a national economic perspective (not necessarily the same as private/consumer costs), using a 6 percent discount rate across the analysis.

- Potential represented: reported abatement volumes largely reflect technical potential (i.e. not constrained by non-cost barriers, supply chain limits, or implementation lead-times), noting that realisable uptake is likely to be smaller in the near term.
- MACC interpretation: the analysis does not predict market behaviour, and the marginal abatement costs should not be conflated with the NZ ETS price required to deliver uptake; negative-cost options indicate net economic benefits and therefore imply barriers other than cost.

The original report also highlighted limitations that remain relevant: MACCs provide a static snapshot at a point in time and struggle to capture technology learning, implementation timing, and interactions/double counting across measures and sectors. Results are also sensitive to baseline projections and assumptions (especially further into the future).

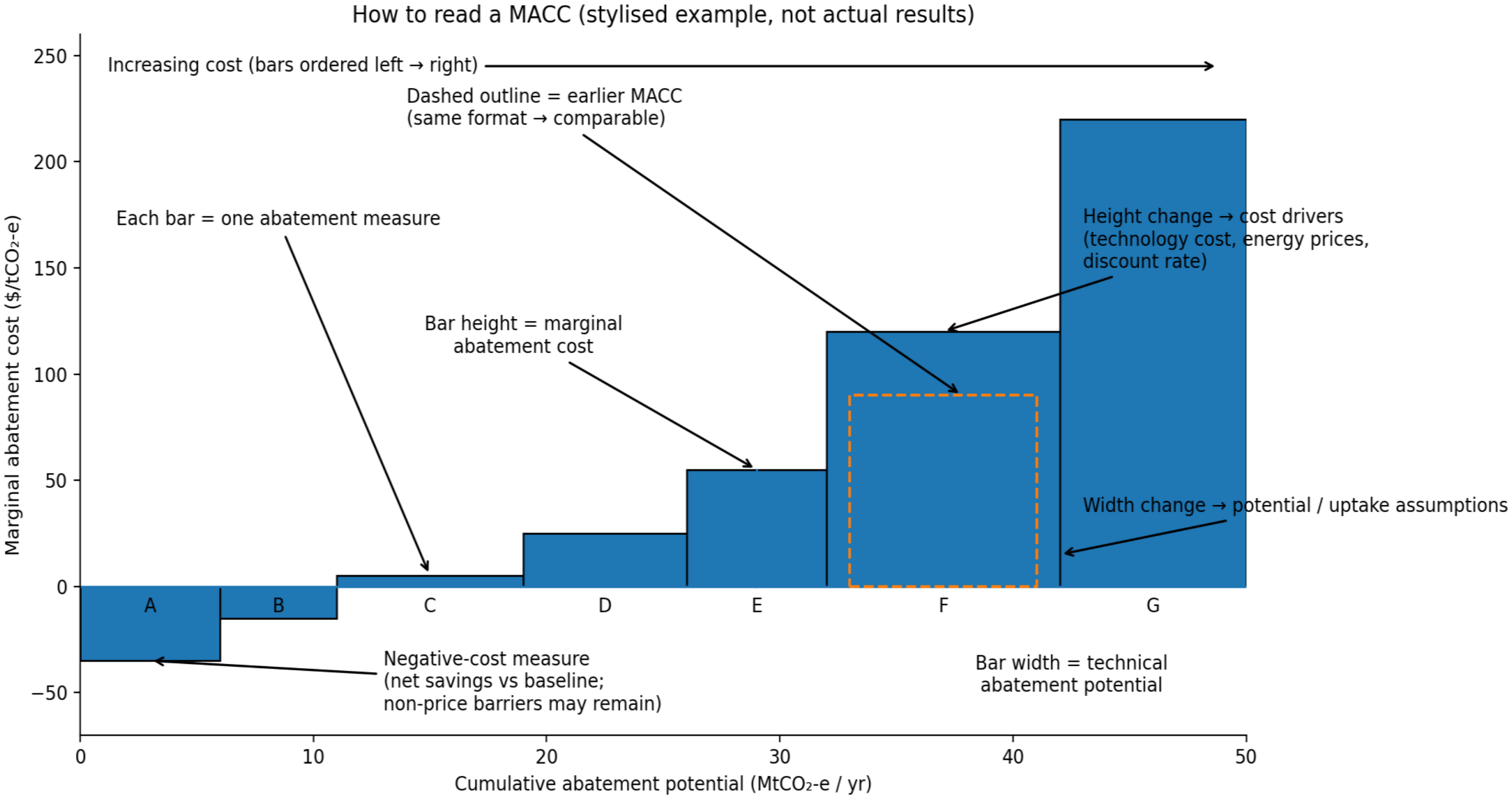
The current update retains the same core MACC logic and presentation conventions, while refreshing inputs, extending/revising sector modelling where needed, and improving transparency so that readers do not need to be familiar with the earlier MACC work to interpret the updated results.

3.2 Introduction to the MACC analysis

This section presents updated MACC analysis for 2035, developed as part of the 2025 refresh of New Zealand's MACC evidence base. The analysis updates key assumptions from the 2020 MACC study. It compares the 2020 MACC's estimated abatement opportunities (assuming no non-price barriers and based on the macroeconomic inputs used in that study) with realised emissions outcomes across major emitting sectors. Data for the 2020 analysis were from 2017, and data for the 2025 analysis were from 2023, so the realised emissions reflect changes over that time period. This analysis is intended to be read alongside the original 2020 MACC report (Ministry for the Environment 2020), which remains the primary reference for detailed sector methodologies.

The interpretation of the MACC results in this update follows the same conventions used in the 2020 MACC study. In that work, each bar in the MACC chart represented a discrete abatement measure, ordered from lowest to highest cost, with bar width indicating the technical abatement potential and bar height representing the marginal abatement cost. Negative-cost measures reflected opportunities where emissions reductions were projected to generate net savings relative to the baseline. By applying this same structure, the updated MACC allows a direct comparison with the original curve, both in terms of the relative position of measures and the overall distribution of costs. Any shifts in bar height or width, therefore, signal changes in underlying assumptions such as technology costs, energy prices, discount rates, or achievable uptake. This continuity in graphical format is intended to help agencies quickly identify where the updated evidence base confirms earlier expectations and where it materially diverges from the 2020 projections (Figure 3).

Figure 3 Explanation of MACC presentation



Source: NZIER

The updated MACC analysis retains the core bottom-up framework in the 2020 MACC, in which abatement options are represented as discrete measures with associated costs and emissions reductions. These measures are aggregated into sectoral and all-of-economy MAC curves by ordering options from lowest to highest marginal cost and cumulating the abatement potential to 2035.

Key sectoral models and spreadsheet tools from the 2020 work are reused and refreshed, including:

- industrial process heat and industrial process emissions (electricity, heat and industry MAC curves)
- transport (light and heavy road vehicles)
- waste
- electricity generation and stationary energy.

The analysis parameters are updated to reflect a new analysis window of 2025–2035 (rather than 2020–2030). The MACC 'snapshot' year is accordingly shifted from 2030 to 2035.

In the reporting, a key metric is the abatement potential. It is used to describe the amount of abatement available and to compare between the 2020 and 2025 analyses. The abatement potential is a fraction of the total abatement potential in the MACC. Total abatement is calculated with a step-wise process:

1 Start with total emissions from MfE, using the baseline emissions inventory.

2 Define the emissions sources in scope for each analysis: select the sectors, gases and activities that the MACC covers. This scope may exclude some emissions sources if no measures are assessed for them.

3 Identify abatement measures: for each emissions source, identify the measures that could reduce emissions, such as fuel switching, efficiency improvements, process changes or technology replacement.

4 Estimate abatement from each measure: for each measure, estimate how much emissions reduction it could deliver relative to the baseline. This estimate is usually based on technical potential, practical constraints, uptake assumptions and the time period considered.

The result is the total abatement potential, often reported in units of $MtCO_2$-e. This report breaks down the abatement potential available at different costs and for different sectors.

3.3 Costing approach

Consistent with the 2020 study, costs are assessed from a macroeconomic perspective rather than a private investor's viewpoint. Capital and operating costs are annualised using a real discount rate of 8 percent (The Treasury 2024) (up from 6 percent previously) and levelised over the technical life of each asset. This enables the calculation of:

- a levelised cost of energy or service (e.g. $/MWh of generation, $/GJ of useful heat), and
- a MAC for each measure, defined as the change in net resource cost divided by the change in emissions, expressed in NZ$/$tCO_2$-e.

3.4 Sector-specific modelling

This 2025 update by NZIER, with support from government agencies, focuses on selected sectors relevant to the MACC refresh as commissioned by MfE. The sectors included in this update are electricity generation, process heat, transport and waste. The agriculture and land sectors are not updated here.

Regarding cross-sector ETS analysis, ETS prices are overlaid on the 2035 MACC to estimate (i) the share of total abatement potential available at negative cost, and (ii) the share that lies below the average ETS price in 2025, which was $56.90. Key summary indicators such as the cost of the first 10 percent of abatement (C10%) and the break-even cumulative abatement share (CX%) are recomputed for 2020 and 2025 for comparison.

Details of the full parameter set used in each sector model are provided in *Quantitative analysis - Supp I - Assumptions.xlsx*, which also includes references to source material.

4 Data for the MACC analysis

4.1 Data providers for the 2025 MACC update

Updating the MACC analysis involved updating data from many sources. Some of the data is easily publicly available, such as public sector real discount rates. Other data is held by government agencies or relies on expert knowledge housed within them. The project team engaged with several agencies to identify and obtain the relevant data. The data sources are shown in Table 3.

Table 3 Data providers for the MACC update

Grouped by type of data

Type of data	Providers
Core macroeconomic & financial parameters	• New Zealand Treasury: real discount rates (public sector discount rate guidance). • Reserve Bank of New Zealand: exchange rates, inflation and financial series (hb1-monthly dataset). • NZIER (QP Series): macroeconomic projections (GDP).
Energy supply, prices & system assumptions	• MBIE: Energy Balance 2024, Quarterly Energy Statistics (wholesale gas prices), Energy in New Zealand 2025, Greenhouse gas emissions from the energy sector, and EDGS 2024 (Electricity Demand and Generation Scenarios: commodity prices, generation mix trajectories). • ASX Energy: 2025 electricity futures used for the updated hedge/baseload price. • Transpower: Generation Stack 2025 for solar baseload capital cost calculation. • BNEF (BloombergNEF): Battery pack price trajectory (lithium-ion battery cost declines). • NZGA (2023) coal prices.
Transport sector data	• Ministry of Transport: Fleet composition and VKT (Fleet statistics), vehicle VOC/heavy-vehicle cost data (DTCC WP-C5 2023), projections WEM (wem202405) and VEPM v7.1, and other travel/vehicle parameters. • NZ Transport Agency Waka Kotahi (NZTA): Zero-emission bus economics study (RR-718, 2024). • NERA: Vehicle technology cost baselines.
Heat, industry & energy-tech assumptions	• EECA TIMES NZ 3.0: Electricity supply assumptions (capacity factor ranges, peak contribution rates), transport sector technology parameters, commercial and industrial process-heat technology costs and performance, and many other TIMES 3.0 assumptions were also used for cross-checks rather than direct updates. • MBIE (EDGS 2024): Fuel import prices (oil, gas). • IEA World Energy Outlook (2025): Crude oil prices by scenario.
Emissions, environmental factors & scientific parameters	• MfE: 2025 New Zealand Greenhouse Gas Inventory (1990-2023 series), Measuring Emissions: Detailed Guide 2024 - emissions factors (e.g. page 138), and HAPINZ 3.0 (health impacts of air pollution).
Hydrogen, biomass and other sector-specific inputs	• MBIE (Hydrogen & energy modelling): EDGS and EY (commissioned by MBIE) hydrogen-related commodity assumptions. • New Zealand Geothermal Association: Geothermal system performance and cost data.

Source: NZIER

4.2 Overview of key updates

Relative to the 2020 MACC, three broad categories of inputs are updated:

1. Macroeconomic parameters
2. Energy prices and technology costs
3. Sector-specific operational parameters (transport, heat, electricity).

A consolidated summary of the most important changes is provided in Table 4, with full details in *Quantitative analysis - Supp I - Assumptions.xlsx*.

Most technical parameters, such as conversion efficiencies, remain unchanged from the 2020 MACC. By contrast, price and economic assumptions have been comprehensively updated to reflect current data and market conditions. The analysis horizon has shifted from 2020–2030 to 2025–2035, with 2024 now set as the starting year for ICE vehicle replacement. Key economic inputs were also refreshed, including an increase in the discount rate from 6 percent to 8 percent and an updated exchange rate assumption (US$0.60 per NZ$).

Energy and fuel price assumptions were revised substantially. Electricity prices now reflect ASX projections, with the 2025 baseload price increasing from $75/MWh to $129.4/MWh, and wholesale gas prices updated using MBIE's *Energy Quarterly*. Oil price paths were re-estimated using Consensus Economics (2025–2030) and MBIE's EDGS (2031–2050). Industry fuel and technology costs were similarly adjusted, including higher capital cost estimates for boilers and a shorter boiler replacement period (reduced from 15 to 10 years – for comparing with 2020 MACC).

Transport and electricity-system parameters incorporate recent evidence from the MoT, MfE, MBIE EDGS, NZTA, and HAPINZ 3.0.[9] Process heat and space/water heating modules now use the updated $129.4/MWh electricity hedge price, aligning them with electricity-supply assumptions.

Waste-sector modelling incorporates revised GDP pathways and updated electricity values, while retaining the original engineering assumptions from the previous analysis. We retained the previous set of measures and the underlying engineering and cost assumptions from the earlier analysis (e.g. food waste prevention, composting, anaerobic digestion, biostabilisation). The resulting cost estimates were then re-expressed in real 2025 dollars (2020 base year), consistent with the treatment applied across the other sectors.

Drivers of the major changes from the 2020 MACC to the 2025 MACC are shown in Table 4. In addition, Table 5 provides a more detailed list of changes in the analysis and the drivers of those changes.

9 https://www.ehinz.ac.nz/projects/hapinz3/

Table 4 Drivers of major changes to the 2020 MACC

Grouped by categories outlined above

Inputs	2020 value	2025 value	Key change	Impact on cost
Category 1 inputs				
Discount rate	6%	8%	Updated discount rate	↑
Exchange rate	0.65 USD/NZD	0.60 USD/NZD	Updated exchange rate	↑ if dependent on imports
Category 2 inputs				
Energy prices	$75/MWh	$129.4/MWh	Electricity increases significantly	↑↑
Category 3 inputs				
Capital costs			Updated renewables, boilers, electrification tech	↑
Technology pathways			More electrification, renewable buildout	Mixed dependent on sector
Time horizon	2020–2030	2025–2035		Mixed

Source: NZIER

Table 5 Detailed changes and impacts in MACC analysis

Changes from 2020 to 2025 analysis

Change: 2020 → 2025	Impact on marginal cost ($/tCO$_2$)	Impact on abatement potential (bar width)	Notes (what drives the direction)
Discount rate: 6% → 8%	↑	–	Raises levelised costs for capital-intensive, long-lived measures (renewables, industrial conversions).
Exchange rate: 0.65 → 0.60 USD/NZD	↑	–	NZD depreciation increases the NZD cost of USD-denominated/imported capex and components.
Time horizon: 2020–2030 → 2025–2035	–	↑	Same duration, but more time for large investments/turnover to occur → can expand technical deployment potential for slow-moving measures. Cost direction is typically second-order and input-dependent.
GDP series updated (NZIER QP)	–	–	Primarily affects scaling/consistency across modules; direction depends on whether revised GDP is higher/lower than the prior series and how scaling is applied.
Electricity price: $75/MWh → $129.4/MWh (2025 baseload)	↑	–	Generally increases operating cost of electrification (heat pumps, EV charging, industrial electrification) → higher $/tCO$_2$. (Can be offset if paired with a cleaner grid or other benefits.)
Gas price: $6.0/GJ → $11.9/GJ (2025 baseload)	↓	–	Makes switching away from gas more cost-effective (larger avoided fuel cost) → lower $/tCO$_2$ for electrification/fuel-switch measures.
Oil price path updated (Consensus Economics near term; EDGS long term)	–	–	Direction depends on how the revised oil trajectory compares to the old assumption; higher oil prices typically ↓ cost of EV/efficiency measures.
Boiler capex increased + replacement interval 15 → 10 years	↑	↑	Higher capex raises $/tCO$_2$, while shorter replacement interval increases turnover opportunities, potentially increasing deployable abatement.
Inventory updated to 2025 NZ GHG Inventory + recoding	–	–	Can shift baselines, emissions factors, and sector allocations, affecting both cost-per-tonne and potentials, but direction is measure/sector-specific (not uniformly up or down).
Transport: lifetime vehicle km increased	↓	↑	More lifetime service → more fuel/emissions avoided per vehicle → can improve cost-effectiveness and increase cumulative abatement per unit uptake.
Transport: maintenance costs per km updated	–	–	Direction depends on whether revised maintenance costs favour EVs or ICE; typically secondary relative to fuel/energy costs.
Transport: health cost of emissions $1.1b → $8.8b/yr	↓	–	If treated as a co-benefit in the metric, higher health benefits reduce net cost (more negative). If only reported separately, then “MACC cost” may not move.

Change: 2020 → 2025	Impact on marginal cost ($/$tCO_2$)	Impact on abatement potential (bar width)	Notes (what drives the direction)
Transport: include BEV $PM_{2.5}$ (previously excluded)	↑	–	Adds a small additional externality/cost component, slightly worsening net benefits for BEVs (magnitude likely modest).
Electricity system recalibration (mix, demand, emissions factors; EDGS)	–	–	Changes marginal emissions factors: a cleaner grid tends to ↑ $/$tCO_2$ for electrification (fewer tonnes per kWh), while a dirtier grid does the opposite. Not one-directional.
Utility PV cost: $95/MWh → $68/MWh	↓	↑	Lowers the cost of solar supply measures and can increase economically attractive deployment potential.

Note: Further details can be found in Quantitative analysis – Supp I - Assumptions.xlsx.

Source: NZIER

5 Results from the MACC analysis

This section provides an integrated view of New Zealand's emissions profile, recent abatement outcomes, and the updated 2025 MACC results. It begins by summarising New Zealand's 2023 emissions across sectors and major industrial activities, drawing on updated national inventory data. The analysis then compares the abatement opportunities estimated in the 2020 MACC (based on that study's macroeconomic inputs and assuming no non-price barriers) with the reductions achieved by 2025, highlighting where observed outcomes align with or diverge from earlier expectations. Building on this, the section presents a side-by-side comparison of the 2020 and 2025 MACC versions for electricity, heat and industry, transport, and waste, illustrating how updated assumptions reshape the cost and scale of available mitigation options. With all costs presented in real 2025 NZD (2020 base year) to ensure comparability across versions and sectors, differences reflect updated assumptions rather than currency/inflation effects. After that, the section assesses how the average ETS price in 2025 interacts with the 2025 MACC, identifying the share of abatement that is cost-effective under today's market conditions and where complementary measures may be required to unlock higher-cost opportunities.

The updated MACCs quantify technical and economic abatement opportunities under common social-cost assumptions, but they do not explicitly model real-world uptake constraints (e.g. behavioural, financing, infrastructure, and system-integration limits), so results should not be read as a forecast of realisable abatement.

