MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

# COVERSHEET

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|---|---|---|---|
| **Minister** | Hon Dr Megan Woods | **Portfolio** | Energy and Resources |
| **Title of Cabinet paper** | A Sustainable Transport Biofuels Mandate: preferred design for public consultation | **Date to be published** | 19 July 2021 |

| **List of documents that have been proactively released** | | |
|---|---|---|
| **Date** | **Title** | **Author** |
| April 2021 | A Sustainable Transport Biofuels Mandate: preferred design for public consultation | Office of the Minister of Energy and Resources<br>Office of the Minister of Transport |
| 19 April 2021 | Sustainable Transport Biofuels Mandate: Release of Consultation Document<br>CBC-21-MIN-0046 Minute | Cabinet Office |
| April 2021 | Sustainable Transport Biofuels Mandate SAR and RIS | MBIE |

**Information redacted** **YES / NO**

Any information redacted in this document is redacted in accordance with MBIE's policy on Proactive Release and is labelled with the reason for redaction. This may include information that would be redacted if this information was requested under Official Information Act 1982. Where this is the case, the reasons for withholding information are listed below. Where information has been withheld, no public interest has been identified that would outweigh the reasons for withholding it.

## Contents



# Coversheet: Sustainable Transport Biofuels Mandate

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|---|---|
| Advising agencies | *Ministry of Business, Innovation & Employment and Ministry of Transport* |
| Decision sought | *Release a public consultation document on the preferred biofuels mandate's design. This document also provides supplementary analysis for the decision by Cabinet in December 2020 to agree in principle to implement a biofuels mandate for transport (Part 2 of the document)* |
| Proposing Ministers | *Minister of Energy and Resources and Minister of Transport* |

# Summary: Problem and Proposed Approach

**Problem Definition**

**What problem or opportunity does this proposal seek to address? Why is Government intervention required?**

Through increasing the use of biofuels as an alternative to fossil fuels, a sustainable transport biofuels mandate seeks to reduce greenhouse gas (GHG) emissions from the transport sector, contributing to New Zealand's progress towards a net zero emissions economy. Biofuels are the only practical option for reducing emissions from the aviation sector, and one of the main green fuels for reducing emissions from the rest of the transport sector. Without government intervention, fuel consumers do not have sufficient incentives to use biofuels, as biofuels, particularly advanced biofuels, are more expensive than their fossil fuels equivalent.

**Summary of Preferred Option or Conclusion (if no preferred option)**

**How will the agency's preferred approach work to bring about the desired change? Why is this the preferred option? Why is it feasible? Is the preferred approach likely to be reflected in the Cabinet paper?**

The preferred option presented in the Cabinet paper is Option B, i.e. to introduce an annual emissions intensity target for transport fuels across the whole transport sector, with one single annual target for all fuels (namely petrol, diesel, aviation fuel and their biofuels equivalent). The emissions intensity target will start at 1.2 per cent below baseline for petrol, diesel and aviation fuel, progressing to 3.5 per cent below baseline for petrol, diesel and aviation fuel by 2025 and potentially a more ambitious target level beyond 2025 subject to future reviews. Having to meet more stringent emissions intensity targets over time, fuel suppliers will be incentivised to sell more biofuels (with low lifecycle emissions) in place of their fossil fuels equivalent.

The preferred option will achieve an appropriate balance between significant emissions reduction (0.85% below baseline in 2025) and its impact on the economy (with Real Net National Income modelled to be 0.12% below baseline in 2025). An emissions intensity target would allow us to track New Zealand's emissions reduction associated with gradually substituting biofuels for fossil fuels. The emissions intensity targets for 2023-2025 under this preferred option are feasible, taking into account the engine specification requirements and the biofuels supply chain (particularly the rise in advanced drop-in biofuels compatible with existing infrastructure). The level of the 2023-25 targets also mean that the impacts of a biofuels mandate on fuel prices are manageable— average petrol blend prices, average diesel blend prices and average jet fuel blend prices could be 0.4 cents/litre (c/L), 7.1c/L and 7.1c/L higher than baseline prices of their neat fossil fuels equivalent in 2025 respectively.

Another option that could be worth testing with stakeholders further is option C, i.e. to introduce emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels. This option has a smaller economic cost associated with increase in aviation fuel prices, but will achieve smaller emissions savings.

The complete list of options considered include:
*High-level options considered in Part 2*

- Option 1: a mandate requiring sustainable biofuels to be used in transport
- Option 2: a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas)
- Option 3: a price subsidy for biofuels at the pump
- Option 4: a pilot scheme for using biofuels in the transport fleet
- Option 5: grants for the development of biofuel-related facilities
- Option 6: tax incentives for biofuels, such as an excise tax exemption
- Option 7: an information and communication campaign about the benefits of biofuels

*Biofuels mandate policy options considered in Part 3*

- Option A : Transport fuels volume-based sales target focusing on conventional biofuels (1.5 per cent by 2025 and provisional more ambitious targets after 2025)
- Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025)
- Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025)
- Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025)

## Section B: Summary Impacts: Benefits and costs

**Who are the main expected beneficiaries and what is the nature of the expected benefit?**

The primary benefit of a sustainable transport biofuels mandate is that New Zealand will be able to achieve material progress on the path to net zero emissions, thereby contributing to global efforts to address climate change impacts, improving air quality and delivering better health outcomes. The main beneficiaries of emissions reduction are the New Zealand general public.