5.1 Emissions profile in 2023

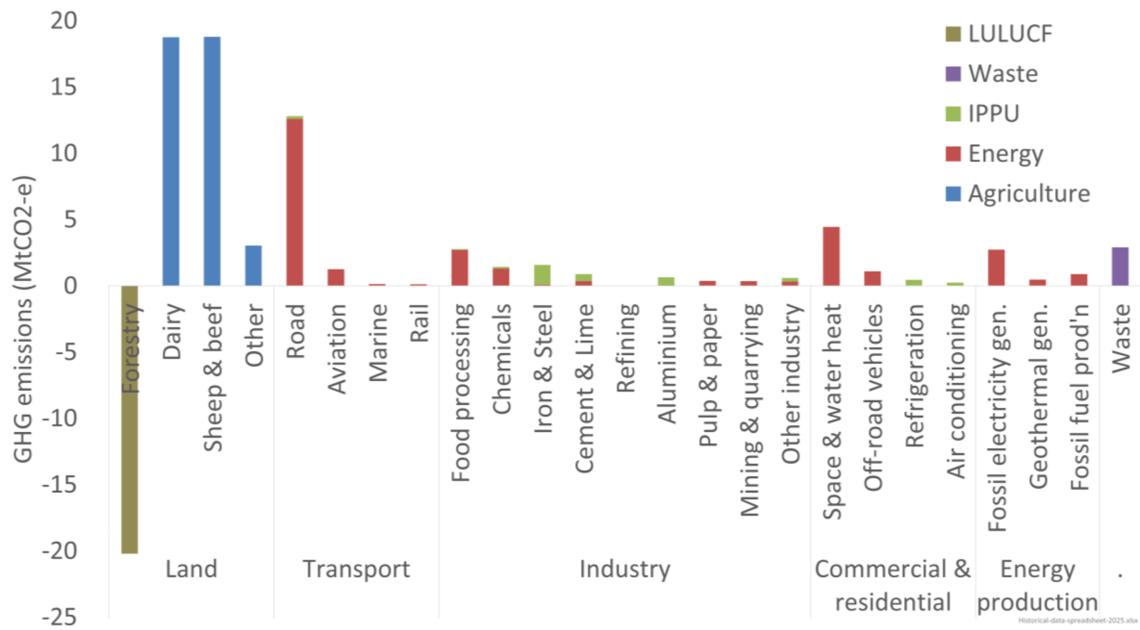
5.1.1 By sector

Figure 4 presents New Zealand's 2023 GHG emissions by sector and sub-sector. The chart highlights that agriculture remains the largest contributor, dominated by dairy and sheep & beef emissions, followed by road transport-related emissions. Industrial sources such as food processing, chemicals, and cement & lime contribute smaller but notable shares. The

LULUCF sector provides a significant carbon sink, offsetting a portion of gross emissions, while waste and IPPU contribute relatively minor shares. The figure illustrates the dominance of agricultural and energy emissions in New Zealand's gross GHG profile, which is partially offset by land-based sequestration. This figure replicates a similar figure in MfE (2020) but with the data from the 2025 *New Zealand Greenhouse Gas Inventory*. Figure 13 in Appendix A adds international travel to the data shown in Figure 4.

Figure 4 New Zealand's greenhouse gas emissions in 2023

By emissions sector and industry



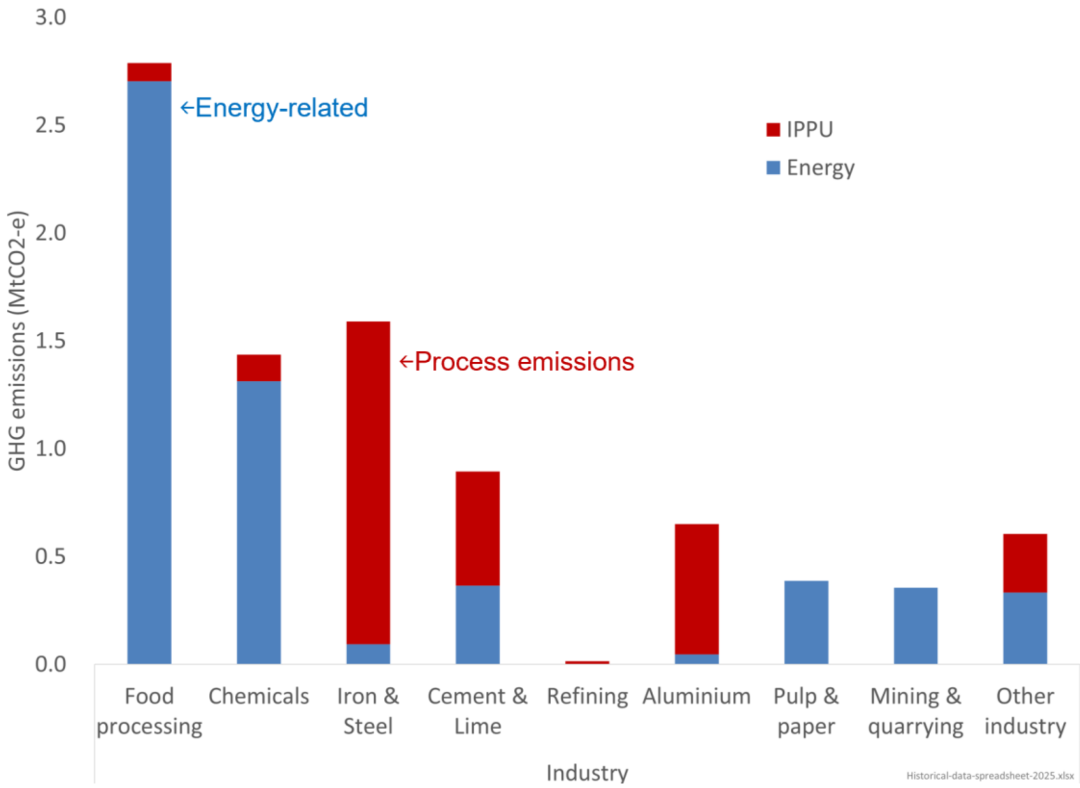
Source: NZIER and MfE

5.1.2 By the top-emitting industry sectors

Figure 5 shows industrial GHG emissions by sub-sector or industry, distinguishing between energy-related (blue) and process (red) emissions. The food processing and chemical industries are identified as energy-intensive, reflecting their high reliance on fossil fuels for heat and power. In contrast, sectors such as iron & steel, cement & lime, and aluminium exhibit significant process emissions arising from chemical reactions inherent to production, as well as from energy use. Other industries, including pulp & paper, mining & quarrying, and refining, contribute smaller shares. The chart highlights that industrial decarbonisation in New Zealand will require both energy efficiency and fuel switching measures, as well as process innovation or carbon capture to address non-combustion emissions. Figure 14 in Appendix A disaggregates emissions by fuel type for the industries in Figure 5.

Figure 5 NZ's emissions from the highest-emitting industries, 2023

Showing IPPU and Energy emissions



Source: NZIER and MfE

5.2 Comparison of 2020 MACC estimates with observed outcomes

Table 6 compares the abatement opportunities estimated in the 2020 MACC with the actual emission reductions observed by 2023 (relative to 2017 levels[10]) across key sectors. The first column presents the estimated abatement potential identified in the 2020 MACC, defined as the quantity of abatement available at a cost equal to or below the NZU price of \$56.90/tCO_2-e. The second column shows the realised abatement achieved over the same period, based on an inventory of emissions changes relative to 2019. The final column shows the difference, highlighting where actual outcomes have fallen short or exceeded expectations.

10 The 2020 MACC used 2017 GHG Inventory data while the 2025 MACC uses 2023 GHG Inventory data, which is the latest version released as of the date of this analysis.

Table 6 2020 MACC estimates versus observed outcomes

Sector	2020 estimates ($MtCO_2$-e)	2025 actuals ($MtCO_2$-e)	Difference
Energy	11.66	3.41	-8.25
IPPU	0.47	0.72	0.25
Waste	0.32	0.23	-0.09
Transport	5.63	0.64	-5.00

Note: The estimates reflect MACC opportunities equal to or less than the NZU price. The 2025 actuals are 2023 inventory-based emissions changes relative to 2019.

Source: NZIER and MfE

5.3 Macro headwinds that slowed abatement, by sector

5.3.1 Energy

In the energy sector, actual reductions (3.41 $MtCO_2$-e) are less than the 2020 estimate (11.66 $MtCO_2$-e).[11] While notable progress has occurred through the phase-out of coal, expansion of renewable generation, and efficiency gains, a substantial portion of potential abatement has not yet materialised (Woods 2023). This shortfall likely reflects slower-than-expected process heat conversions, capital constraints, and deferred industrial investment decisions, despite higher NZU prices over 2021-2025 than the levels observed around the time the 2020 MACC was prepared.

5.3.2 IPPU

For IPPU, outcomes outperformed the 2020 MACC's estimated abatement opportunity, with abatement of 0.72 $MtCO_2$-e by 2025 compared with 0.47 $MtCO_2$-e indicated in the 2020 MACC. The progress reflects incremental efficiency improvements but continued challenges in adopting low-emission technologies due to long asset lifetimes, limited technology readiness and high capital costs (Ministry for the Environment 2023).

5.3.3 Waste

In the waste sector, abatement outcomes are broadly consistent with the 2020 MACC estimated opportunity, with emissions decreasing marginally from 0.32 $MtCO_2$-e (estimated) to 0.23 $MtCO_2$-e (actual). Most low-cost measures, such as landfill gas recovery and organics diversion, have already been implemented, leaving only smaller opportunities for further reductions (Climate Change Commission 2025b). Future gains will likely depend on technological improvements and enhanced organics management policies (Ministry for the Environment 2024b).

5.3.4 Transport

Transport sector abatement remains well below expectations. Actual reductions of 0.64 $MtCO_2$-e, compared to a projected 5.63 $MtCO_2$-e, indicate that the ETS price alone has had a limited impact in driving behavioural and investment change (Climate Change

11 The closure of the Marsden Point refinery contributed to these emissions reductions. Under the current system of production-based carbon accounting, the closure shifted responsibility for the related emissions offshore.

Commission 2025a). While initiatives have contributed, deeper decarbonisation appears to rely on complementary regulatory and infrastructure policies (Ministry for the Environment 2022). For example, initiatives such as the Clean Car Discount and infrastructure investment supported early progress, but the end of the Clean Car Discount in 2023 has since slowed the pace of low-emission vehicle uptake, based on car dealer reports of reduced sales.

These results indicate that progress has been uneven and that the abatement opportunities identified in the 2020 MACC have not been fully realised by 2025.

5.4 2020 vs 2025 MACC comparison

Compared with the 2020 MACC, the 2025 MACC shows a modest increase in the abatement potential in the low-cost zone (at or below the ETS price), rising from 17.43 $MtCO_2$-e/yr to 19.45 $MtCO_2$-e/yr. By contrast, the mid-cost zone (above the ETS price but below \$100/tCO_2-e) falls from 3.70 $MtCO_2$-e/yr to 2.26 $MtCO_2$-e/yr, while the high-cost zone (above \$100/tCO_2-e) increases slightly from 5.45 $MtCO_2$-e/yr to 6.21 $MtCO_2$-e/yr. While there is a small increase in total abatement potential, a key change between the two MACC vintages is a redistribution of abatement potential across cost zones. Details for the changes are listed in Table 7, showing the increases in the low-cost and high-cost zones. Weighted average costs of abatement for each zone and both years of analysis are provided in Table 8. The low-cost zone has decreased in average cost by over 100 percent, while the other two zones show small increases in average costs. An aggregate MACC comparison of 2020 and 2025, excluding the land sector (agriculture and forestry), is shown in Figure 11 of the discussion section.

Table 7 Comparison of abatement potential by cost zone in the 2020 and 2025 MAC curves

Cost zone	2020 abatement potential ($MtCO_2$-e/yr)	2025 abatement potential ($MtCO_2$-e/yr)
Low	17.43	19.45
Mid	3.70	2.26
High	5.45	6.21
Total	**26.59**	**27.92**

Source: NZIER and MfE

Table 8 Comparison of abatement costs by cost zone, 2020 and 2025

Weighted average cost for each cost zone of MAC curves

Cost zone	2020 MAC value (NZ\$/tCO_2-e)	2025 MAC value (NZ\$/tCO_2-e)	Increase/decrease (%)
Low	-71.8	-159.7	↓ 122%
Mid	74.6	78.8	↑ 6%
High	232.5	251.4	↑ 8%

Note: Weighted averages are calculated as the abatement-weighted average of the marginal abatement cost for all measures within each cost zone. This gives an estimate of the average cost per tonne of abatement in each zone. For comparability, all prices were adjusted to 2025 NZ dollars.
Source: NZIER and MfE

The sub-sections below focus on the sector-by-sector comparison. For each sector, the 2020 and 2025 figures use the same scales. However, the scales are different across the sectors, especially in the amount of abatement (shown on the X axis). Care should be taken when comparing the graphs across sectors.

5.4.1 Electricity generation

Key points

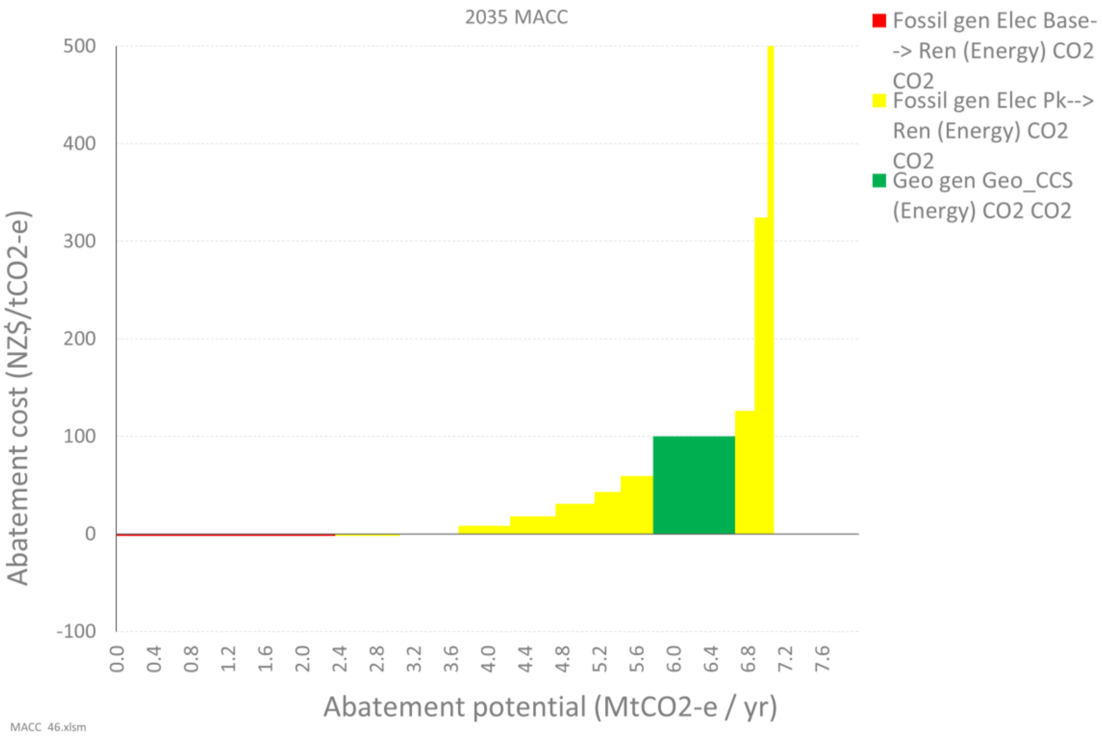
- Low cost zone – the 2025 results are both wider and taller than the 2020 results, indicating more abatement potential and great cost savings have developed in that time. Base generation with renewables has a lower relative cost than before, and the potential for meeting peak demand with renewables has increased. This zone is mostly negative-cost measures.
- Mid-cost zone – the mid-cost zone, which contains abatement options between the ETS price and $100, disappeared in the 2025 MACC. Options are either low-cost or over $100.
- High-cost zone – the high-cost zone is similar in the two analyses. The costs are largely unchanged, with a small increase in abatement potential at costs over $100.
- Figure 6 presents the 2020 MACC and 2025 MACC together for the electricity generation sector.

Potential contributing factors

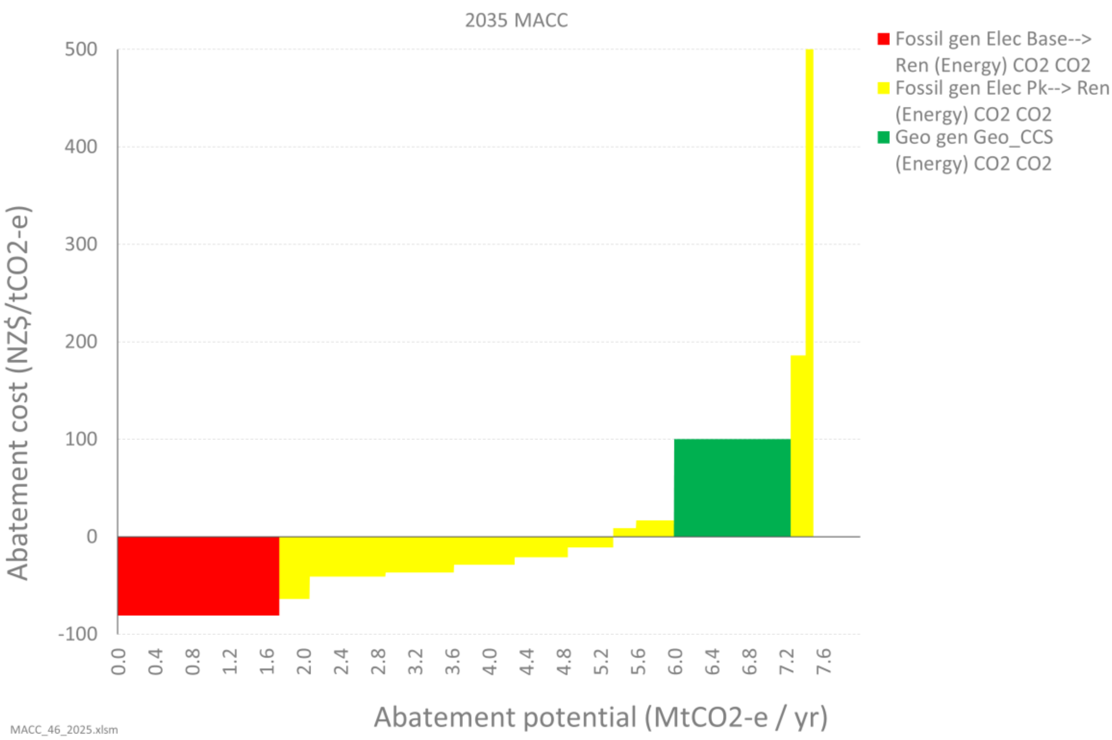
Relative to the 2020 model run, the 2025 electricity-generation MACC for 2035 shows a larger low-cost opportunity set at the start of the electricity block, including a material tranche (around 6 $MtCO_2$-e/yr) at negative or near-zero cost associated with replacing fossil baseload generation with renewables. A key reason this portion shifts from around zero cost in the 2020 MACC to negative cost in the update is that the avoided operating costs of fossil generation are now higher under updated inputs (most notably higher gas/thermal fuel costs and revised wholesale price trajectories), so renewable substitution can deliver net savings while also reducing emissions. Beyond this, the updated curve also includes a tranche around $100/$tCO_2$-e (largely CCS-related options), which could be within reach with higher carbon prices, stronger policy support or targeted incentives. By contrast, the final increment, fully displacing remaining peak fossil capacity, remains at a very high cost, reflecting the need for firming capacity, storage, and network upgrades to maintain security of supply at very high renewable shares. It also suggests that higher capital costs while many large-scale renewable projects remain in early or mid-construction phases (Jones 2024), grid integration and storage requirements (Planetary P&L 2025), residual fossil energy use for stability, and the exhaustion of lower-cost decarbonisation options earlier in the transition (Hale 2025).

Figure 6 2035 MACC for Electricity generation, 2020 vs 2025 forecasts (truncated)

a) 2020 version



b) 2025 version



Notes: See full version in Appendix D. Notes on legend: For consistency with the 2020 MAC, the labels have been kept unchanged. The meaning of each entry can be understood by referring to the explanations below.

- Generation type and operating mode: Fossil gen Elec Base = Baseload fossil-fuel electricity generation; Fossil gen Elec Pk = Peaking fossil-fuel electricity generation; Geo gen = Geothermal electricity generation

- Technology shift notation: → Ren = Replacement of fossil-fuel electricity generation with renewable electricity generation; Geo_CCS = Geothermal electricity generation with carbon capture and storage
- Scope and gas coverage: (Energy, CO_2) = Measure applies to the energy sector, and abatement reflects direct CO_2 emissions reductions from electricity generation
- The right-most abatement costs reach 1,490 and 1,346 NZ$/t$CO_2$-e for the 2020 and 2025 MACC, respectively. For readability and to better distinguish the remaining measures, the vertical axis is capped at NZ$500/t$CO_2$-e.

Source: NZIER and MfE

5.4.2 Transport

Key points

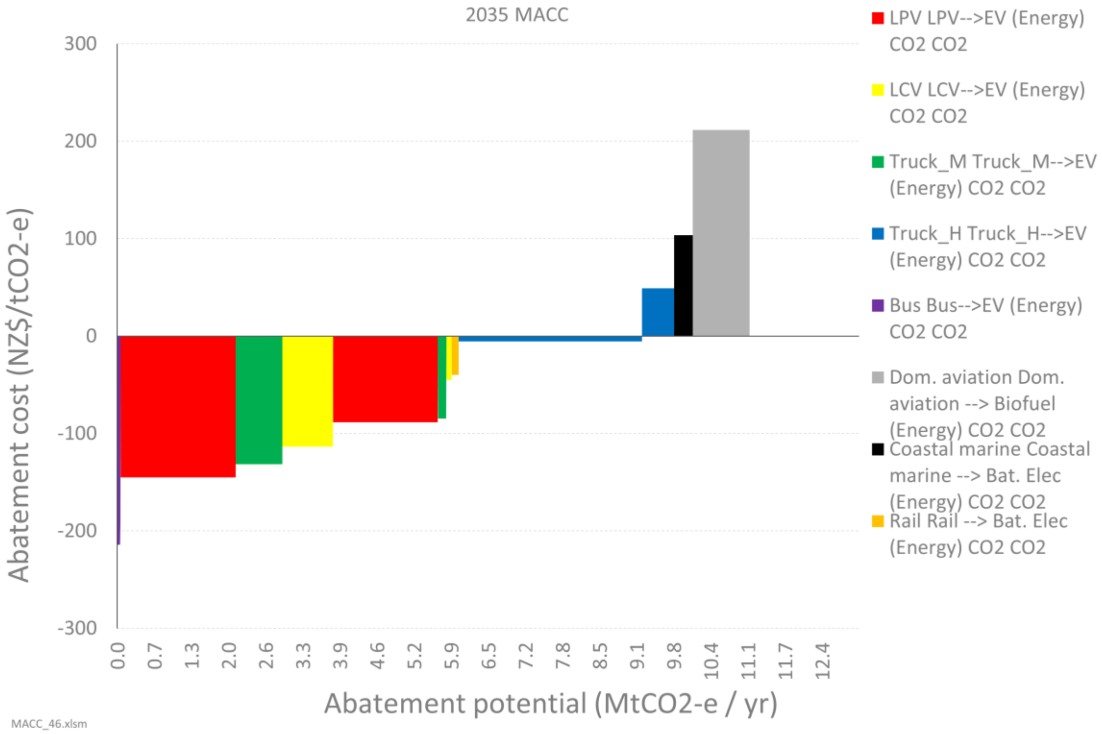
- ICE replacement in the transport model is assumed to commence from 2024 rather than 2019, in line with observed market developments in low-emission vehicles.
- Low-cost zone – most of the measures in the 2025 results are in the low-cost zone, and all of those measures potentially offer cost savings. These low-cost options have larger negative costs (potential savings) than the 2020 analysis. The abatement potential has also increased: options that had positive costs in 2020 now show negative costs. Road-transport electrification (especially LPVs, LCVs and medium trucks) is the dominant source of negative-cost abatement.
- Mid-cost zone – in both MACCs, heavy trucking includes a mid-cost option that provides a small amount of abatement.
- High-cost zone – the 2025 MACC does not include a high-cost zone, unlike the 2020 analysis. The domestic aviation and coastal marine abatement options have now become low-cost, whereas they were high cost in 2020. This is primarily a result of underlying fuel-price assumptions, which were not updated due to a lack of recent source data. Because other fuel-price assumptions have increased, aviation biofuels may appear artificially low-cost relative to other transport abatement options. Further information is provided in the *Quantitative Analysis – Supp I – Assumptions* Excel file, which documents changes to assumptions and data sources since the 2020 update.
- Figure 7 compares the transport MACCs produced using the 2020 and 2025 versions of the transport model.

Potential contributing factors

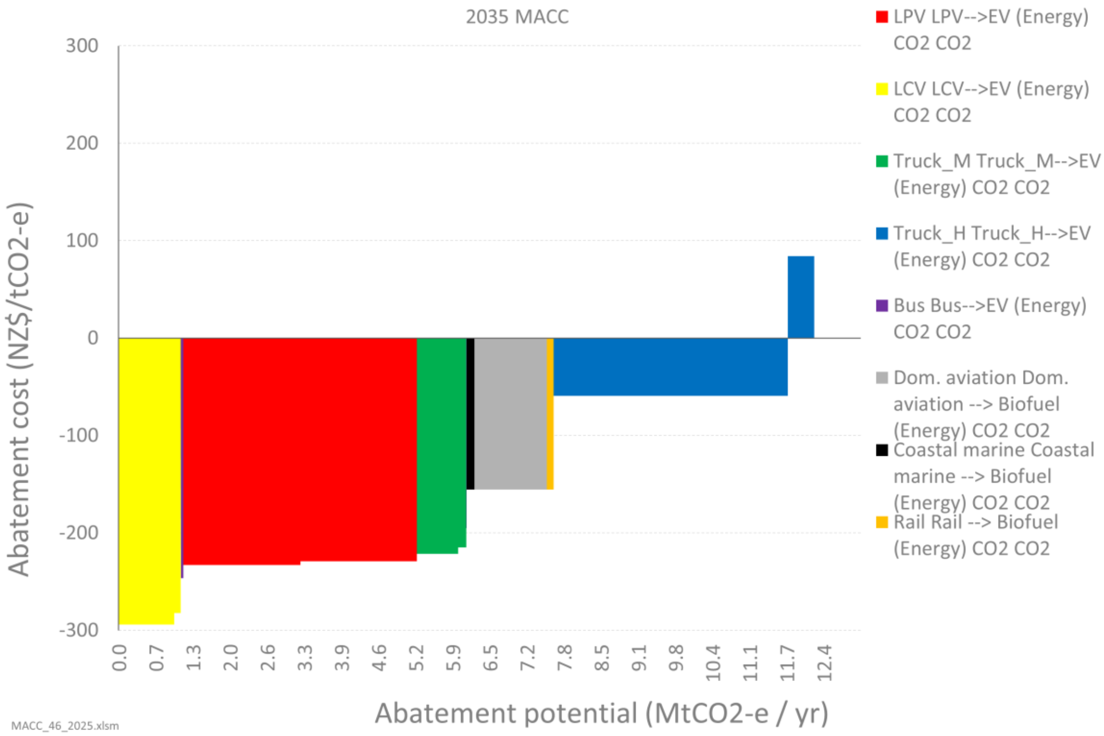
Across both versions, the dominant sources of negative-cost abatement are electrification of LPVs, LCVs, and medium trucks. In the 2025 MACC, this negative-cost segment is wider than in 2020, mainly because higher assumed lifetime VKT and revised EV-ICE maintenance cost differentials increase lifetime savings per vehicle, particularly for light vehicles and vans. Both curves exclude a social-cost basis, which uses air-quality and health externality values. The key difference in the 2025 update is the revised oil price projection (IEA 2025 World Energy Outlook), which increases the avoided fossil-fuel cost in the counterfactual and therefore increases the lifetime savings from electrification and fuel switching. Higher electricity prices in 2025 increase charging costs, but do not overturn these savings. Heavy-truck electrification is more mixed and remains less consistently negative-cost, reflecting higher capital costs and heterogeneous duty cycles.

Figure 7 2035 MACC for Transport, 2020 vs 2025 forecasts

a) 2020 version



b) 2025 version



Notes on legend: For consistency with the 2020 MAC, the labels have been kept unchanged. The meaning of each entry can be understood by referring to the explanations below.

- Vehicle type: LPV; LCV; Truck_M; Truck_H; Bus
- Mode and fuel switch notation: → EV = Switch from internal combustion engine vehicles to electric vehicles

- Aviation and marine: Domestic aviation = Domestic air transport; → Biofuel = Switch from conventional aviation fuels to sustainable aviation fuels; Coastal marine = Coastal shipping; → Battery electric = Switch from fossil-fuel propulsion to battery-electric propulsion
- Rail: Rail → Battery electric = Replacement of diesel traction with battery-electric rail on non-electrified lines
- Scope and gas coverage: (Energy, CO_2) = Measure applies to the energy sector, and abatement reflects direct CO_2 emissions reductions from fuel combustion

Source: NZIER and MfE

5.4.3 Heat

Key points

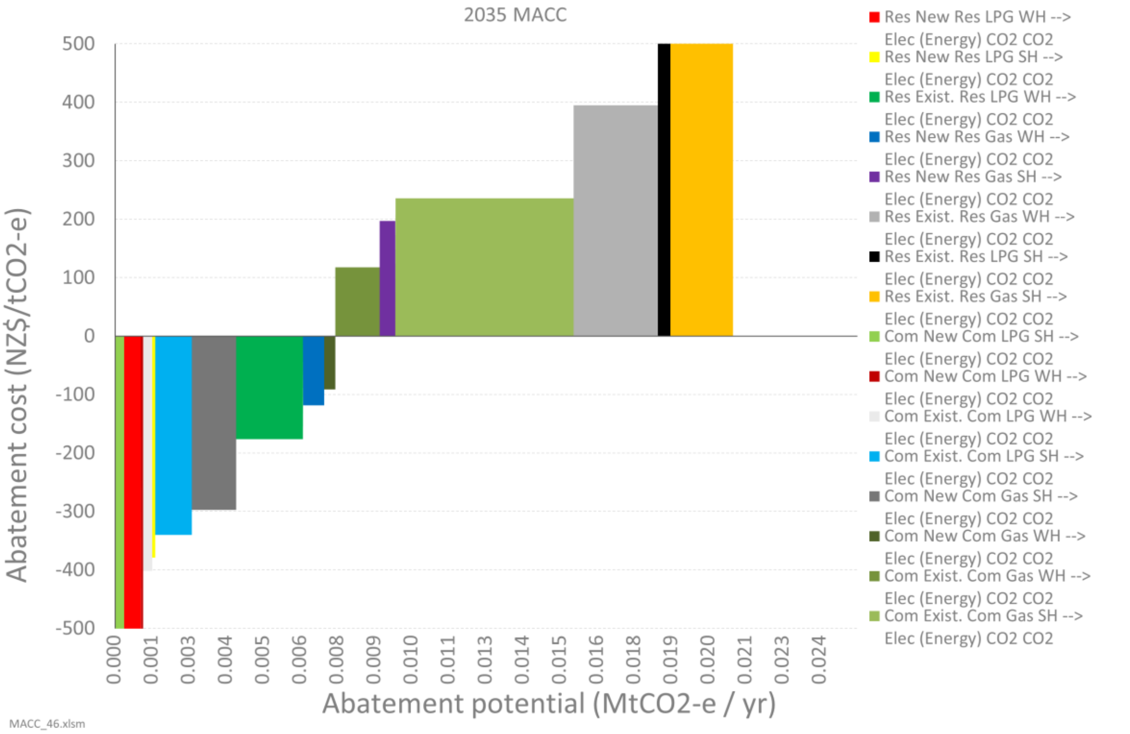
- Low-cost zone – in general, costs move upward somewhat in the low-cost zone. There are still options with negative costs, but the potential gains are smaller. In addition, the abatement potential, always low, has decreased by a small amount.
- Mid-cost zone – there are no options in the mid-cost zone in either year's MACC.
- High-cost zone – the cost of options in the high-cost zone has increased, and there is a small increase in abatement potential.
- The overall higher costs are the result of assumptions about fuel prices, technology capital costs and a higher real discount rate.
- Figure 8 compares the industrial heat MACCs produced using the 2020 and 2025 model versions.

Potential contributing factors

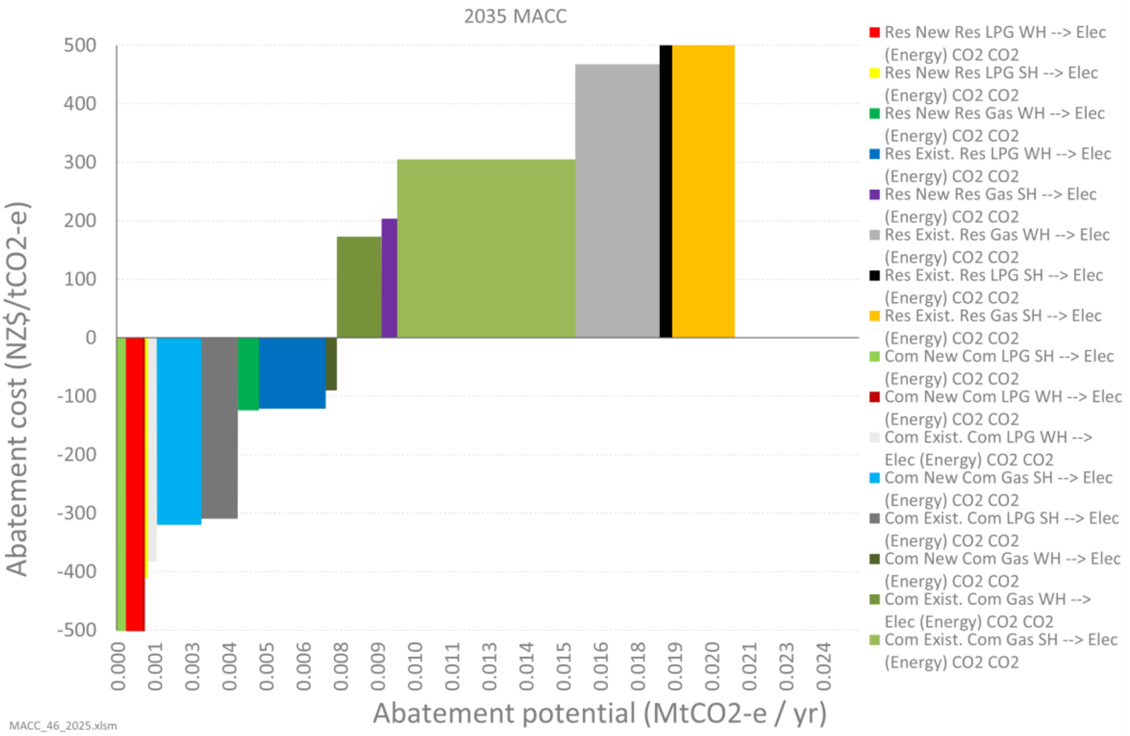
These changes largely reflect higher electricity, biomass, and technology cost inputs, alongside higher financing/discounting assumptions, which reduce the cost advantage that some electrification and fuel-switch options exhibited in 2020. Negative-cost opportunities generally remain negative but with smaller savings and/or altered scale, while several positive-cost options become materially more expensive. Fuel switching from fossil fuels to electricity or biomass is generally more expensive in the update, and process-heat electrification options move higher on the cost axis. While industrial heat measures therefore become more costly in the 2025 MACC, the sector still contributes to total abatement potential, particularly in the low-cost range. The highest-cost components remain elevated, reflecting current market conditions and the comparatively less mature or more capital-intensive nature of some abatement technologies.

Figure 8 2035 MACC for Heat, 2020 vs 2025 forecasts (truncated)

a) 2020 version



b) 2025 version



Notes on legend: To keep it consistent with the 2020 MAC, the labels were kept unchanged. One can understand the meaning of each entry by checking the guide below. Sector: Res = Residential sector; Com = Commercial sector:

- Appliance status: New = New appliances; Exist. = Existing appliances

- Fuel/technology being replaced: LPG = Liquefied petroleum gas-fired appliance; Gas = Natural gas-fired appliance
- End use: WH = Water heating; SH = Space heating
- Arrow notation: → Elec = Switch from the existing fuel/technology to an electric heating technology
- Scope and gas coverage: (Energy, CO_2) = Measure applies to the energy sector and abatement reflects direct CO_2 emissions reductions.

Source: NZIER and MfE. See full version in Appendix D

5.4.4 Industry

Key points

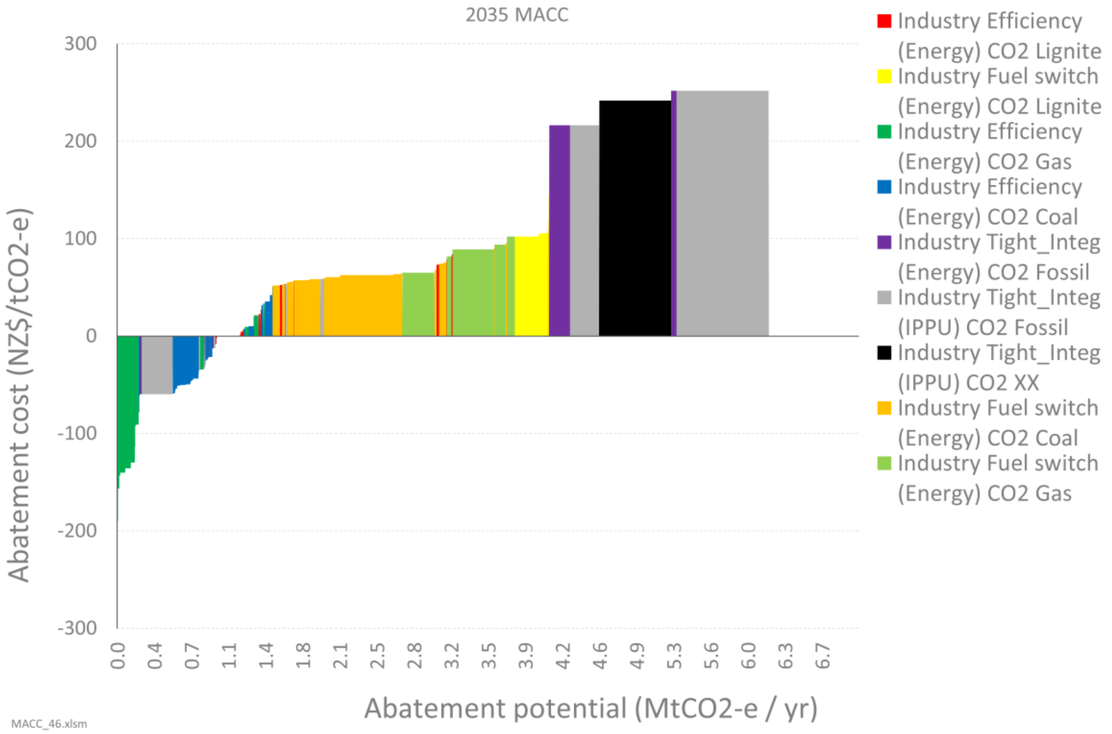
- Low-cost zone – the amount of abatement potential in the low-cost zone has remained roughly constant between the 2020 and 2025 analyses. The impact on costs is mixed: some options have reduced costs, while others have stayed roughly the same.
- Mid-cost zone – there is a small mid-cost zone for this sector in both MACCs, with roughly the same abatement potential in both years. The costs in this zone have also decreased somewhat.
- High-cost zone – the high-cost zone is nearly the same in both cost and abatement potential in the 2020 and 2025 MACCs.
- Figure 9 compares industrial abatement measures in the 2020 and 2025 MACC, covering both energy-related and IPPU emissions.