As a biofuels mandate is a demonstrable government action to address climate change, the New Zealand Government will also enhance its credibility to influence international climate change negotiations.

Businesses that switch to biofuels for their operations in response to the biofuels mandate could use green branding to enhance their market position. A biofuels mandate, which will expand the biofuels market in New Zealand, could also potentially strengthen the market position for domestic biofuels producers and producers of biofuels feedstock (such as the forestry and wood processing sectors). For example, these sectors could build a strong 'story' around how they are sustainably fuelling New Zealand in the future – or helping other sectors to decarbonise.

A biofuels mandate could help build the momentum for developing biofuels production capacity in New Zealand, but it will likely need to be complemented with other interventions to provide sufficient incentives for investments in building significant domestic biofuels

production capacity.[1] New Zealand needs to compete with other countries for capital investments, and investors take into account a range of factors in their decisions, such as feedstock costs, other production costs and proximity to markets.

Should there be sufficient momentum for domestic biofuels production, primary industries that produce feedstocks for biofuels will benefit. For example, the forestry and wood processing sector could see an increase in the value of logs and woody biomass/residues, the meat processing sector could get more value by selling tallow, and the arable sector could sell organic waste from harvesting to be used as a feedstock in biofuel production. Growers/farmers in NZ could potentially plant short rotation energy crops to supplement their income.

**Where do the costs fall?**

Upstream fuel suppliers at the point of obligation (e.g. fuel importers and refineries) will need to invest in fuel infrastructure to store and blend biofuels, change the way they manage their fuel supply chains (with more biofuels that are typically more costly than fossil fuels), and face additional compliance costs associated with the biofuels mandate-related emissions reporting. Downstream fuel retailers (including supermarkets selling fuels) will also need to update their retail outlets to sell biofuel products. The fuel sector is expected to pass on at least some of the costs associated with the implementation of the biofuels mandate to fuel users.

The transport sector (e.g. airlines, freight operators) and businesses using diesel (such as farming, heavy construction and fishing) will face higher fuel costs, as biofuels are more expensive than their fossil fuels equivalent. Transport is a key input for many businesses, and higher fuel costs will therefore raise the costs of many goods and services across the economy. Households using transport fuels in their internal combustion engine (ICE) vehicles will also face higher fuel costs.

**What are the likely risks and unintended impacts? How significant are they and how will they be minimised or mitigated?**

Some biofuels may come from sources that could cause sustainability concerns, such as biofuels produced from palm oil. Sustainability criteria for biofuels that can count towards the New Zealand biofuels mandate will be based on international best practice.

New Zealand currently has limited infrastructure for storing and blending biofuels because of the under-developed biofuels market here. To allow for sufficient time for biofuels infrastructure to develop fully, the initial mandated target will start at a relatively low level and progressively increase over time, and there will mechanisms that allow a certain degree of flexibility in meeting the emissions intensity target. For example, in the first two years of implementing the biofuels mandate, fuel suppliers at the point of obligation will be able to apply for a deferral of meeting the emissions target. These fuel suppliers will also be allowed to bank, borrow and trade emissions reduction achieved through biofuels supply will also be allowed.

[1] Stage One Report of MPI's New Zealand Wood Fibre Futures Project indicated it was unlikely that investment in domestic biofuels production would occur without some form of biofuels mandate as well as other Government interventions.

In the initial years of implementing the biofuels mandate, some fuel suppliers may also face challenges in sourcing biofuels, and officials expect that most of the biofuels will need to be imported from overseas to start with. There are some risks associated with security of biofuels supply, particularly given that the advanced biofuels markets is still under development. The aforementioned flexibility mechanisms will mitigate these risks.

The fuel cost increase resulting from the biofuels mandate will affect households and businesses. The relatively low mandated target in initial years of implementation will mitigate the risk of fuel prices becoming unaffordable. Officials will monitor the fuel price movements, and will undertake periodic review of the biofuels mandate to ensure that transport fuels remain affordable.

Higher blends of conventional biofuels could cause engine performance problems, and the quality of biofuels may vary between different producers, as they use different feedstocks and different production methods. Officials will undertake periodic reviews of the biofuels mandate and engine fuel specification regulations in consultation with key stakeholders, such as the fuel sector and the transport sector. More resources may also be dedicated to fuel quality monitoring, depending on availability of funding.

Should investors develop biofuel production plants in New Zealand in response to the biofuels mandate, there will be implications for land use and biomass availability in New Zealand. For example, there could be competition for forest residues between solid wood fuels (used for process heat) and liquid biofuels (used for transport), and more intense competition for agricultural land. There could also be competition for other organic waste, which could have implications for composting businesses in New Zealand.