Potential contributing factors

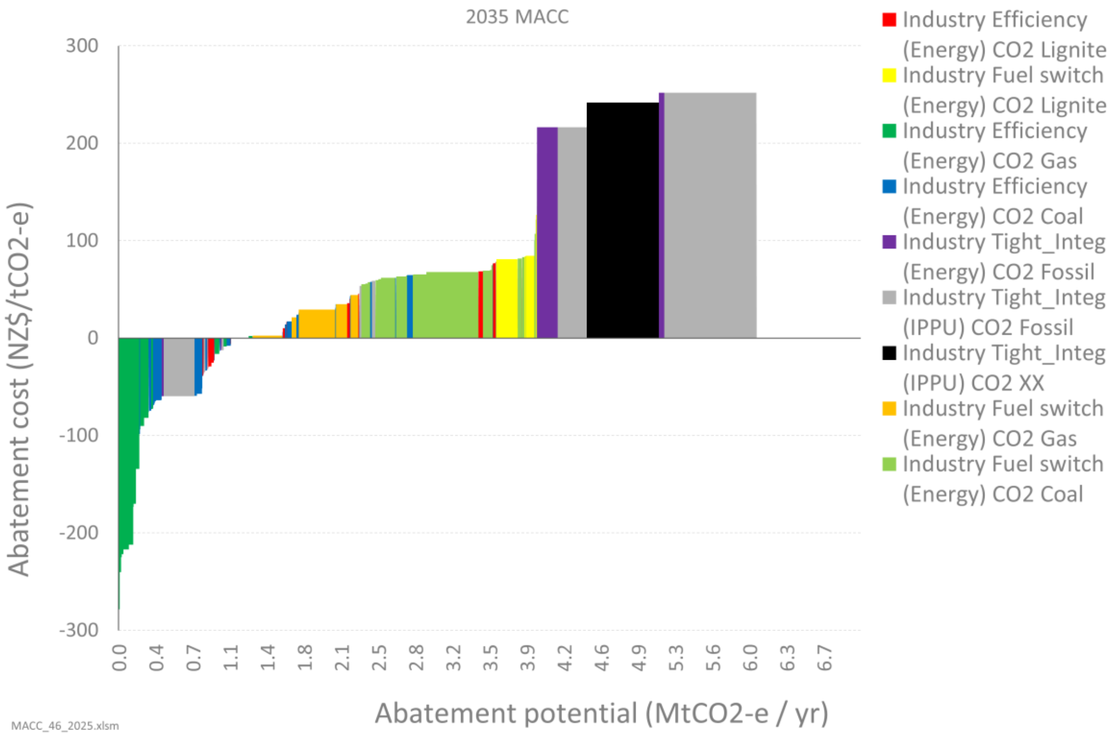
The 2025 industrial MACC reflects updated input assumptions, including higher capital costs for industrial equipment and process-integration upgrades, updated fuel price paths (notably electricity and gas), and a higher discount rate, which together would be expected to shift levelised abatement costs upward relative to 2020. In practice, the charts suggest the net cost changes for most measures are modest, with the overall ordering largely unchanged, indicating that the industrial cost profile continues to be driven primarily by structural features such as high-temperature heat requirements and process-specific emissions. The reduction in 2025 abatement potential for some fuel-switching measures (the red tranche) is consistent with a tighter feasible deployment wedge under updated assumptions, e.g. revised turnover/replacement rates, fuel availability constraints, or baseline activity/emissions levels, rather than a wholesale change in technical performance; where fuel switching remains available, the highest-cost options continue to be those requiring tight process integration or replacement of energy production assets by 2035.

Figure 9 2035 MACC for Industry, 2020 vs 2025 forecasts (truncated)

a) 2020 version



b) 2025 version



Notes on legend: To keep it consistent with the 2020 MAC, the labels were kept unchanged. One can understand the meaning of each entry by checking the guide below.

- Measure type: Industry Efficiency = Improvements in industrial energy efficiency within existing production processes; Industry Fuel switch = Switching industrial energy use from one fuel to another; Industry

Tight_Integ = Tightly integrated industrial process changes, including major process reconfiguration or technology substitution

- Sectoral scope: (Energy) = Measure applies to industrial energy use; (IPPU) = Measure applies to industrial processes and product use
- Fuel/emissions source: CO2 Gas = CO_2 emissions from natural gas use; CO2 Coal = CO_2 emissions from coal use; CO2 Lignite = CO_2 emissions from lignite use; CO2 Fossil = CO_2 emissions from fossil fuel use; CO2 XX = CO_2 emissions from industrial process sources where fuel attribution is not specified individually

Source: NZIER and MfE. See full version in Appendix D (with Urea, Kraft Pulp and Refining)

5.4.5 Waste

Key points

- Low-cost zone – the costs for the negative-cost measures have become less negative, so they represent less potential gain, while the rest of the low-cost zone has become slightly less expensive. The abatement potential remains about the same between the two analyses.
- Mid-cost zone – the 2025 MACC has no measures in the mid-cost zone. Increasing costs have pushed some options over the $100 threshold, leaving no abatement in this zone.
- High-cost zone – as a result, the 2025 MACC now contains options in the high-cost zone, and they represent the bulk of abatement opportunities in the sector.
- Figure 10 compares the waste MACCs from the 2020 and 2025 model versions.

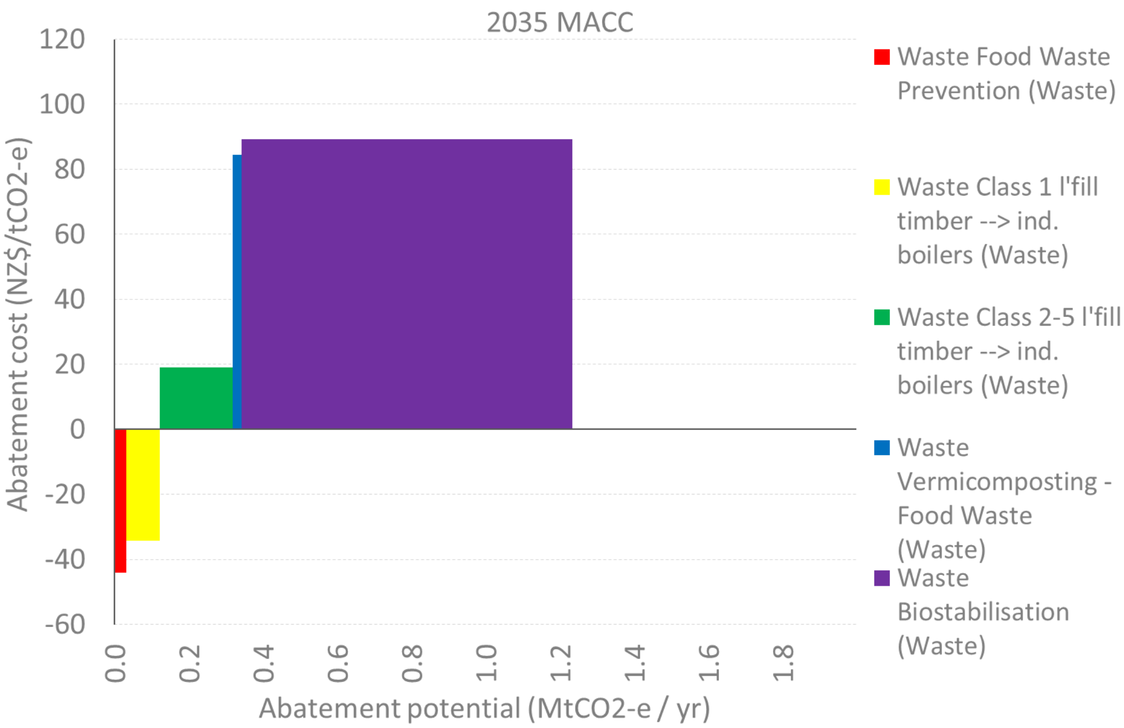
Potential contributing factors

In both versions, food waste prevention remains negative cost, reflecting avoided collection, transport, and disposal costs, and timber diversion also remains cost-saving. However, the magnitude differs (e.g. Class 1 timber diversion is slightly less negative in 2025 due to higher processing/transport costs and revised assumptions about boiler demand and fuel displacement). Moderate-cost options (Class 2-5 timber diversion and vermicomposting) remain in roughly the \$10–\$25/tCO_2-e range, with a small upward shift in 2025 consistent with updated labour, energy, and operating costs. The largest single opportunity remains biostabilisation[12] (around 1.0-1.2 $MtCO_2$-e/yr), with costs increasing from roughly \$85–\$90/tCO_2-e in 2020 to \$100–\$110/tCO_2-e in 2025, reflecting higher capex/opex and revised methane generation/capture assumptions that affect the baseline. The update reinforces that the waste sector offers readily available, low-cost abatement through prevention and diversion, but deeper reductions in organics require higher-cost processing interventions.

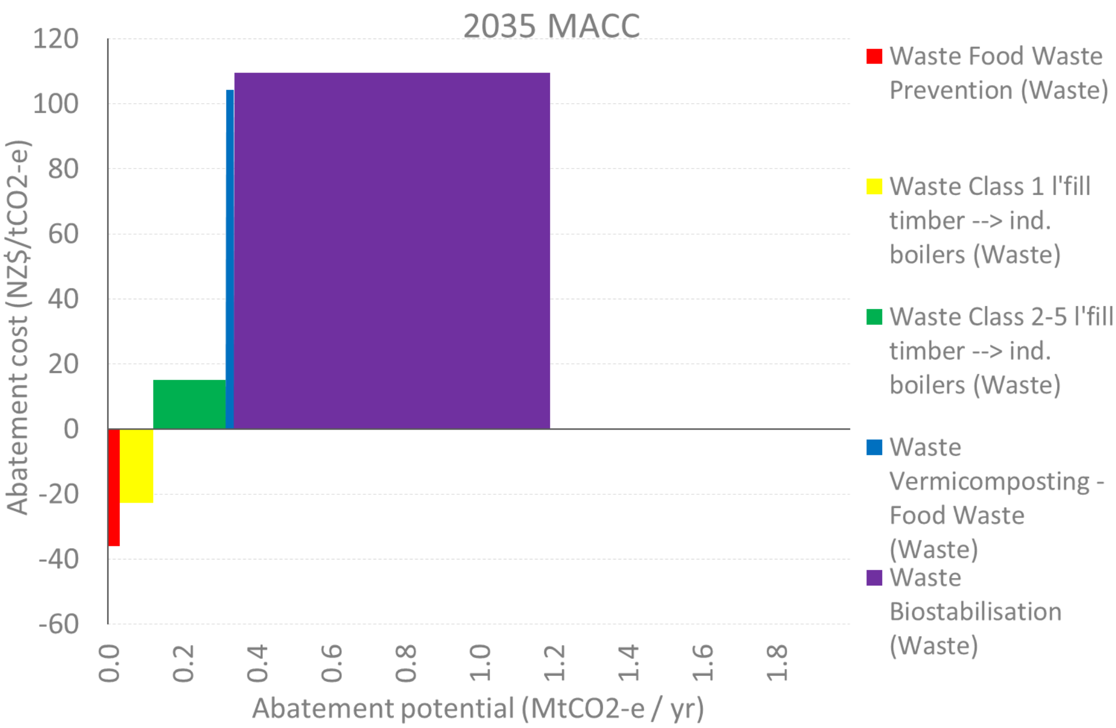
12 Mechanical-biological treatment of residual waste to stabilise organics and reduce methane generation after landfill disposal.

Figure 10 2035 MACC for Waste, 2020 vs 2025 forecasts

a) 2020 version



b) 2025 version



Notes on legend: To keep it consistent with the 2020 MAC, the labels were kept unchanged.

Source: NZIER and MfE

5.5 ETS impact and abatement opportunity analysis (2020–2025)

The low-cost zone refers to the left-hand portion of the MACC, where emissions can be reduced at little or no cost. In the updated 2025 MACC, it corresponds to 19.45 $MtCO_2$-e/yr of abatement potential (compared to 17.43 $MtCO_2$-e/yr in 2020). The marginal cost[13] at that point is \$56.90 /tCO_2-e. This includes a range of low-cost measures, such as early fuel-switching from fossil fuels to electricity or biomass, low-temperature process electrification, and energy efficiency improvements across both industry and transport sectors, as well as all the negative-cost opportunities.

Second, a further 2.26 $MtCO_2$-e/yr of total abatement potential sits above the current NZU price (\$56.90 /tCO_2-e) but below \$100/tCO_2-e. This indicates a middle-cost band of abatement that is unlikely to be delivered by the current ETS signal alone, but could become more achievable under a stronger carbon price, particularly if supported by targeted non-price measures such as capital support, technology deployment incentives, and regulatory interventions to address financing, infrastructure, and adoption barriers.

Finally, the remaining $MtCO_2$-e/yr (6.21) reflects very high-cost and/or low-feasibility options, which may be unlikely to be fully realised even with strong policy and high carbon prices, suggesting the need to consider alternative pathways (including technology development, demand shifts, or offsets) to meet long-run targets.

There are several drivers for the changes as detailed in Table 9. Because these measures rely on higher-cost inputs in 2025 than they did in 2020, their levelised abatement costs naturally rise. Second, the updated analysis applies a higher real discount rate (8 percent, up from 6 percent). A higher discount rate places greater weight on upfront capital expenditures relative to future savings, thereby increasing the economic cost of long-lived industrial investments such as boilers, kilns, or heat-pump systems. As a result, even if the technical performance of these technologies is unchanged, their discounted lifetime abatement costs increase in the 2025 MACC.

13 Marginal cost means the extra cost (or saving) to reduce one additional tonne of emissions using a specific measure, usually shown as \$/tCO_2-e. If it is positive, cutting that extra tonne costs money. Otherwise, cutting that saves money.

Table 9 Comparison of 2020 and 2025 MACC benchmarks

Metric	Description	2035 MACC (v2020)	2035 MACC (v2025)	Comment
Current ETS price in 2025	Inflation-adjusted prices (all converted to 2025 levels)	\$47.40 /tCO_2-e	\$56.90 /tCO_2-e	Prices obtained from EMS[14]
Low-cost zone (Negative-cost figures in brackets)	Cumulative share below carbon price	17.43 $MtCO_2$-e/yr (14.38 $MtCO_2$-e/yr)	19.45 $MtCO_2$-e/yr (17.20 $MtCO_2$-e/yr)	Somewhat higher in 2025
Mid-cost zone	Cumulative share from carbon price to \$100/tCO_2-e	3.70 $MtCO_2$-e/yr	2.26 $MtCO_2$-e/yr	Slightly lower in 2025
High-cost zone	Cumulative share beyond \$100/tCO_2-e	5.45 $MtCO_2$-e/yr	6.21 $MtCO_2$-e/yr	Slightly higher in 2025

*Price has been inflation-adjusted to 2025 levels (The nominal price is -\$34.1 /tCO_2-e for 2020).

Source: NZIER

However, the cost-effectiveness shown in the MACC does not automatically translate into real-world uptake. Despite several negative or low-cost opportunities, many have not yet been realised. This indicates that non-price barriers, such as high upfront capital requirements and limited access to finance, split incentives, information and capability gaps, transaction/hassle costs, and practical delivery constraints (e.g. supplier capacity, permitting, grid connection timelines), can discourage early action even when measures look cost-effective on paper. Stakeholder interviews echoed these points, with many participants highlighting capital budgeting constraints, implementation risk, and operational disruption as key reasons projects do not proceed. It also partly reflects the MACC being calculated from a societal perspective, so it includes benefits not typically captured in private investment appraisals, such as public health gains from reducing transport emissions.

6 Method – qualitative interview research

6.1 How we organised interviews

For the interviews, NZIER and MfE identified organisations that participated in the ETS and individuals within those organisations with knowledge of the ETS, business operations, and organisational decision-making. Individuals were contacted via email and invited to participate. NZIER then organised and conducted the interviews.

These semi-structured interviews were conducted using an interview guide, a set of questions developed collaboratively by MfE and NZIER and based on prior research (Ministry for the Environment 2016). Interviews were recorded. Raw transcripts of recordings were then cleaned using ChatGPT 5 under a paid licence.

14 https://www.emstradepoint.co.nz/#downloads

More detail on the interview method is provided in Appendix A. The interview guide is provided in Appendix B.

6.2 How we analysed the data

To analyse the interview data, we used an iterative thematic analysis approach. After the interviews were transcribed, multiple economists independently reviewed the interviews to identify recurring concepts, patterns, and points of divergence across organisations and sectors.

We cross-checked the emerging themes against sector characteristics and the MACC results to understand where qualitative insights aligned with or diverged from the modelled abatement opportunities. This process enabled us to develop a robust set of themes that reflect both common experiences and sector-specific nuances.

6.3 Limitations of our data collection process

While the qualitative interviews provided rich insights into how firms engage with the ETS, they also have inherent limitations. Participation was voluntary, and the final sample was not randomly selected, which means the views presented may not fully represent all firms affected by the ETS. Some sectors were more willing or available to participate than others, and larger organisations tend to have more capacity to respond. Interviewees spoke from the perspective of their own roles and responsibilities, which may emphasise certain operational or strategic considerations over others. In addition, the interviews capture views at a single point in time, and perceptions may evolve as carbon prices, technology options, and regulatory settings change. These limitations do not undermine the value of the findings, but they provide important context for interpreting the insights presented in this report.

7 Results from the interviews

7.1 Introduction to the interview results

In the following sections, we summarise the responses by topic. We focus on the themes that emerged across sectors, which enables us to identify where the ETS is working as intended, where the price signal may be inadequate, and where non-price barriers limit the uptake of cost-effective abatement options. The responses are grouped into two broad categories:

- **Current:** how businesses are presently operating under the ETS
- **Future:** what businesses would like to see from the ETS or believe would enable it to function more effectively.