The risks associated with resource allocation can be mitigated through both the international framework for biofuels' sustainability certification and domestic resource management policy framework. It is expected that domestically produced biofuels would need to achieve international certification for sustainability if they were to be counted towards New Zealand's biofuels mandate. Domestically, local government is expected to consider the land use implications when considering resource consents, while central government will keep an oversight of the overall resource management framework, waste management framework and bio-economy development.

## Section C: Evidence certainty and quality assurance

**Agency rating of evidence certainty?**

The modelling results on the potential impacts of the biofuels policy options are dependent on assumptions on a range of matters, such as technological developments, carbon prices, biofuels prices, fossil fuel prices, and structure of the New Zealand economy.

There are uncertainties in all these matters. For example, biofuels prices could be lower than assumed because of new technological breakthroughs in the future. Sensitivity analysis indicates that if the assumed long-term crude oil price is changed from around $50-60 per barrel to around $80 per barrel, with no corresponding movement in biofuels prices, the impact of the preferred policy option (uniform emissions intensity target for all transport fuels) on real GDP could reduce by 45 per cent in the period to 2035.

Other green technologies and EV uptake could move faster than assumed. The structure of the New Zealand economy could be different from the model assumption that there will be no major structural change in the New Zealand economy between now and 2035. It is difficult to anticipate whether new sizeable low-emissions industries, including a significant domestic biofuels industry, could emerge in New Zealand in the period to 2035.

*To be completed by quality assurers:*

| Quality Assurance Reviewing Agency: |
| --- |
| The Regulatory Impact Analysis Team at the Treasury and the Ministry of Transport |
| **Quality Assurance Assessment:** |
| A quality assurance panel with representatives from the Regulatory Impact Analysis Team at the Treasury and the Ministry of Transport has reviewed the Regulatory Impact Statement (RIS) "Sustainable Transport Biofuels Mandate" produced by the Ministry of Business, Innovation and Employment, and the Ministry of Transport. The panel considers that it **meets** the Quality Assurance criteria. |
| **Reviewer Comments and Recommendations:** |
| This RIS covers a supplementary impact analysis of the in-principle policy decision taken by Cabinet in December 2020 to implement a biofuels mandate for transport, and impact analysis of the detailed design of the mandate. A problem has been clearly defined. A wide range of regulatory and non-regulatory options have been identified and evaluated against a comprehensive assessment framework, covering social, economic and environmental impacts.<br><br>The RIS confirms that a mandate for biofuels in transport is the best approach to increasing the demand for biofuels in New Zealand to reduce transport emissions. The preferred option identified for the mandate supports New Zealand's goal under the Climate Change Response Act 2002 to have net-zero GHG emissions by 2050. This preferred option strikes a balance between emissions reductions and economic impact.<br><br>It is recognised that time constraints have resulted in less engagement with stakeholders than is desirable. However, the proposed public consultation following the Cabinet decision will afford greater engagement by stakeholders on the final approach to the mandate and any implementation challenges. |

# Impact Statement: supplementary analysis for in-principle agreement to a biofuels mandate

# Part 1: Current state and problem definition

## Section 1: General information

### 1.1 Purpose

The Ministry of Business, Innovation and Employment (MBIE) and the Ministry of Transport (MoT) are responsible for the analysis and advice set out in this document, except as otherwise explicitly indicated.

This document has three parts. It sets out:

- the current state and problem definition (**Part 1**).
- supplementary analysis of the in-principle policy decision taken by Cabinet in December 2020 to implement a biofuels mandate for transport (**Part 2**).
- analysis and advice for the purpose of informing:
    - Cabinet decisions on the design of a biofuels mandate proposal to be released for public consultation
    - stakeholders to be consulted on the proposal (**Part 3**).

### 1.2 Key Limitations or Constraints on Analysis

The decision to agree in principle to a biofuels mandate in December 2020 was made with insufficient time to fully analyse or document the costs, benefits and risks of options. The supplementary analysis serves as a "regulatory pre-mortem", as described in the Treasury's Guidance on Cabinet's Impact Analysis Requirements.

The supplementary analysis includes a wide range of regulatory and non-regulatory options. We have qualitatively analysed these options against a set of criteria (the more detailed options for a biofuels mandate in the associated RIS are supported by significant quantitative analysis including economic modelling).

The Prime Minister announced Cabinet's in-principle decision to implement a biofuels mandate in January. As the Minister of Energy and Resources and the Minister of Transport are expected to report back to Cabinet in April 2021, there is relatively limited time for analysis. Therefore, our quantitative analysis of the potential impacts of biofuels policy options, focuses primarily on the specific options for a biofuels mandate.

Also, due to the time constraint, we have had engagements with only some key stakeholders, namely fuel companies, Air New Zealand and the International Sustainability & Carbon Certification (ISCC), to discuss the practicalities of implementing

a biofuels mandate, such as emissions certification and trading between fuel suppliers for the purpose of meeting emissions intensity target for transport fuels.

As mentioned in section C, there is uncertainty in the future outlook of biofuels and more widely transport energy technologies. Therefore, assumptions on biofuels markets were made when modelling the potential impacts of a biofuels mandate. For example, it is assumed that the domestic production of biofuels is expected to be very limited in the short term and will need to rely on biofuel imports. Future developments, such as technological breakthroughs and policy developments, could deviate from those assumptions.

### 1.3 Responsible Manager (signature and date):

Ewan Delany

Environment, Emissions and Adaptation

Ministry of Transport

12 April 2021

Justine Cannon

Energy Markets Policy

Energy and Resource Markets Branch

Ministry of Business, Innovation & Employment

12 April 2021

# Section 2: Problem definition and objectives

## 2.1 What is the current state within which action is proposed?

The transport sector is New Zealand's second biggest source of greenhouse gas (GHG) emissions, contributing 21.1 per cent to total emissions over the 1990-2018 period. Since 1990, transport emissions have increased by 90 percent and within transport, road emissions have more than doubled.

Around two-thirds of domestic transport emissions come from cars, SUVs, utes and vans. Heavy road vehicles are responsible for around a quarter of domestic transport emissions, aviation 7 percent, and shipping and rail 2 per cent.

It is important to decarbonise the transport sector in order to meet New Zealand's goal under the Climate Change Response Act 2002 to transition to a net zero GHG emissions (excluding biogenic methane) by 2050, and New Zealand's commitment under the Paris Agreement to reduce GHG emissions by 30 per cent below 2005 levels by 2030. The Climate Change Commission is currently consulting on emissions budgets for 2022-2025, 2026-2030 and 2031-2035, which the Government will set by the end of 2021.

*Opportunities to decarbonise transport modes*

To understand the costs associated with different options to decarbonise transport, we looked at their estimated marginal abatement costs (MAC). The MAC is a measure of the abatement potential of greenhouse gas mitigation measures and the relative costs associated with each of these measures. A marginal abatement cost curve (MACC) is a graph that visualises the MAC of mitigation measures to assist in comparing the cost-effectiveness of abatement options in a consistent way. Although they are not a complete measure, they can inform decisions about cost-effective transition pathways to a low-emissions economy.

The Ministry for the Environment prepared a marginal abatement cost curve (MACC) analysis for New Zealand. The assessment is subject to several assumptions and estimations, but presents a picture of the relative costs of GHG mitigation options.[2]

**Light vehicles**

EVs are the most significant opportunity to decarbonise light vehicles. A 2019 analysis of marginal abatement costs for GHG mitigation options indicated that switching to EVs for light and medium road vehicles (new vehicles entering the fleet) will deliver net public savings on a lifecycle basis.

[2] Ministry for the Environment. 2020. Marginal Abatement Cost Curves Analysis for New Zealand: Potential Greenhouse Gas Mitigation Options and Their Costs.

The impacts were evaluated from a national economic perspective, which means it does not take into account who bears the costs of the options. Further, the report only looked at the technical potential of emissions abatement options i.e. it did not evaluate non-cost barriers to the take-up of options such as infrastructure constraints and supply constraints, or the realisable potential of the policy option. We have looked at non-cost barriers further on in this report. Overall, the report's authors note that this analysis has required assumptions to be made, but consider it to be "a reasonable basis for evaluating the relative costs of the different abatement options, and the likely first-order estimates of the scale and cost of such options".

This analysis is also sensitive to the oil price and the cost of batteries, which is expected to decline over time as electric vehicles achieve scale.

However, EV purchase price parity with conventional vehicles is unlikely to occur until the late 2020s. While there are other interventions to increase the electric vehicle proportion of the fleet, there are still many internal combustion engine (ICE) vehicles entering and remaining in the fleet. Every ICE vehicle that enters the fleet today will, without further action, be driven until it is, on average, 20 years old. For new ICE vehicles purchased in 2020, it will not be until 2040 that many of them will be replaced with EVs.

Therefore, increasing the share of renewable fuels used presents an opportunity to decarbonise light ICE vehicles already in the fleet or that will enter the fleet in the next decade or so. Biofuels could play a key role in the decarbonisation of transport by acting as a transition fuel, lowering emissions from ICE vehicles until they are gradually replaced with EVs. Biofuels, being more costly than fossil fuels, will also increase the incentive for motorists to switch to EVs in order to reduce their per km costs.

**Heavy vehicles**

Heavy vehicles, the majority of which are freight vehicles, are responsible for almost a quarter of New Zealand's transport GHG emissions. Nearly all trucks in New Zealand use diesel. Future alternative green fuels for heavy vehicles include electricity, green hydrogen and biofuels.