7.2 Current operations under the ETS

7.2.1 Significance of energy costs

Energy costs were generally considered a meaningful component of operating expenditure, though the scale varied considerably across firms' activities and cost structures. For organisations with large transport or logistics requirements, diesel represented one of the highest non-labour costs. Fluctuations in global fuel prices were seen as the most significant driver of energy expenditure, even when fuel costs were passed through to contractors rather than recorded directly on the firm's balance sheet.

For the stationary energy and industrial process sectors that rely on natural gas, coal, or electricity, energy is also a major cost. Gas supply constraints, wholesale electricity prices, and broader fuel market dynamics are currently the most influential factors shaping their operating costs. Energy-intensive firms described these conditions as material to both day-to-day operations and long-term investment planning.

Typically, organisations with lower direct energy consumption reported that energy represents a smaller share of total expenditure. For waste operators and others whose core ETS liability arises from methane emissions rather than from energy use, direct spending on fuel or electricity is relatively modest.

7.2.2 ETS impacts on energy costs for businesses

For a significant proportion of interviewees, the ETS is felt mainly through fuel prices, where the carbon component is embedded in the cost of petrol, diesel, gas, or coal. Here, the ETS costs are generally described as a modest addition to energy expenditure. We were provided with estimates of the ETS accounting for roughly 9 percent to 17 percent of the per-litre diesel price, but global fuel markets and domestic supply constraints have a far larger influence. As a result, the ETS rarely operates as the dominant cost pressure in these organisations. Interviewees did not provide specific information on the carbon prices they used to estimate the impact of the ETS, nor did they discuss the impact of variation or volatility in carbon pricing or fuel markets.

In the stationary energy and industrial process sectors, more substantial impacts were reported. For these businesses, ETS obligations are both significant and rising over time, even after accounting for industrial allocations. Some highlighted that increasing net (the growing difference between allocations and emissions) ETS costs erode competitiveness relative to overseas producers who are not facing similar carbon pricing. In these cases, the ETS can influence operating margins and investment decisions.

On the other hand, several firms, representing nearly every sector, explained that the ETS has little direct effect on their own energy costs because their consumption is modest, emissions costs can be passed through to customers, or their exposure is primarily indirect through wholesale electricity price dynamics. For waste operators, the ETS impact is dominated by obligations on methane from landfill decomposition, which far outweigh fuel or electricity-related ETS costs. This occurs because Class 1 landfills are required to report and surrender units for the methane generated as waste breaks down, regardless of energy use. As a result, ETS obligations related to methane emissions far outweigh any ETS costs associated with energy.

In many cases, the ETS effects lie on top of underlying fuel and electricity markets rather than exert a core influence; only in some cases do the ETS costs represent a significant share of expenditure. Those cases include industrial process companies and the waste sector. This highlights that the effectiveness of ETS price signals depends largely on where costs sit within the firm's operating structure and on whether current market conditions amplify or weaken the effects of carbon prices.

7.2.3 Dealing with increased ETS costs

Most firms reported that if ETS-related costs were to rise, they would manage these increases through existing commercial or financial mechanisms rather than through fundamental changes in operations. For many organisations, fuel adjustment factors, cost-plus pricing models, or standard pass-through arrangements already apply to diesel, gas, or electricity costs. In these cases, higher ETS costs would flow through to customers in the same way as other changes in the cost of production inputs. Several firms noted that because these mechanisms are common across their sector, increased ETS costs would not materially alter their competitive position. These firms tended to be in industries that were not trade-exposed.

Some organisations had previously built up NZU buffers, invested in decarbonisation early, or benefited temporarily from industrial allocations, but expect these benefits to diminish as NZU allocations fall.

Some organisations – which tended to be from trade-exposed industries – stressed that they cannot pass costs through effectively because they compete with producers overseas who face no carbon price; higher ETS costs directly reduce margins and can influence decisions about long-term investment or continued operation. New Zealand firms' overall profitability also depends on the amount of free NZUs an industry receives, which helps soften the ETS's impact on international competitiveness. (Since 2021, the NZU allocation for EITE has been reduced by annual phase-downs.[15] Baseline adjustments in 2023, 2024 and 2025[16] have accelerated the phase-down for some products and reversed it for others.)

Some participants partially manage costs through hedging, forestry partnerships or other offset arrangements, and emphasised that predictable long-term ETS settings are essential for planning such strategies. While these activities were mentioned in interviews, they did not appear to be widespread or central to cost management.

7.2.4 Effect on past business performance

The impact of the ETS on past business performance reflects differences in the materiality of emissions costs, the capacity of organisations to pass through emissions costs in their prices, and exposure to competition from overseas suppliers. For businesses that could not easily pass on emissions costs to their customers, the ETS was one of several factors that encouraged businesses to make decarbonisation decisions. It was not the primary driver because, typically, future ETS liability was neither high enough nor sufficiently predictable to secure investment business cases. In organisations that can more easily pass through costs to their customers, the ETS has largely blended into the background of broader operating expenses, thereby having little observable effect on margins and decision-making. Most firms in both groups reported that their decarbonisation activity was driven primarily by operational efficiency or corporate commitments, rather than the carbon price itself. The research did not attempt to quantify the relative impact of different drivers on decarbonisation activity.

Interviewees from trade-exposed businesses reported that ETS costs have become a meaningful factor in decisions about whether to maintain, invest in, or eventually exit New

15 'Climate Change Response Act 2002 - Version as at 31 October 2025' Section 81(2)(a). Downloaded from https://www.legislation.govt.nz/act/public/2002/0040/latest/whole.html#DLM158584

16 See 'Table of allocative baselines as at 17 December 2024' downloaded on 17 Dec 2025 from https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/participating-in-the-nz-ets/overview-of-industrial-allocation/updates-to-allocative-baseline/

Zealand operations. Impacts are particularly pronounced during low-margin periods in cyclical industries, when ETS costs weigh more heavily on profitability.

Several organisations reported that the ETS had supported the business case for major decarbonisation investments, especially where rising or stable carbon prices strengthened the business case for renewable generation, fuel switching, energy-efficiency upgrades, and emissions-reduction technologies. In the electricity sector, scenario modelling using rising ETS price paths has been used to inform investment timing in new generation. In the waste sector, the influence was more immediate: inclusion in the ETS drove significant investment in landfill gas capture and contributed to large reductions in emissions over the past decade. (However, regulations on waste have limited the recovery of methane from landfills. Exclusion of Class 2 landfills, combined with their continued acceptance of wood waste, means methane emissions from them are not captured.)

Businesses noted that volatility has been more disruptive to performance and planning than the absolute level of the ETS price. The exact timeframe over which incentives were weakened was not reported, and interviewees reported different timings for reductions in carbon-focused activities.

7.2.5 Influence on energy procurement strategies

Across all firms, the consistent message was that the ETS rarely dictates procurement strategy on its own, but it can tip the balance when paired with clear price signals,[17] stable policy trajectories, and complementary funding or regulatory programmes. Businesses tend to make decisions based on operational efficiency, customer expectations, and competitive dynamics.

The carbon component of fuel prices is too small and too easily passed through to materially influence choices about decarbonisation initiatives such as warehouse electrification, shifting to hybrid or EV vehicles, trialling low-emission delivery options, or installing solar for those in transport and logistics.

Electricity generators and major energy suppliers described incorporating ETS price paths into long-term modelling and investment committees, using internal shadow carbon prices, and weighing ETS liabilities when assessing geothermal reinjection, renewable generation investment, or the structure of power purchase agreements.[18] Even so, most noted that engineering constraints, resource availability, and broader market settings have had a stronger influence on their procurement and investment decisions. Interviewees noted other factors that have been more influential than emission pricing on decarbonisation decisions: wholesale-market dynamics such as high spot prices, tight supply, and uncertainty about when new generation would come online, as well as the GIDI Fund, which reduced the upfront cost to businesses of switching away from fossil fuels.

Some forestry-aligned businesses previously saw the ETS as a catalyst for bioenergy partnerships or renewable-heat projects, only to see those opportunities stall when NZU prices fell, and volatility increased. Waste operators have used ETS obligations to justify

17 Interviewees initially expected a carbon price that increased steadily over time.

18 For geothermal reinjection, NZU prices have a direct effect on the business case. The influence of NZU prices on business cases for investment in renewables and structure of power purchase agreements is through the contribution of NZU costs to wholesale electricity prices when thermal generation costs are affecting wholesale electricity prices. Over the past 5 years the cost of gas and coal used for electricity generation have increased by about 70 percent and 50 percent, respectively. In contrast the NZU average price was around $60 to $70 over most of last five years. This suggests increase in fuel costs (which flowed on to wholesale electricity prices) has been a stronger influence on any improvement in the business case for new wind and solar capacity than the changes in NZU prices.

investment in methane capture and electricity generation, but procurement strategies are now constrained by uncertainty around landfill policy.

7.3 Interviewees' perspective on the future of the ETS

7.3.1 Expected future effects from the ETS

Across most organisations, the expectation is that it will remain 'bumpy', with credibility rebuilding only slowly. Over the medium to long term, over half of interviewees still see a rising carbon price as necessary to incentivise decarbonisation.

Firms with landholdings or forest-related activities expressed a particular sensitivity to price credibility. They explained that sustained carbon prices in the $80–$100+ range could revitalise domestic forestry, biomass supply chains, and bioenergy investments. The risk of sudden design changes, including how forestry units are treated relative to auction units, adds to the hesitancy around long term commitments.

For emissions-intensive and trade-exposed industries, rising net ETS liabilities as industrial allocation phases down highlight the possibility that higher carbon prices could determine whether New Zealand operations remain viable at all. Some see recent adjustments to allocation rules as helpful risk-reduction measures, but most described future ETS costs as a growing share of margins, particularly in cyclical downturns.

7.3.2 Characteristics of a strong ETS incentive

Some firms stressed that ETS pricing has almost no impact at current levels (they cited current prices of $30–$40) because they face few practical options for emissions reduction. At the same time, very high prices (for example, the $150–$200 range) were viewed as potentially catastrophic, prompting closures rather than decarbonisation.

For some, the incentive is stronger in principle than in practice. Waste operators emphasised that the ETS historically provided a powerful signal to capture methane, particularly when carbon prices translated to around $10 per tonne of waste. But as prices fell, the incentive to push beyond compliance reduced significantly, made worse by rules that cap crediting for methane capture at 90 percent even when actual performance is higher.

7.3.3 Estimates of effective carbon prices

Credibility and stability were key messages for ETS effectiveness. Firms that nominated approximate thresholds did so cautiously:

- Forestry and land-based industries pointed to $80–$100+ with a reliable upward trajectory as the minimum needed to revive biomass investments and long-term projects.
- Electricity generators suggested that $75–$120 was needed for meaningful coal-to-renewables switching or geothermal reinjection to make commercial sense.
- Transport firms said the ETS component of diesel would need to be three to four times higher before it materially influenced fleet choices.

As free allocations fall, the net cost rises, yet the incentive to invest may not grow proportionately. In these sectors, higher ETS prices are perceived less as a prompt for green investment and more as a signal that the financial viability of domestic production may be at risk.

7.3.4 Non-price barriers to reducing emissions

The single most common theme on non-price barriers was policy and regulatory uncertainty. Frequent rule changes, shifting government positions and poorly signalled interventions have made it difficult for organisations to commit to long-term abatement projects.

A second major barrier concerns the availability and readiness of technology. Where organisations operate in sectors where low-emissions alternatives are either unavailable or not yet suited to New Zealand conditions, firms noted that they often wait until technologies have been proven internationally before adopting them locally. Interviewees did not mention asset lifecycles or their alignment with abatement opportunities.

Supply chain constraints were also widely cited. These include restricted domestic manufacturing capabilities, long lead times for major equipment (e.g. turbines and heavy vehicles), and fragmented electricity network arrangements that complicate electrification.

Many firms cited consenting and planning hurdles as a significant constraint, due to lengthy, unpredictable approval processes for renewable generation projects. Even where capital is available, delays can stall or derail otherwise viable projects.

Another common barrier was customer and market behaviour. Several organisations explained that while customers express interest in lower-emissions products or services, they are often unwilling to pay a premium, weakening the commercial case for abatement investments. In traded goods sectors, competition with untaxed or higher-emitting imports also limits firms' ability to invest without eroding market share.

Some firms highlighted structural or physical constraints inherent to their processes that limit how much emissions can be reduced without breakthrough technologies.

Furthermore, many noted non-price barriers, including governance and operational issues within the ETS itself, thin market liquidity, difficulties using the registry, rigid accounting rules that cap crediting for high-performing activities, and concerns about the ability of some participants to exit the market after building up liabilities.

7.3.5 Driving more emissions reductions

Across every sector we interviewed, firms that thought they could potentially reduce emissions were remarkably consistent on one point: the ETS cannot meaningfully drive deeper emissions reductions unless it becomes more stable, more predictable, and sheltered from short-term political intervention. These interviewees also expected the NZU price to rise over time, but there was a wide range of expectations of how quickly and to what level.

The fact that only a narrow set of activities (mainly forestry) can generate NZUs was mentioned in several interviews. Some interviewees suggested broadening the types of projects that can earn credits (e.g. soil carbon, biochar, methane-reduction technologies, or verified carbon-removal projects), which would increase the overall supply of removals and make the market deeper and more liquid.

It was also indicated that separating technical tweaks from major reforms would make it clearer which changes are routine and expected, and which signal a fundamental shift in the scheme. Firms told us that when both types of changes are announced or consulted on in the same way, and often at short notice, they cannot tell whether the ETS is being fine-tuned or re-designed.

- **Transport and logistics sector participants** noted that in an environment where the ETS component of diesel is small and easily passed through, only a large and sustained increase combined with a clear price path would shift fleet investment models toward lower-emissions technologies.
- **Energy and electricity sector participants** want the scheme to operate with enough autonomy that its rules cannot be altered abruptly, and several suggested a strengthened role for the Climate Change Commission or more explicit rules limiting political discretion. They see the ETS as capable of being a central tool for decarbonisation.
- **Industrial processes sector participants,** which are often trade-exposed, emissions-intensive industries, raised a strong concern: the ETS must address competitiveness and carbon-leakage risks if higher prices are expected to deliver domestic emissions reductions. Potentially, tailored industrial-allocation settings or the introduction of border adjustment mechanisms where a carbon levy is paid, or NZUs are surrendered, so domestic producers are not undercut by imports from higher-emitting jurisdictions.
- **Waste sector participants** argued for bringing Class 2 landfills into the ETS and removing the hard cap on methane-capture crediting, which currently prevents best-performing sites from being rewarded for optimisation beyond 90 percent.
- **Forestry sector participants** called for more proportionate administration fees and clarity that forest-derived units will not be devalued relative to auctioned units.

7.4 Final thoughts from the interviews

The set of interviews involved qualitative discussions with a varied sample of ETS participants that would not be considered statistically significant. Nevertheless, the interviews produced several common themes that should be considered representative. A major theme was that the ETS by itself has not produced carbon prices high or stable enough to serve as the primary incentive for changes, across the product, technology, or behavioural level, at major businesses and other organisations.

8 Discussion: results, limitations and future research

8.1 Scope of the discussion

This section provides a discussion of the project. It includes some interpretation of the results, in particular by working across qualitative and quantitative information. It attempts to situate them in the broader decarbonisation context. The section also discusses some of the limitations of the update to the MACC analysis:

- Identifies key uncertainties (e.g. electricity price trajectories, technology learning rates, behavioural change)
- Highlights data limitations where agency feedback is particularly important

- Notes where additional evidence would materially improve the MACC.

Finally, this section sets out priorities for future refinement in line with the previous report's recommended next steps.