However, currently battery electric and hydrogen heavy trucks are still only being produced as demonstration models. A 2020 working paper by the Ministry of Transport examining green fuels for freight noted that the upfront cost of electric trucks (including both battery electric vehicles, and fuel cell electric vehicles using hydrogen gas) is a significant barrier for freight operators to transition their fleets and will remain so in the near future. Significant investments in infrastructure for recharging or refuelling such trucks will also be needed. The upfront cost of low and zero-emissions heavy vehicles is likely to remain a significant barrier for the next five years, and many will not achieve price parity with diesel vehicles until after that.[3]

Setting aside the practical barriers to hydrogen and battery electric heavy trucks, an analysis of the marginal abatement costs for trucks by the Ministry for the Environment concluded that it is lowest for electric vehicles when the charging frequency is overnight.[4] However, when the charging frequency is more or less frequent than overnight, biofuels are estimated to have the lowest marginal abatement cost.

**Table 1 - estimated marginal abatement costs for fuel-switching for heavy trucks**

| Recharging frequency | Once a fortnight | Once a week | Once every two days | All overnight | 50% top-up during day | Full top-up during day | Full top-up twice a day |
|---|---|---|---|---|---|---|---|
| Biofuel | $189 | $189 | $189 | $189 | $189 | $189 | $189 |
| Bat. Elec | $859 | $477 | $192 | -$41 | $109 | $190 | $248 |
| Hydrogen | $525 | $450 | $425 | $456 | $451 | $449 | $446 |

[3] Ministry of Transport, Green Freight Strategic Working Paper, 2020

[4] Analysing the impact of different recharging periods is important for battery electric vehicles because it represents the optimal battery size taking into account charging frequency and electricity supply costs, which vary throughout the day.

By comparison, the Climate Change Commission's draft supporting evidence for consultation referred to a cost of emissions reduction of $400/tonne.$CO_2e$ of synthetic renewable fuels[5].

Biofuel blends (i.e. biofuels blended with their fossil fuels equivalent) can be used in conventional ICE heavy vehicles, and major truck manufacturing companies like Scania, are now producing truck engines capable of running entirely on biofuels.

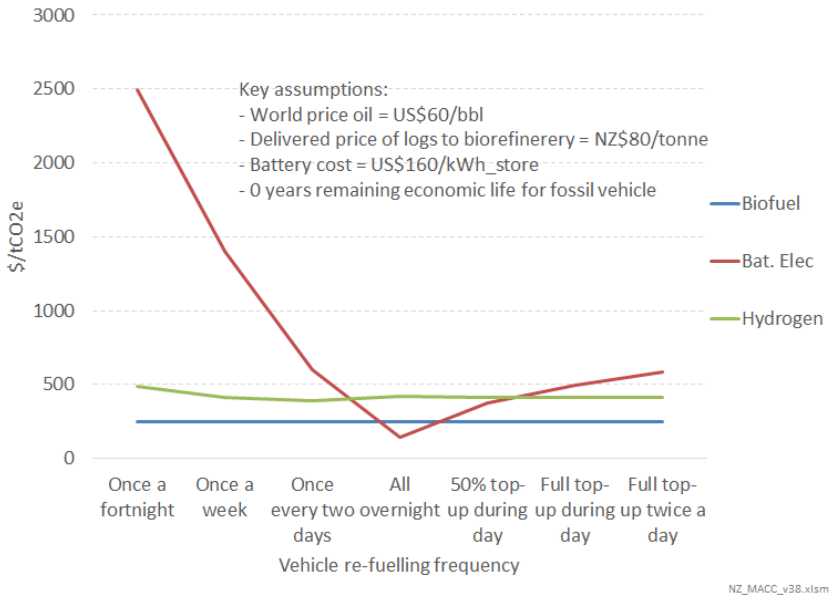
**Aviation, marine and rail**

Biofuel blends can also be used in aviation, marine transport and rail. Air New Zealand has identified sustainable aviation fuel (the type of biofuels designed specifically for aviation) as the main green fuel for decarbonising aviation, as electricity and hydrogen are not suitable for long-haul flights.

For shipping, there are more green alternatives, including biofuels (renewable diesel, biodiesel or liquefied biogas), methanol, liquefied natural gas (LNG) and hydrogen. From a technology perspective, renewable diesel is more suitable for shipping than biodiesel, as biodiesel is known to have technical issues for marine use. For example, bacteria and mould may grow if condensed water accumulates in biodiesel fuel. Microbial growth will lead to excessive formation of sludge, clogged filters and piping over time.

An analysis of the marginal abatement costs for hydrogen, battery electric and biofuels for marine transport showed that, similar to heavy trucks, increasing the use of biofuels is the most cost-effective alternative fuel for reducing emissions, except for a scenario where battery electric vehicles are charged overnight. There was no relevant data for methanol or LNG.

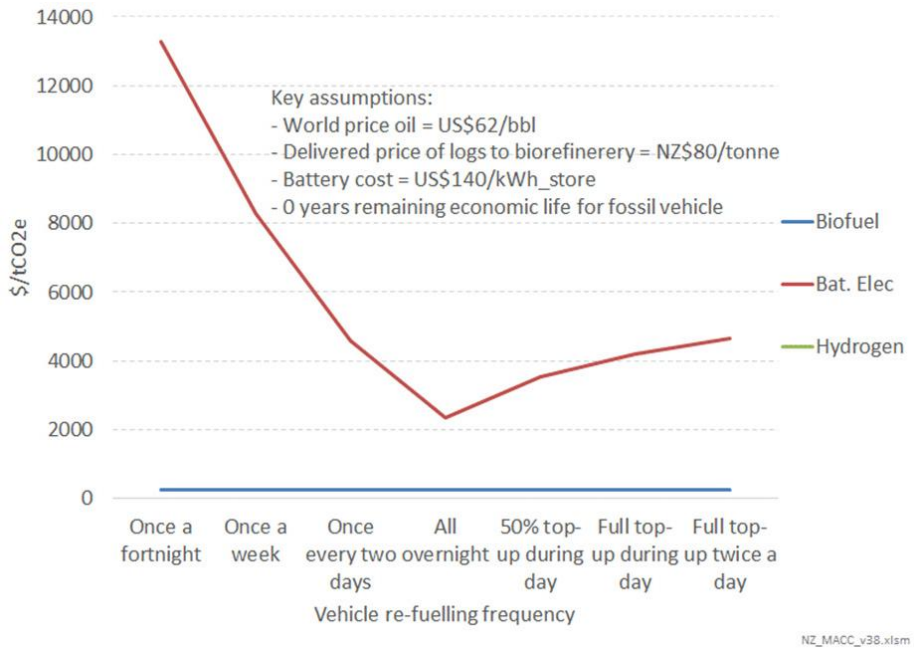
The marginal abatement costs for alternative marine fuels are compared in the figure below.




[5] Climate Change Commission, Draft Supporting Evidence for Consultation – Chapter 4b: Reducing emissions – opportunities and challenges across sectors – *Transport, buildings and urban form*

Source: MfE (2020)[6]

Similarly, the following figure shows that biofuels are the most cost-effective alternative fuel for reducing emissions in aviation compared to battery electric vehicles.




Source: MfE (2020)[7]

For rail, electrification is assessed as being the most cost-effective option (it has a negative marginal abatement cost, which means that it has a net benefit even without taking into account the benefits of carbon emissions reductions).

Note that this analysis represents the lowest-cost way to reduce emissions from fossil fuels; it may still have a significant price premium above fossil fuels.

*Difference between conventional biofuels and advanced biofuels in terms of production method and emission savings*

Biofuels are derived from natural sources such as plants, animal wastes, forest residues, and other organic material. In broad terms, they can be classified as conventional or advanced biofuels. Conventional biofuels, such as bioethanol and biodiesel (fatty acid methyl ester), are produced through technologies that are already available at commercial scale. Most bioethanol is produced from agricultural crops, while most biodiesel is produced from vegetable oils and waste oils. As conventional biofuels have different chemical properties from fossil fuels, they can cause engine problems over time and are therefore subject to blend limits.

The blend limits for conventional biofuels are low: 10 per cent for bioethanol, 5-7 per cent for biodiesel for road transport use in most countries. In marine transport, due to poor performance in cold waters, limits of up to 7 per cent are applied to biodiesel. Biodiesel is

[6] MfE, *Marginal abatement cost curves analysis for New Zealand: Potential greenhouse gas mitigation options and their costs,* January 2020. https://www.mfe.govt.nz/publications/climate-change/marginal-abatement-cost-curves-analysis-new-zealand-potential-greenhouse

[7] Ibid.

not suitable for aviation because it does not fulfil the key jet fuel requirements such as stringent cold flow viscosity and high energy density specifications.

In contrast, advanced (drop-in) biofuels, such as renewable diesel, can be blended with fossil fuels in much higher proportions or even used in neat form, and are compatible with existing fuel infrastructure, as they have similar chemical properties to fossil fuels. Nevertheless, blending limits can be applied to advanced biofuels to ensure that the final fuels comply with fuel standard specifications in a particular jurisdiction. In aviation, limits of up to 10% or up to 50% of drop-in fuels are applied depending on the conversion pathway.

Advanced biofuels can be produced through a number of conversion technologies, such as hydro-treatment (reacting feedstocks with hydrogen), biochemical processes and thermal conversion. Their feedstock ranges from tallow and forest residues to other organic waste.

Different types of biofuels have different lifecycle emissions, depending on the source of their feedstock and the production method. Many but not all biofuels have lower lifecycle emissions than fossil fuels. Due to the land-use change impact, biofuels produced from vegetables oils have relatively high lifecycle emissions, and in some cases, higher emissions than from fossil fuels. On average, biodiesel from soybean oil can increase lifecycle emissions by 57 per cent, and biodiesel from palm oil by 104 per cent on an energy content basis ($gCO_2$-e/MJ fuel).[8]

Compared to conventional biofuels, advanced biofuels from forestry residues and energy crops emissions have much lower lifecycle emissions. Furthermore, as blended fuels, advanced biofuels can generate greater emissions savings because they can be blended with fossil fuels in much higher concentrations. Emissions savings are in the range of 21-50 per cent for a final fuel containing 50% drop-in fuel, depending on the feedstock and conversion pathway. [9]