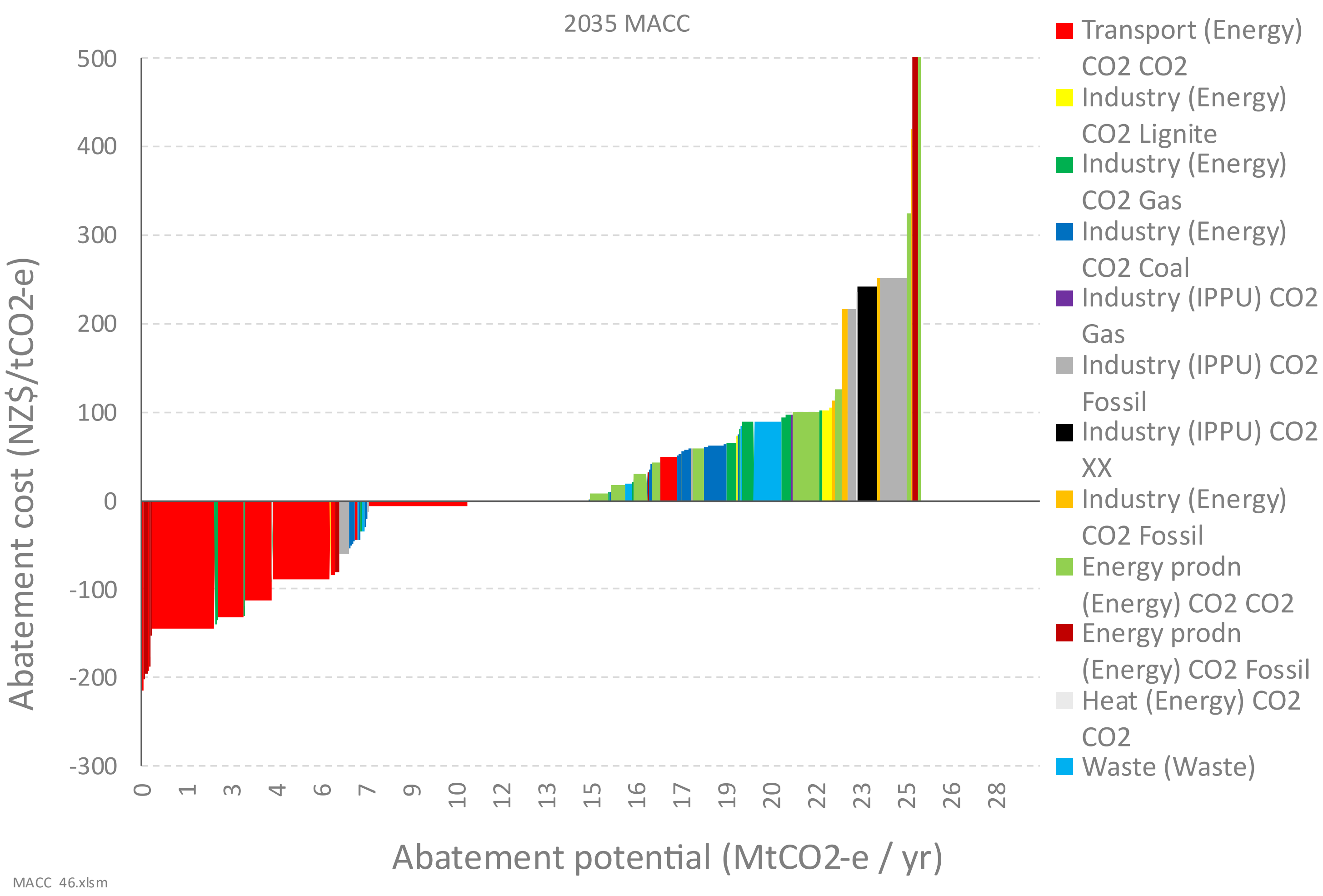
8.2 Interpretation of results

8.2.1 Interpretation of MACC results

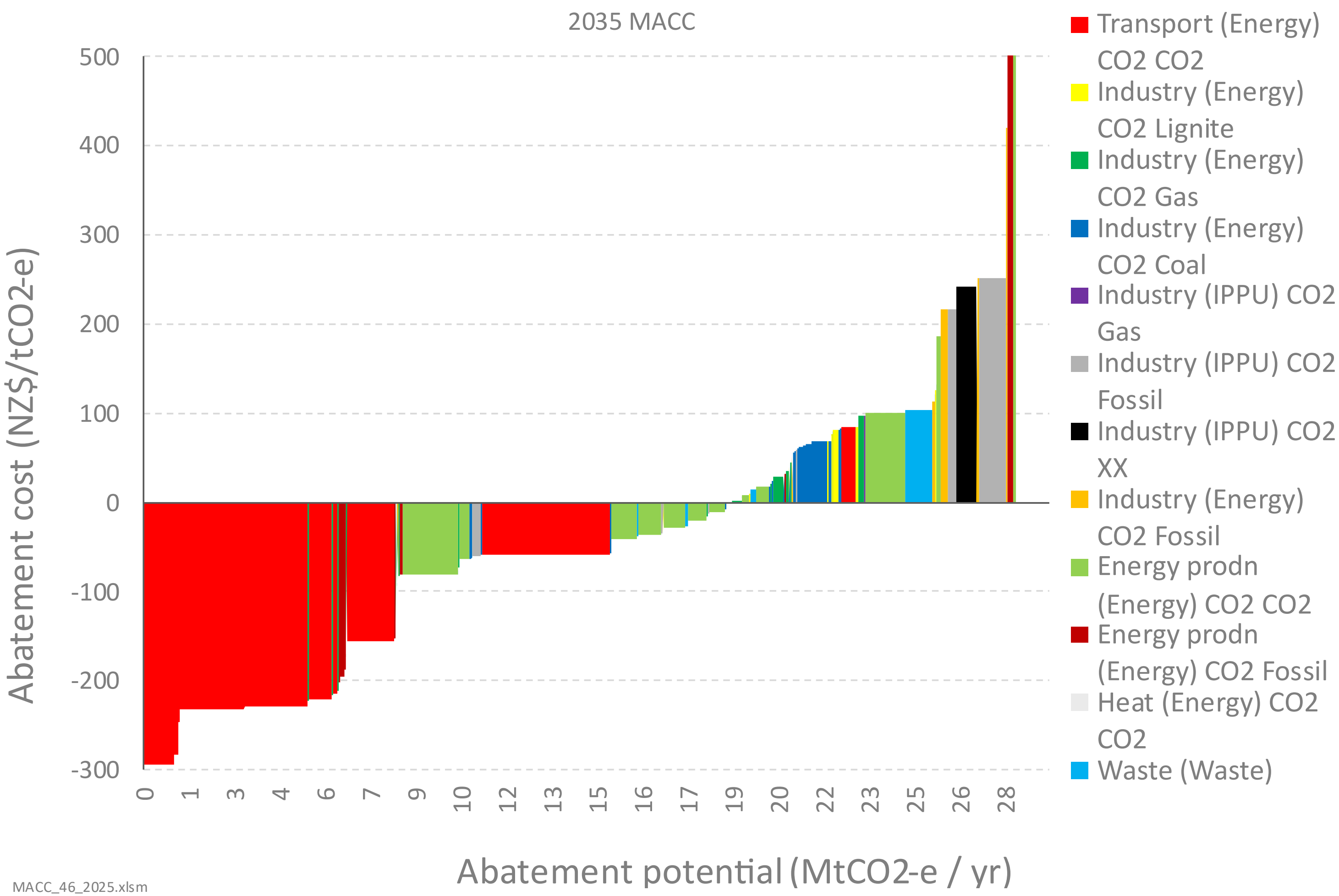
The report has focused on sector-by-sector analysis of the MACCs. For this discussion, an aggregated MACC is presented, truncated to focus on abatements of \$500/tCO_2-e or less and excluding the land-based sector.

Figure 11 Aggregated MACCs, 2020 and 2025, excluding land sector (truncated)

a) 2020 version

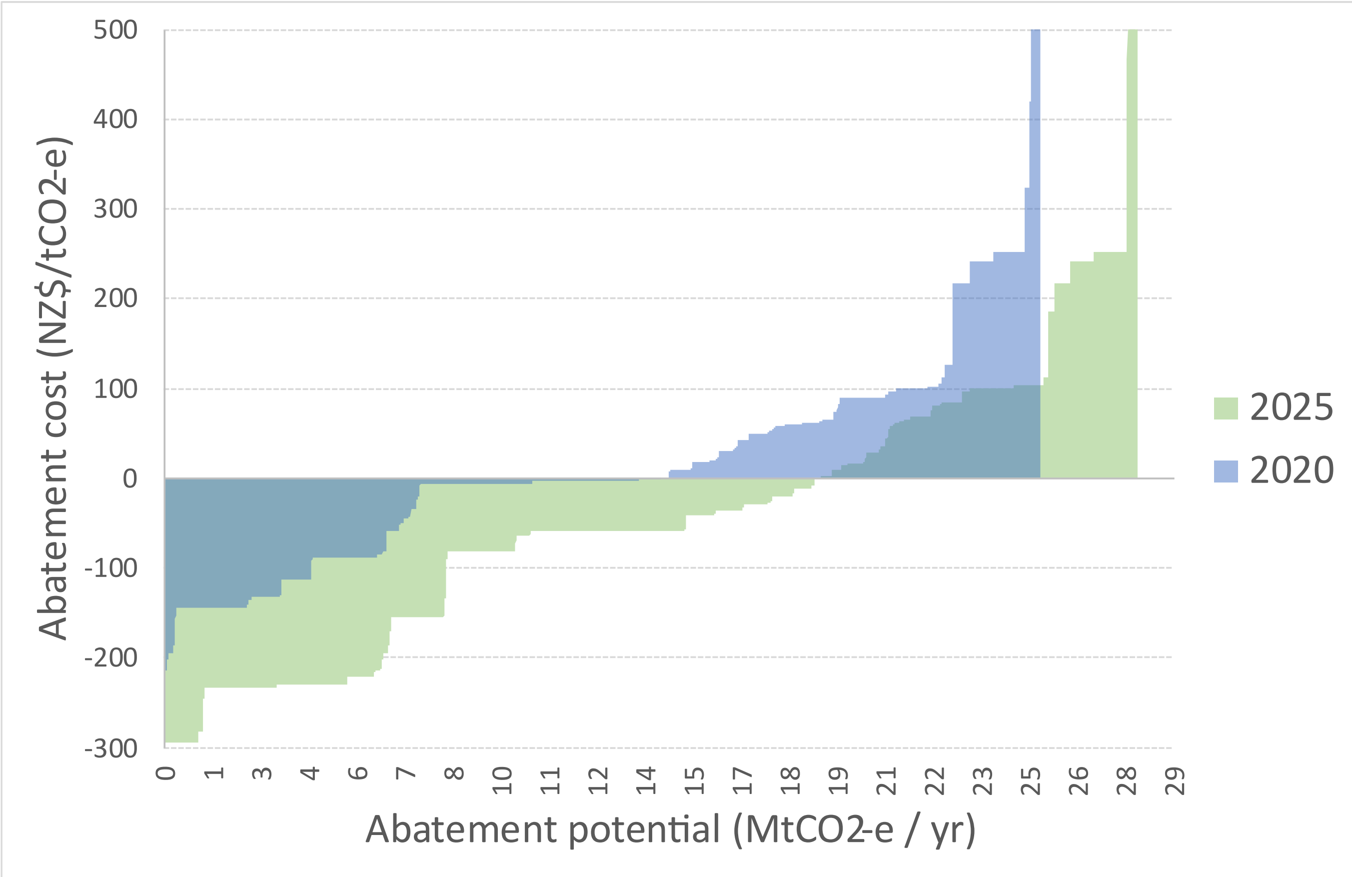


b) 2025 version



MACC_46_2025.xlsm

c) Overlay of 2020 and 2025 MACCs



Source: NZIER and MfE

The updated MACC analysis suggests some broad conclusions:

- **Abatement potential is redistributed across cost zones:** from 2020 to 2025, the low-cost share expands noticeably, the mid-cost share modestly narrows, and the high-cost share increases slightly.
- **The ETS is necessary but not sufficient:** The average ETS price in 2025 ($56.90) was high enough that 19.45 $MtCO_2$-e of abatement potential (69.7 percent) had a cost below that price on a social cost basis, but observed abatement has lagged behind the technical potential implied by both the 2020 and 2025 MAC curves.
- **Transport and industrial sectors face challenges:** The largest difference between 2020 MACC abatement and 2025 MACC abatement, and the largest upward cost shifts in the updated MACC, occur in transport and energy-intensive industry. These sectors have large abatement potential and face increases in energy costs and capital-market uncertainty. These are sectors (and technologies) where non-price barriers are evident, and both a higher ETS price and complementary policies may be useful for increasing levels of abatement.
- **In some cases, opportunities for substitution are limited:** Electrical energy is not suitable for high-temperature process heat, and biomass with coal-like properties is not readily available. It is not economically viable to replace either natural gas or coal used as a feedstock, or oil or gas used as fuel, with synthetic replacements manufactured from green hydrogen.[19]

8.2.2 Interpretation of interview results

These MACC results are interesting in the light of the interview findings. Both the quantitative and qualitative research found that the ETS cannot meaningfully drive deeper emissions reductions unless it supports a stable, higher carbon price into the future. That would make the abatement approach economically feasible and support decision-makers in making changes in their organisations. The interviews suggest that confidence in the scheme has been eroded by abrupt rule changes, price collapses, and shifting government positions. As a result, many businesses treat NZU prices as too uncertain to anchor long-lived investments, even when they broadly support carbon pricing and want the ETS to succeed. Thus, the ETS price for the MACC analysis is affected by carbon-prices expectations driven by experience with the ETS as it has functioned in recent years.

The potential for different approaches to addressing emissions also raises questions. Interviewees felt that only a narrow set of activities (mainly forestry) could generate NZUs. They suggested that other types of removal projects should be allowed to earn credits. However, at the same time, the MACC analysis shows that some abatement measures that are technically feasible do not appear to be economically attractive. This raises the question of where businesses are placing their focus: are new business opportunities more

[19] Natural gas is used as a feedstock for methanol and urea manufacture while coal is used as a reducing agent in steel production. Green hydrogen is a technologically but not economically viable alternative feedstock ingredient for methanol and urea manufacturing. The technological process for using hydrogen as a replacement reduction agent for carbon to produce steel from ironsand is still being developed. Green hydrogen is currently being used as a fuel for heavy road freight transport both blended with diesel and as a standalone fuel. However, green hydrogen fuel cost is substantially higher than the cost of diesel. The main changes required to close the gap between green and diesel fuel prices are a large reduction in the cost of water electrolysers and access to electricity with a delivered price below $20 to $30 per MWh.

interesting than improving existing activities, even if both produce the same levels of abatement?

These are some results by sector:

- The transport and logistics sector faces challenges. Interviewees felt that only a large, sustained increase, combined with a clear price path, would shift the industry toward lower-emissions technologies. At the same time, the MACC analysis showed large upward cost shifts and unrealised abatement potential.
- Participants in the energy sector advocated for clearer rules in the ETS and greater insulation from political pressures. This stance could reflect a MACC in which abatement measures are marginally no-cost, but whose break-even point is therefore at risk from fluctuations in the ETS price.
- The waste sector has few options, according to the MACC, and is looking for changes to the ETS to recognise the positive effects of the measures it can take.
- Industrial processes sector participants were interested in seeking some protection because they are trade-exposed and emissions-intensive. For them, the MACC analysis shows that there are potential no-cost abatement measures, but the interviews suggest that there are wider business concerns that prevent the sector from adopting them.

8.3 Data and methodological gaps

The findings from the interviews were similar to those in prior work, including the earlier ETS evaluation (Ministry for the Environment 2016), and prior work by the project team for MBIE and EECA. In that sense, there isn't a data gap to fill. The non-price barriers and behavioural drivers have been explored in prior New Zealand and international research. However, there may be a gap in understanding how to apply the information in a targeted way alongside a technical understanding of the ETS and abatement technologies. Several gaps identified in the 2020 MACC remain relevant and, in some cases, more pressing in light of the updated analysis:

- **Realisable vs technical potential:** The current MAC curves continue to illustrate technical/economic potential under idealised conditions, using common social-cost assumptions. They do not fully account for real-world implementation constraints such as supply-chain capacity, skilled labour availability, grid-connection lead times, planning and consenting risks, or social licence. In addition, abatement outcomes over 2020–2025 were influenced by the COVID-19 disruption, which affected activity levels, investment timing, capital availability, and delivery capacity across sectors, factors that can suppress or delay uptake independently of price signals. These factors will influence how much of the technical potential can be realised within each emissions-budget period. Future work should incorporate explicit feasibility filters or scenario-based constraints to distinguish 'theoretical' from realistically deliverable abatement.
- **Electricity system dynamics:** While the updated MACC incorporates revised electricity prices and EDGS assumptions, it still relies on stylised representations of costs associated with peak demand, storage, and integration challenges. The marginal cost of additional renewables is especially sensitive to system-level dynamics at high penetration. Tighter coupling to detailed power-system models (e.g. security-constrained dispatch and capacity-expansion models) would improve the

representation of marginal emissions factors and the cost of very high renewable shares, particularly for late-stage abatement options.

- **Bioenergy availability and competition:** Interactions between biomass for process heat, liquid biofuels, and other bio-based products are only partially represented. The absence of a unified bioenergy cost-supply framework, linked to land-use and forestry scenarios, limits confidence in the scale and cost of biomass options in the MACC. Developing a coherent, cross-sector bioenergy module would clarify trade-offs between bioheat, biofuels, negative-emissions options, and material uses.
- **Aviation and marine transport assumptions:** Inputs for domestic aviation and coastal marine transport have not been comprehensively updated to reflect the latest technology, fuel costs, and demand projections. As a result, the aviation and marine components of the transport MACC are indicative rather than fully up to date. Incorporating newer cost and performance data for sustainable aviation fuels, marine biofuels, and potential electrification pathways would materially improve the reliability of these parts of the curve.
- **Industrial boiler technologies and space-heating characterisation:** The characterisation of boiler and process-heat technologies in the industrial MACC still draws heavily on the original MfE material (the Atkins boiler spreadsheet and legacy space-heating tables). Updated boiler cost and performance assumptions, and more granular treatment of temperature ranges and load factors, are needed to reflect contemporary technology options. Work is underway with Dr Martin Atkins (University of Waikato) to update the boiler technology parameters; these revisions are expected to be incorporated before the report is finalised. Space-heating tables should be refreshed in a similar way using current evidence and EECA TIMES 3.0 outputs.
- **Waste-sector parameters:** Waste-sector MAC parameters have not been fully re-estimated, because the previous MACC analysis for the waste sector was not available for this update. Several waste-related assumptions are carried over or only lightly adjusted (with the focus on economic figures rather than technical parameters), which introduces more uncertainty into the waste MACs than for other sectors. Future updates could focus on the waste module using accessible, documented parameter sets to ensure consistency with the rest of the framework.
- **Land-sector MAC curves:** This update focuses on non-land sectors. Land-based mitigation options (on-farm practice changes, land-use change, new forestry and biomass plantations) remain critical to New Zealand's long-term transition but are not represented in a 2025-style MACC in this analysis. Bringing land-sector MACs onto a consistent footing would require updated commodity-price, productivity, and co-benefit assumptions, as well as integration with He Waka Eke Noa and related agricultural policy settings.
- **Discount rates:** In practice, many firms may apply internal hurdle rates, and they face additional transition and transaction costs that are not captured in the MACC. Once these are considered, a number of options that appear cost-effective in the MACC will no longer pass a strict private cost-benefit test. For this reason, the curves show a sizeable pool of negative- or low-cost opportunities, while real-world uptake remains limited. This means that capital is often redirected toward more commercially attractive investments, leaving technically viable but lower-return abatement projects unfunded. From an economic perspective, the opportunity cost of undertaking

abatement – namely, the higher-return investment or activity that must be displaced – exceeds the technical cost reflected in the MACC.

Compared with the 2020 MACC, the cost of renewable electricity abatement has increased notably. This reflects a combination of updated market data and investment pressures during the transition phase. Between 2020 and 2025, wholesale electricity prices increased from $75/MWh to $129.4/MWh (both are real dollars), reflecting both global fuel cost shocks and domestic supply constraints post-COVID. At the same time, capital costs for new wind and solar projects have remained elevated due to inflationary pressures in materials, construction, and grid connection costs. The depreciation of the NZD over this period (the NZD/USD rate has fallen from 0.65 to 0.60) has slightly further compounded these pressures by increasing the cost of imported renewable technologies and equipment. These short-term increases are not expected to persist in the longer term, as cost reductions are projected to continue through 2035, driven by improved supply-chain conditions and learning effects from technology.

Further details on the data sources, parameter choices, and sector-specific gap assessments are provided in the accompanying spreadsheet *Quantitative analysis - Supp I - Assumptions.xlsx*.

8.4 Limitations of this analysis

- Consistent with the 2020 MACC, these curves are constructed from a national economic ('social') perspective, using common assumptions about capital, operating costs, and the social discount rate. They are intended to describe the socially optimal cost of abatement under consistent assumptions, rather than to reflect firm-specific financing conditions or predict actual market behaviour.
- In practice, many businesses face higher internal hurdle rates, additional transition costs (e.g. project development, downtime, organisational change) and capital-market constraints. These non-price barriers, alongside behavioural preferences and institutional frictions, are not included in the MACC analysis.
- The MACC analysis focuses on the technical/economic potential, assuming that all measures up to a given cost threshold could in principle be implemented. Real-world uptake constraints (behavioural barriers, financing frictions, infrastructure bottlenecks) are discussed qualitatively in this report but are not explicitly modelled.
- Some underlying assumptions were not updated due to data limitations, while others could be refined as better data becomes available. Further information is provided in the *Quantitative Analysis – Supp I – Assumptions* Excel file, which documents changes to assumptions and data sources since the 2020 update.

8.5 Priorities for future work

Building on this update, future work could focus on:

- Developing realisable MAC curves that overlay implementation constraints and plausible uptake rates on the technical curves, to better inform emissions-budget and policy planning. These could be informed by further engagement with industry participants.

- Examining in detail the MACC assumptions, particularly around decision processes, costs and non-price barriers, to produce results that better align with observed abatement.
- Aligning fully with official projections, ensuring that MACC baselines and activity projections match the latest government forecasts across sectors, and reconciling bottom-up and top-down modelling.
- Improving the presentation and usability of the analytical tool and computer files. Currently, they require significant time and effort to understand and update, and are suitable only for informed and expert users.
- Expanding co-benefit and distributional analysis, including health, air quality, water quality and regional employment impacts, especially where these co-benefits may materially shift the ranking of options.
- Supporting iterative co-design with agencies and sector experts, using the supplementary spreadsheets as a shared modelling platform. Agency feedback on assumptions in *Quantitative analysis - Supp I - Assumptions.xlsx* and related workbooks will be central to refining both the data and the interpretation of MACC results.
- Exploring some of the specific suggestions from the interviews about changes to the ETS. For example, there could be a clearer separation between detailed tweaks and fundamental shifts, as suggested by participants.

To sum up, the updated MAC curves and this review provide a refreshed, but still evolving, evidence base for understanding the costs and opportunities of decarbonisation in New Zealand. They should be interpreted as a guide to relative cost-effectiveness and remaining abatement headroom, rather than as a deterministic forecast of market behaviour under the ETS.

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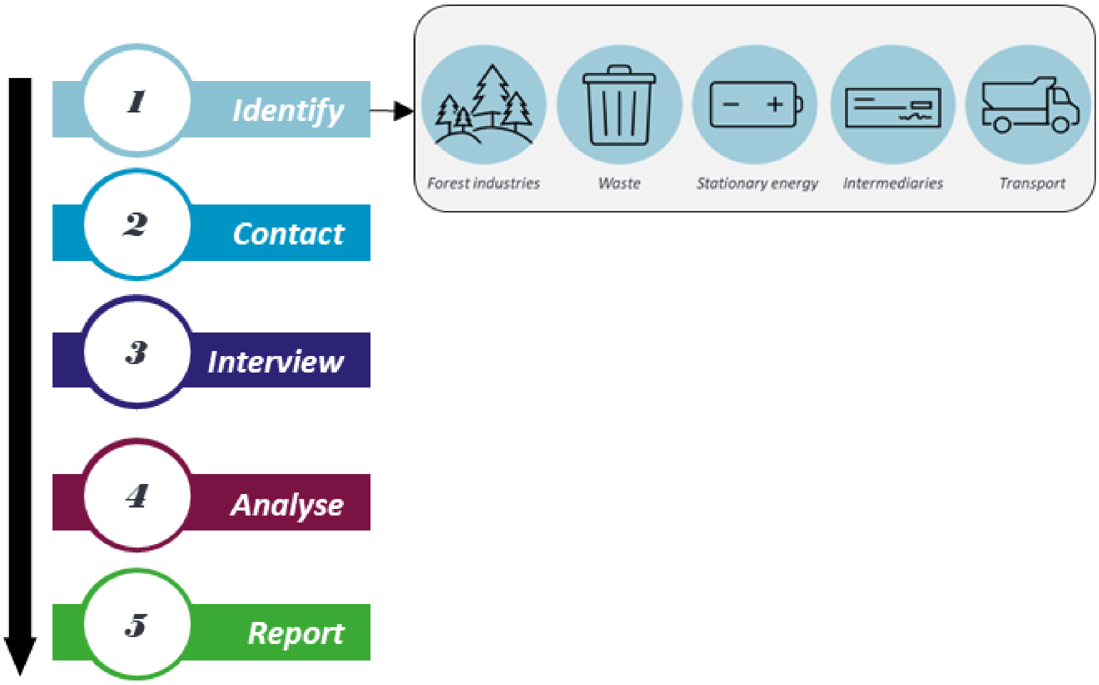
Appendix A Method for interviews with ETS participants

A.1 Our interview process

To conduct our interview process, we followed a series of structured steps while liaising with MfE to ensure a robust approach, a varied sample, and rigorous analysis. The process for collecting, analysing, and presenting the qualitative data consisted of five defined steps:

1. **Identifying interview participants** internally and alongside MfE
2. **Making contact with participants** via email, corresponding with them to book interviews, and ensuring we spoke to the most relevant employee(s)
3. **Conducting interviews** with the participants and a senior economist at NZIER
4. **Analysing key themes** from the interview transcripts by identifying trends across sectors and the wider market, and comparing these to the results of the MACC analysis
5. **Report the information** by presenting the themes and developing a clear and cohesive narrative.

Figure 12 Our interview process



Source: NZIER

A.2 How we identified participants

Both NZIER and MfE presented lists of potential participants from sectors based on the groupings used in *The New Zealand Emissions Trading Scheme Evaluation 2016*.

We then worked with MfE to select a final list of participants, keeping in mind several factors, including:

- firms with high levels of carbon emissions, and therefore more likely to be significantly affected by ETS regulations
- firms operating across a wide range of sectors
- firms that interact with the ETS in different capacities (e.g. compliance obligations or intermediary roles)
- firms operating in different geographic regions across New Zealand
- firms of varying sizes, as measured by annual turnover and the number of FTEs
- existing contacts and professional relationships from previous engagements with either MfE or ourselves (NZIER)
- senior representatives within firms who held decision-making authority regarding their response to ETS regulations and long-term planning.

A.3 Our participant correspondence process

The initial list of potential participants contacted comprised 36 individuals across 24 organisations in six sectors:

- Industrial processes
- Stationary energy
- Waste
- Transport
- Intermediaries
- Forest industries.

We corresponded with participants to book interviews, clarify any questions, and address confidentiality concerns. Several individuals referred us to colleagues who were better suited to participate, particularly where the initial contact did not work directly in the relevant part of the business. In some cases, we interviewed multiple individuals within a single organisation who worked with different aspects of ETS impacts. This ensured our discussions were held with employees whose roles required them to engage directly in ETS-related decision-making.

A.4 How we conducted participant interviews

After accounting for email bounce-backs, non-responses, and declined interview requests, our final sample comprised 24 participants across 14 organisations operating in the sectors listed above. The interviews were completed over the period 10 Nov 2025 to 1 Dec 2025. NZU prices[20] over this period were between $38.50 and $46.75.

The organisations varied substantially in scale. Workforce sizes ranged from small specialist teams of under 100 people to very large employers with several thousand staff. Annual turnover also varied, from hundreds of millions for mid-sized domestic operators to many billions of dollars for large national and multinational firms. The participants we

20 Downloaded from https://github.com/theecanmole/nzu/blob/master/nzu-edited-raw-prices-data.csv on 15 December 2025.

interviewed made up 31 percent of the total emissions before removals from firms reporting to MfE under the ETS in 2024.

All interviews were conducted on a confidential basis, and we report only the themes observed across participants or anonymised comments unless explicit permission was given to attribute information or quotations to an organisation.

We conducted approximately 30-minute interviews with one or more senior representatives from each organisation. Each discussion was led by one of our economists using a structured interview guide. Key topics included:

- the significance of energy costs
- the effect of the ETS on operational decisions
- the strength of current incentives to reduce emissions
- the barriers firms face
- the carbon prices that would meaningfully influence investment behaviour.

The full interview guide is provided in Appendix B.

Not all questions were relevant to all participants, and interviewers adapted the discussion accordingly. Interviews were recorded and transcribed using appropriate software, enabling more robust analysis through detailed review after the discussions. Multiple economists conducted interviews due to scheduling constraints and the number of participants. Creating transcripts for all interviews allowed our team to analyse themes and trends across the full dataset and to present a more rounded picture of the market as a whole.

After completing these interviews, we determined that thematic saturation had been reached. The same patterns and insights were consistently emerging, and we concluded that additional interviews were unlikely to yield substantial new information. As a result, we decided not to pursue further participants.

Appendix B Interview guide

Question	Response	Tick box
Company name		
Industrial sector		
Company size (FTE or $m turnover/yr)		
How significant are energy costs in your business's annual expenditures?	Percentage share of total expenditure or High/medium/low significance	
Has the NZ ETS increased energy costs for your business?	If so, how much is the impact on energy costs? (High/medium/low)	
How would the business deal with increased costs due to the NZ ETS?	Absorb costs	
	Hedge NZUs ahead of time	
	Pass costs on to customers (in full or in part)	
	Reduce energy use to minimise the impact of increased costs	
What has been the effect of the NZ ETS on your firm's business performance in the past?	[Open-ended response to start]	
Prompted responses for follow-up	No performance impact due to the NZ ETS	
	Don't know the impact	
	NZ ETS constrains business (Highly/medium/low)	
	NZ ETS enhances business (Highly/medium/low).	
How has the ETS influenced your energy procurement strategy (e.g. switching to renewables, renegotiating contracts)?	[Ask if not covered above]	
Looking into the future, what effects do you expect on your business from the ETS?	[Open-ended response] Follow up with the same prompts if needed	
How strong an incentive does the ETS or the current NZU price provide to look at ways to reduce emissions?	Strong/moderate/weak incentive to reduce emissions	
What are the biggest non-price barriers you firm faces regarding emissions reductions?	[Open-ended response to start]	
Prompted responses for follow-up	Lack of options High cost of capital Complexity No demand for change	

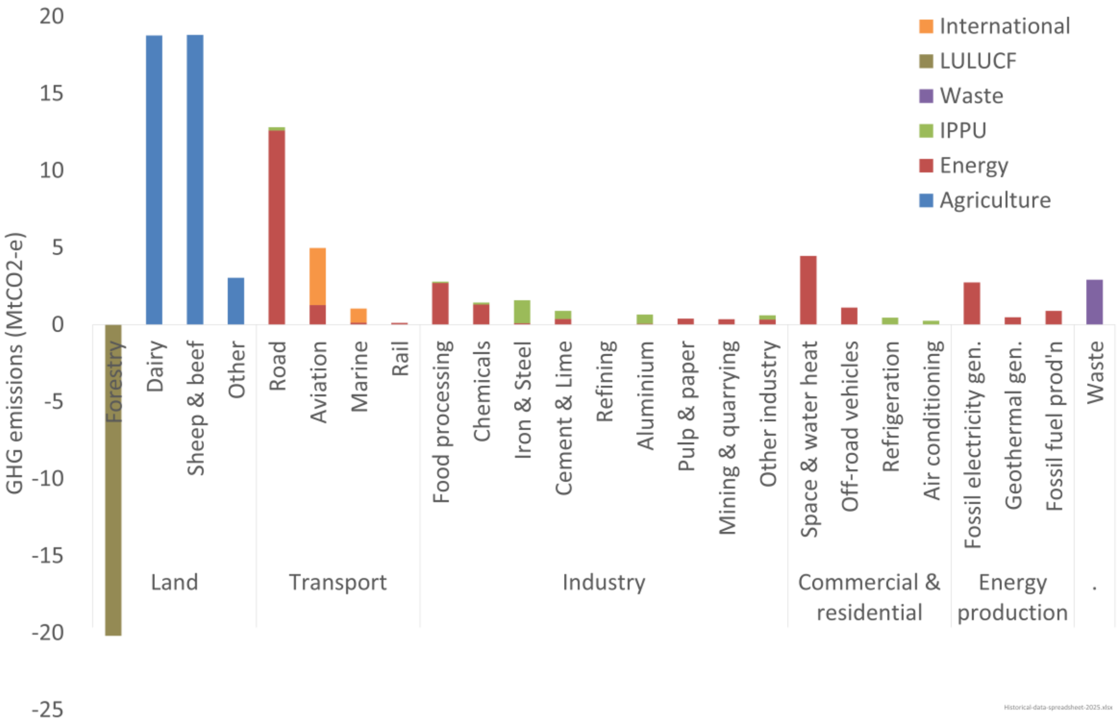
Question	Response	Tick box
	Regulatory uncertainty Other uncertainties Other non-price barriers?	
What could NZ ETS do to drive more emissions reductions in your business?	[Open-ended response]	
What carbon price would lead you to invest more in green investments?	[Open-ended response] [Could prompt with $75, $100, $150?]	

Source: NZIER

Appendix C Disaggregated emissions

Figure 13 New Zealand's greenhouse gas emissions in 2023 by sector

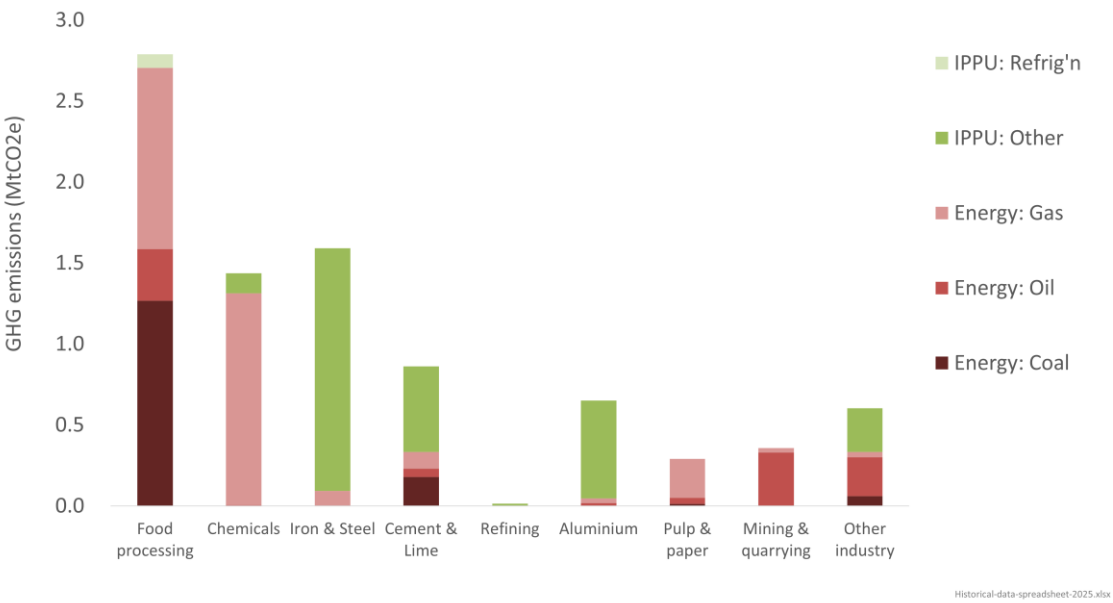
Including international travel



Source: MfE & NZIER

Figure 14 New Zealand's emissions from the highest-emitting industries, 2023

Disaggregated by fuel type

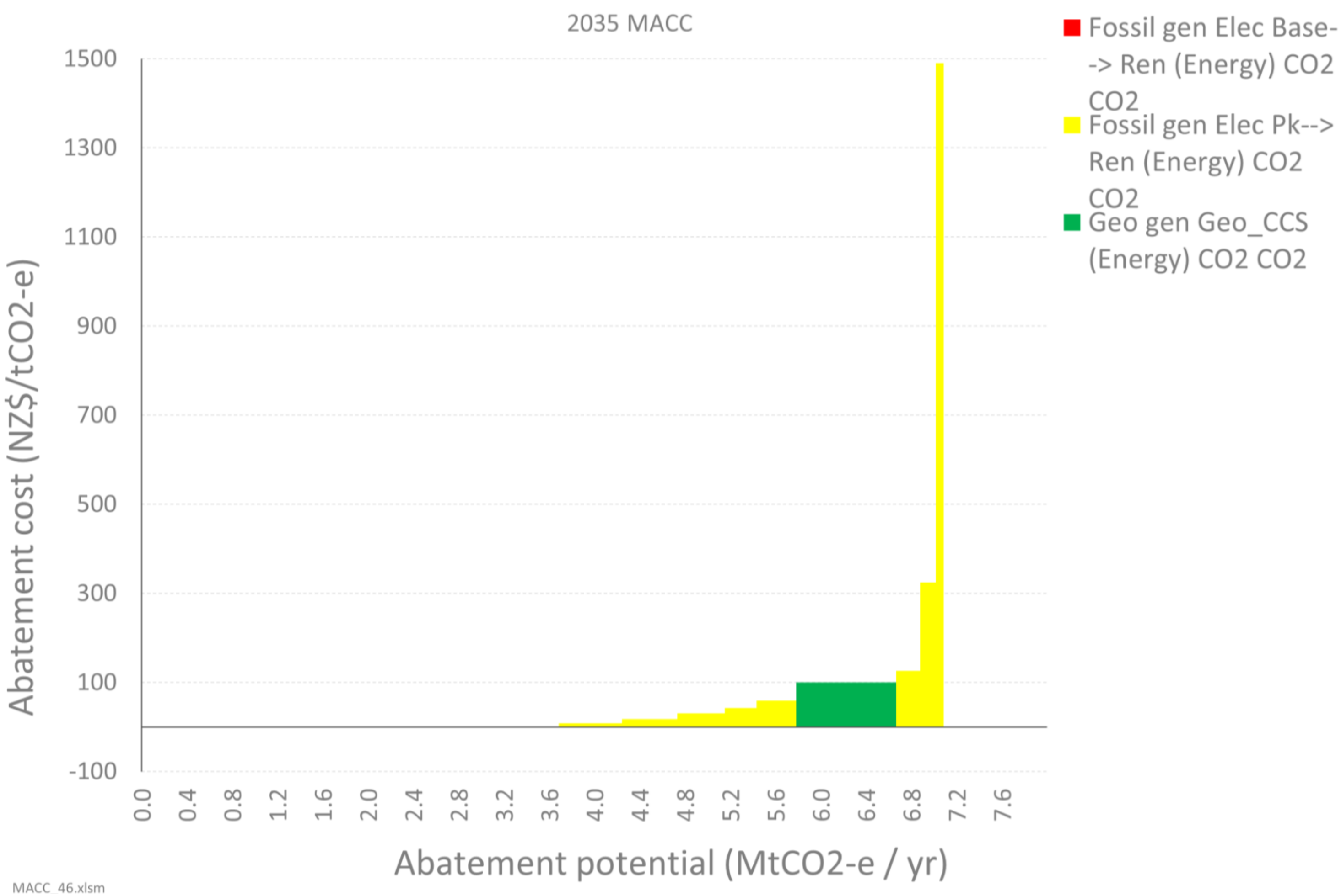


Source: NZIER and MfE

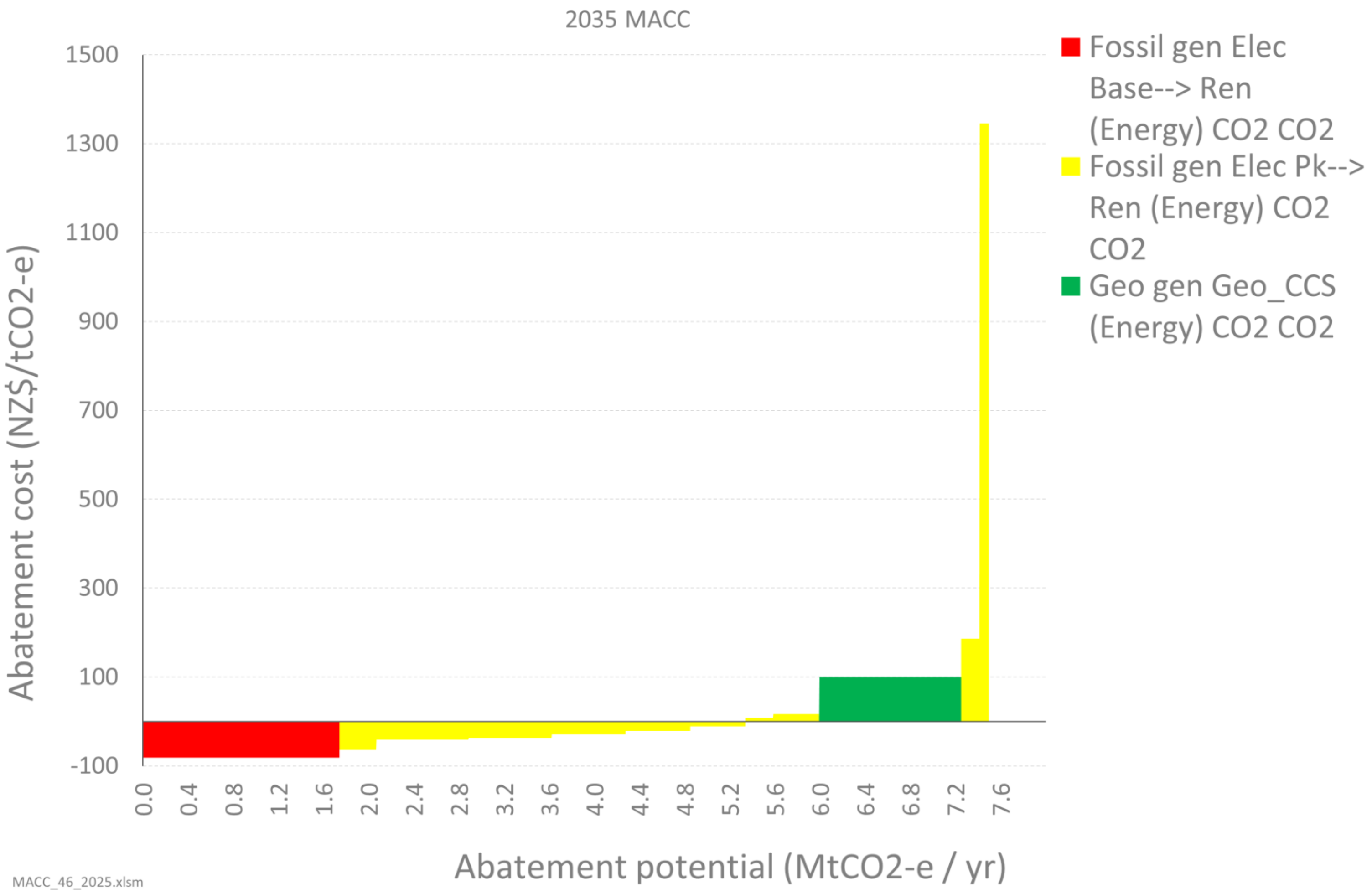
Appendix D Full MACC (not truncated)