On the other hand, due to the blending limits, conventional biofuels have relatively low emissions reduction potential, even if they are produced from sustainable feedstock. For example, a seven per cent biodiesel blend containing biodiesel produced from waste oils can achieve emissions savings of roughly 3-6 per cent, while a 10 per cent bioethanol blend (E10) can achieve emissions savings of roughly 1-6 per cent. [10]

*Current biofuels supply in New Zealand is very limited*

Bioethanol and biodiesel are currently the most common biofuels. Bioethanol is typically blended with petrol for use in light ICE vehicles, while biodiesel is typically blended with mineral-based diesel for use in heavy ICE vehicles. Biodiesel blends can also be used in ships but are not commonly used, as most ships, particularly large ones, use heavy fuel oil, which is much cheaper than mineral-based diesel, as well as biodiesel blends.

[8] Sapere report

[9] Ibid

[10] Ibid

Biofuels constitutes less than 0.1 percent of New Zealand's total liquid fuel sales, compared with about 4 percent globally or even higher in some countries with ambitious renewable fuels targets.

At present, most of the bioethanol in the New Zealand market is imported from Australia, while only a very small amount of bioethanol (0.13 PJ in 2019) is produced domestically primarily from whey (a dairy by-product). Globally, the US and Brazil are the biggest bioethanol exporting countries, but New Zealand has not traditionally imported from those countries.

Similarly, only a very small amount of biodiesel is produced in New Zealand, using tallow, rapeseed oil and used cooking oil as feedstock.[11] Some tallow-based biodiesel is also imported from Australia.

*Future biofuels demand and new investments are shifting towards renewable diesel*

Over the next decade, biodiesel production in OECD countries is expected to fall, as OECD countries driven by the need to overcome blending limits and sustainability concerns gradually shift toward advanced biofuels. On the other hand, biodiesel production in non-OECD countries, such as Argentina, is expected to increase driven by supportive policies.

Based on current technological developments and direction of policy support in other countries, it is expected that the global production and uptake of advanced drop-in biofuels will start to expand and potentially overtake that of conventional biofuels from 2025. Most of the new investments in biofuels production capacity are directed towards renewable diesel, a type of advanced drop-in biofuel.

*New Zealand could have potential to develop significant domestic biofuels production capacity in the future but this depends on capital investments and government interventions*

New Zealand currently does not produce any advanced drop-in biofuels. However, Sapere estimated that 9.2 PJ of advanced drop-in biofuels (270 million litres), which is equivalent to 7 per cent of New Zealand's total energy demand from petrol light vehicles, diesel heavy vehicles, marine vessels and aviation, could potentially be produced in New Zealand by 2030, using local tallow and forest biomass as feedstock. This estimate is an upper boundary estimate based on low-carbon-fuel demand potential, potential feedstock supply and Sapere's judgement on technology pathways. To reach this local production level over time, significant capital investments in the order of tens to hundreds of millions of dollars per annum between now and 2035.[12]

Due to increasing pressure to reduce emissions and move away from fossil fuels, there is growing interest in domestic biofuel production by potential feedstock suppliers (e.g. the forestry and wood processing sector, the waste management sector, technology providers, end-users. However, as indicated in Stage One Report of the Ministry for Primary Industries' (MPI) New Zealand Wood Fibre Futures Project, it is unlikely that investment in

[11] Fulton Hogan

[12] Sapere (2021), *Biofuel Insights: An independent report prepared for EECA*.

domestic biofuels production would occur without some form of biofuels mandate to provide certainty of demand, as well as other government interventions to improve the feasibility.

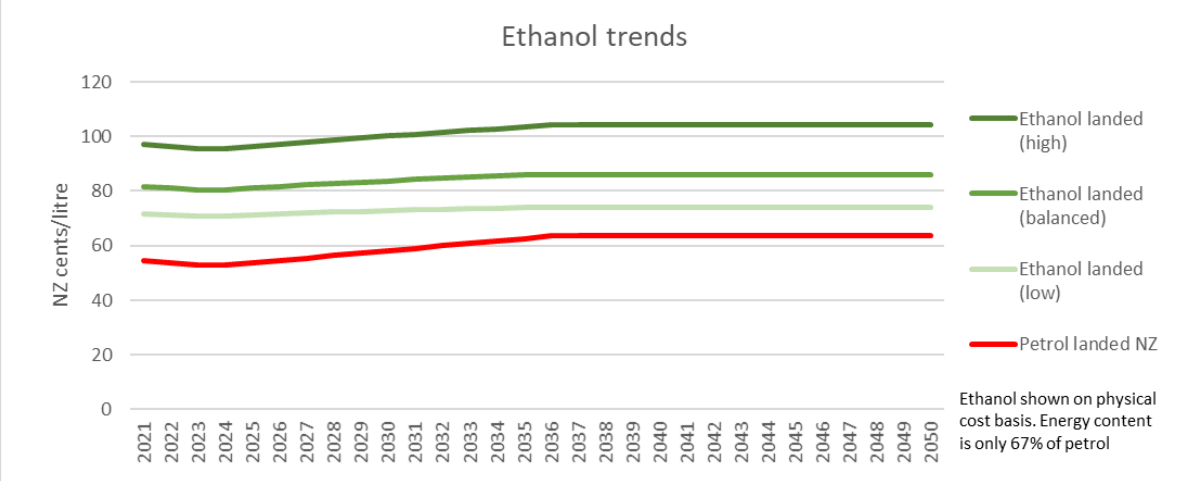
Systems thinking about resource allocation (particularly in relation to land use, skills, and feedstock availability and collection) will also be required to ensure that resource allocation across the economy functions effectively. Stage Two of MPI's New Zealand Wood Fibre Futures Project, which is looking into the business case for biofuels, biocrude oil and other wood-based products (including investigating options for increasing the supply of wood residues and the use of manufacturing clusters or industrial symbiosis), will help inform such systems thinking. The Stage Two report is expected to be available later this year, and this will be an input into the impact analysis for subsequent decisions on the biofuels mandate.