Figure 15 2035 MACC for Electricity generation, 2020 vs 2025 forecasts (full)

a) 2020 version



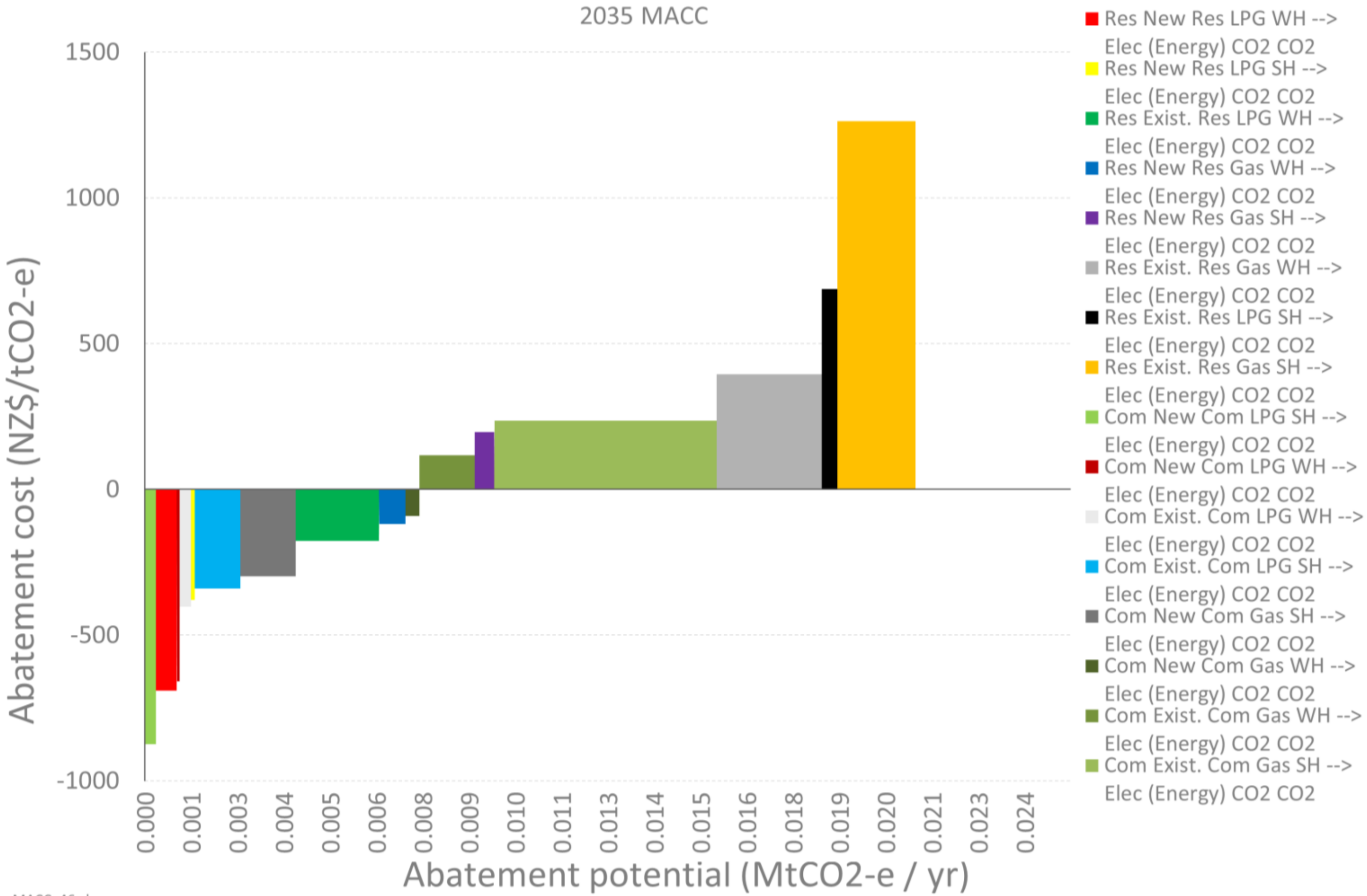
b) 2025 version



Source: NZIER and MfE

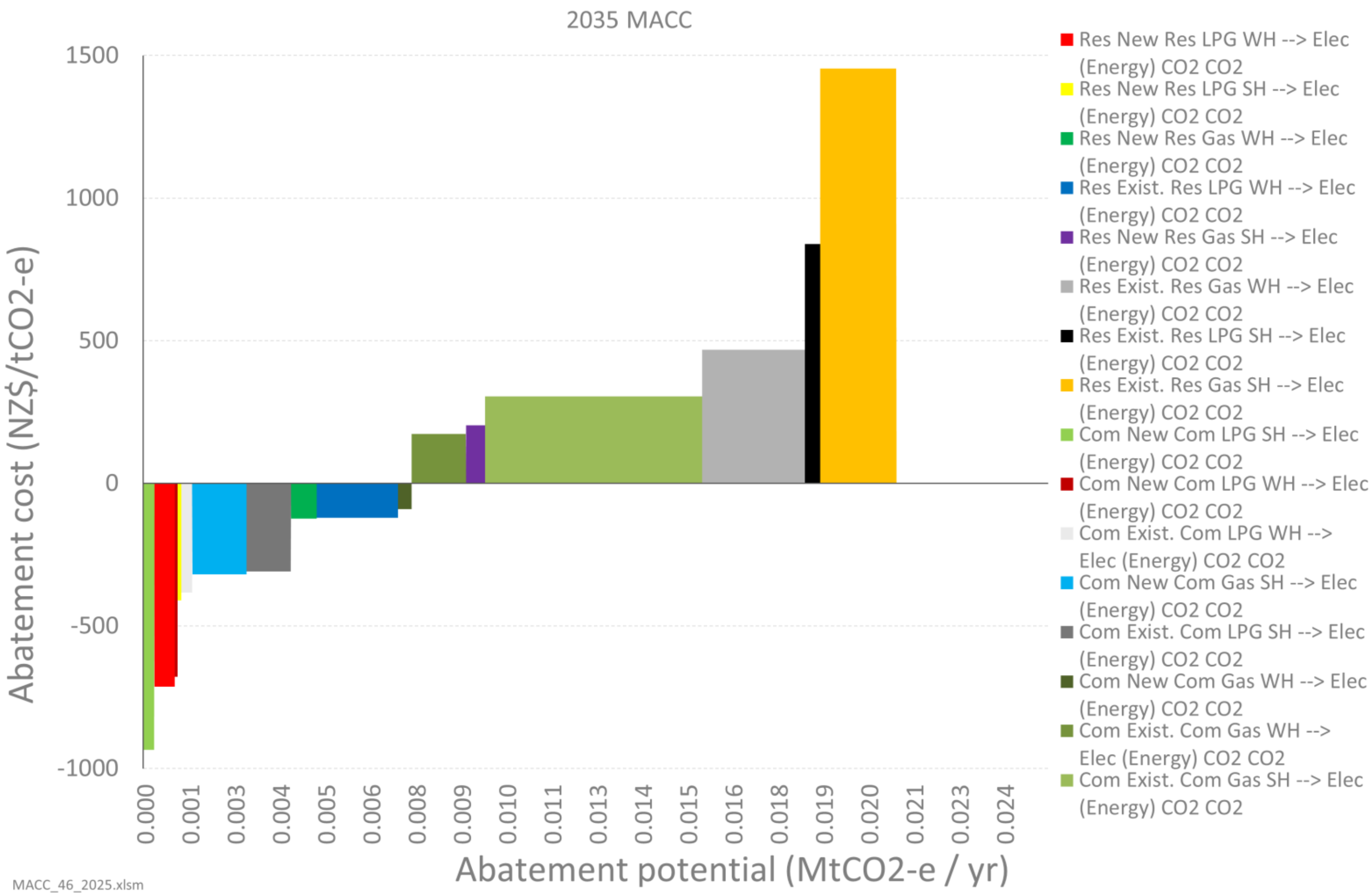
Figure 16 2035 MACC for Heat, 2020 vs 2025 forecasts (full)

a) 2020 version



MACC_46.xlsm

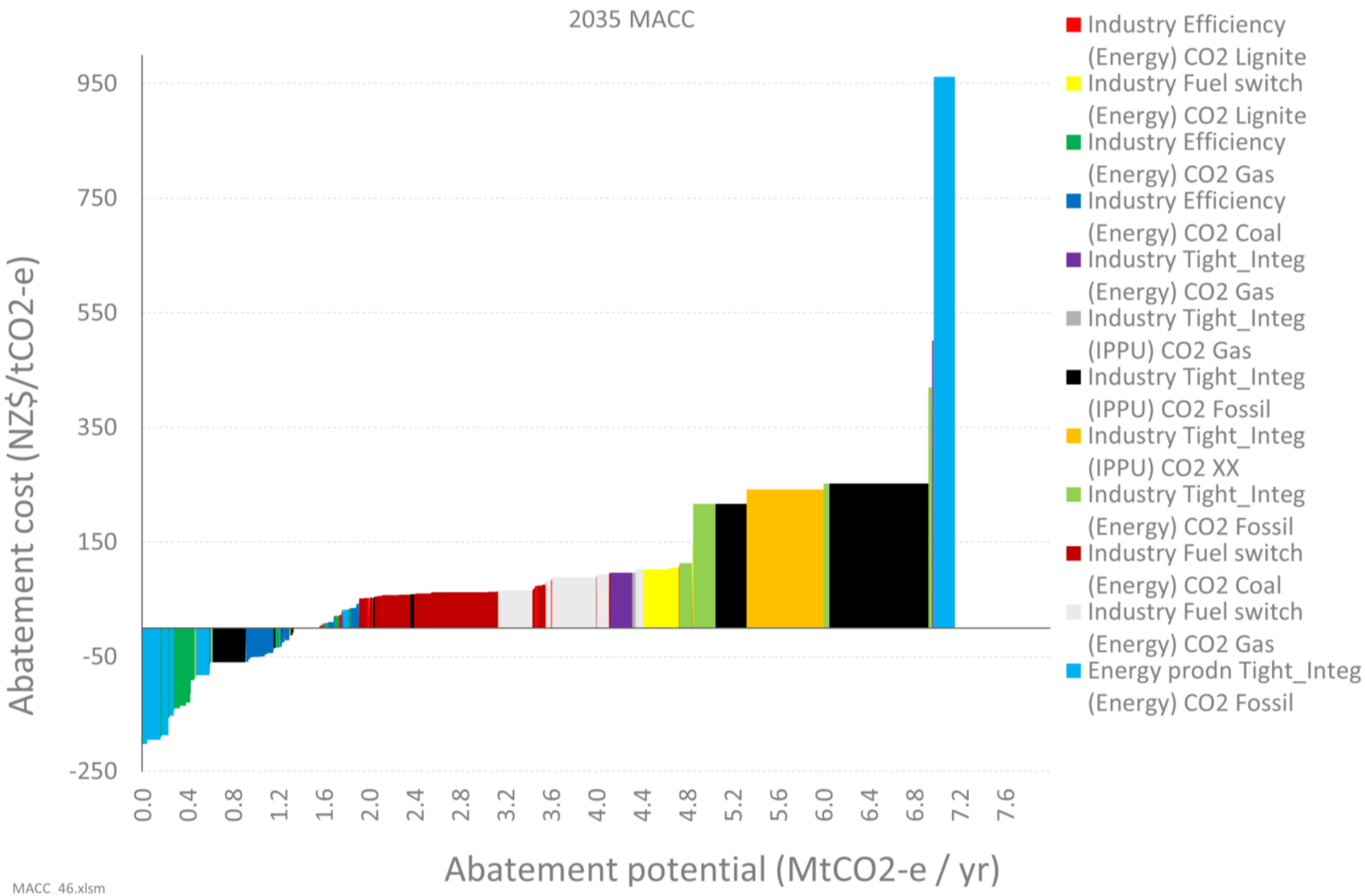
b) 2025 version



Source: NZIER and MfE

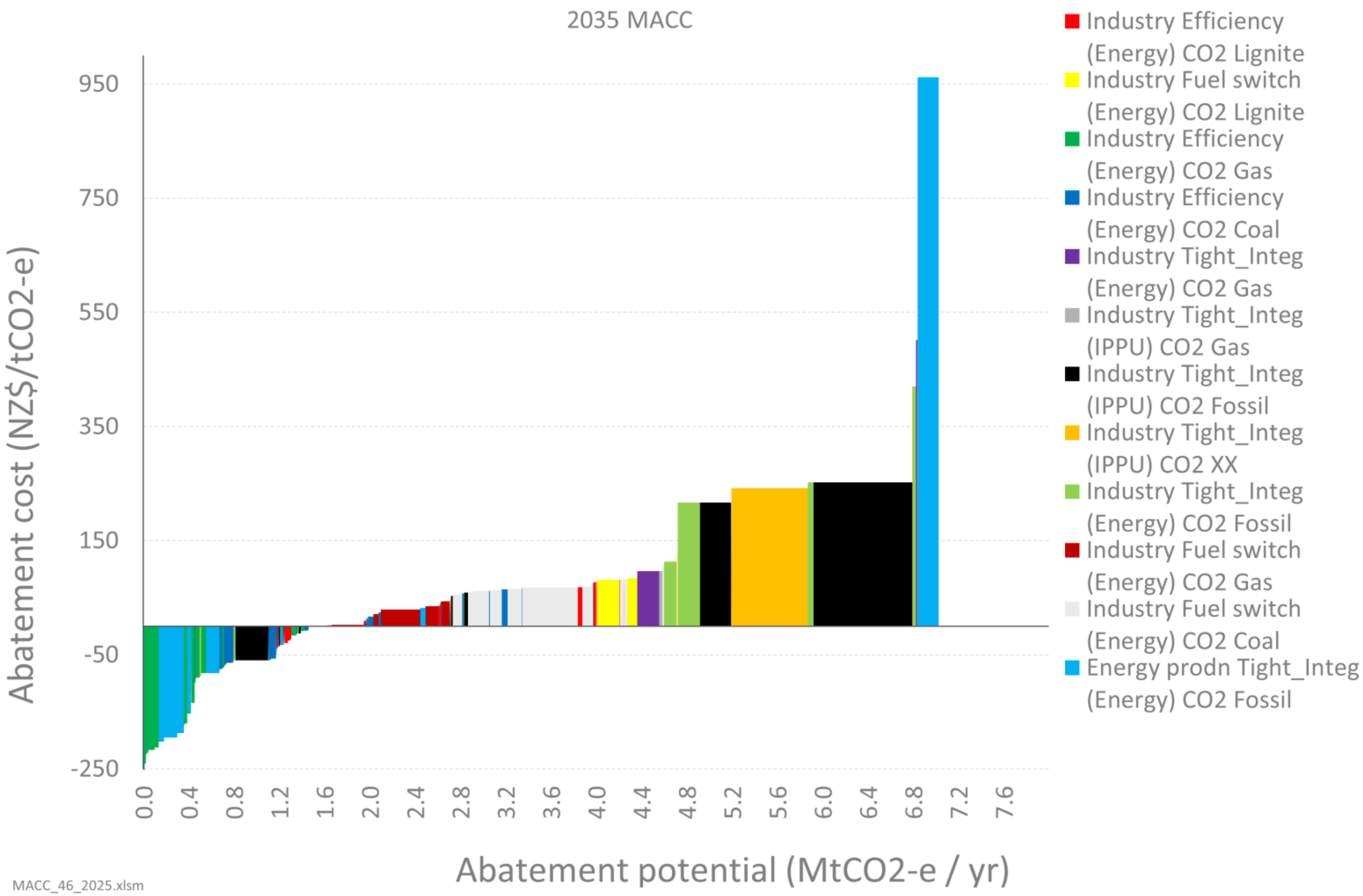
Figure 17 2035 MACC for Industry, 2020 vs 2025 forecasts (full)

a) 2020 version



MACC_46.xlsm

b) 2025 version



Source: NZIER and MfE

Appendix E Files included in the update

A separate supplementary workbook, *Quantitative analysis - Supp I - Assumptions.xlsx*, includes the full set of updated parameter values (prices, technology costs, lifetimes, load factors and other control variables). It also documents parameters that were not updated and explains the reasons why no revision is required at this stage. In addition to the assumptions workbook, the MACC_2025 spreadsheet serves as the core modelling file and retains the same structural logic as the 2020 MACC model to ensure full comparability of results. A separate Historical_2025 spreadsheet provides the underlying time-series data, formatted to match the 2020 framework so that realised emissions and activity trends can be aligned seamlessly with the updated analysis. All these associated workbooks are intended as the primary vehicle for agencies to apply their technical expertise when reviewing and stress-testing assumptions and data sources. The present report focuses on a synthesised narrative rather than measure-by-measure detail.

Appendix F Deflation

To ensure that cost assumptions across years are comparable, all monetary values are converted to a common base-year dollar unit. This process removes the effect of general price inflation. It allows for a like-for-like comparison between the original MACC assumptions (expressed in 2019 real dollars) and updated assumptions (expressed in later-year real dollars, such as 2024).

Deflation is performed using an annual GDP deflator series based on QP data from NZIER. The series represents the relative price level in each year. For any value expressed in year t, the equivalent value in the base year b is calculated as:

$$\text{Real}_b = \frac{\text{Value}_t}{\frac{D_t}{D_b}}$$

where $D_t$and $D_b$are the deflator indices for year t and the base year b, respectively. This adjusts the value downward when converting from a later year to an earlier base year, reflecting the loss of purchasing power over time.

For example, converting a cost expressed in 2024 real dollars into 2019 dollars involves dividing the 2024 value by the inflation factor (D_{2024}/D_{2019}). This aligns all cost inputs to the same price basis and ensures that differences between MACC curves reflect real cost changes rather than inflation. Details for which figures are deflated and during which years can be found in *Quantitative analysis - Supp I - Assumptions.xlsx*.