If a sizeable biofuels industry is developed in New Zealand, it could have significant positive impacts on regional development, primary industries that are able to produce the feedstock for biofuels (e.g. wood residues from the wood processing sector), and possible exports (assuming that New Zealand's biofuels produces are internationally competitive).

*Biofuels prices are and will remain higher than fossil fuels*

While biofuels can result in emissions savings and some of them are compatible with existing fuel infrastructure, they have not replaced fossil fuels mainly because biofuels, particularly those from sustainable sources, are not cost competitive with fossil fuels. There are multiple factors driving up the biofuels prices, such as limited feedstock supply resulting in high feedstock costs, lack of economies of scale, financial barriers and technical barriers.

Bioethanol is the cheapest type of biofuels and has a well-established international market, but it is still expected to cost more than petrol over the long term. The bioethanol price trend is shown in the graph below.

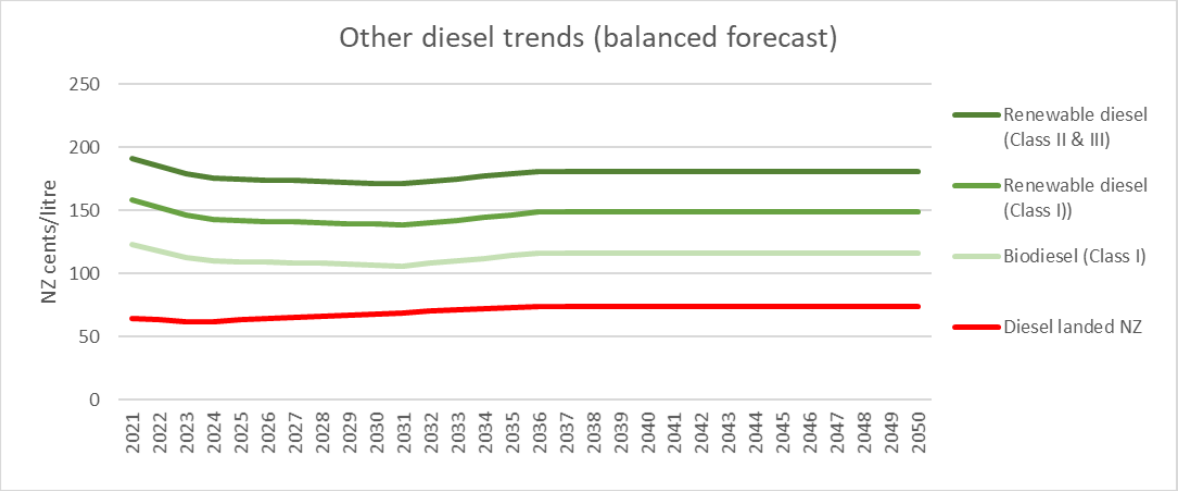



Source: Hale and Twomey (2021)[13]

Renewable diesel is currently trading at nearly three times the cost of fossil fuel diesel and a reasonable premium is expected to remain over this decade because of high demand in countries where there are existing biofuels mandates or governments provide other policy incentives. Conventional biodiesel is less expensive than renewable diesel but is and will

[13] Hale and Twomey, *Biofuels price forecast*, 22 January 2021.

remain more expensive than mineral-based diesel. The price trends of renewable diesel, conventional biodiesel and mineral-based diesel are compared in the graph below.




Source: Hale and Twomey (2021)[14]

Sustainable aviation fuel is even more expensive than renewable diesel because planes have stricter fuel energy and performance requirements.

Note that the price trends illustrated above represent estimates of the prices of globally traded commodities, rather than bottom-up estimates of fuel production costs. It is expected that global demand for biofuels, driven by emission reduction policies, will generally exceed available supply, and the fuels will generally trade at some multiple of relevant fossil fuels for the foreseeable future.

*Overseas policy developments*

Globally, 68 countries have enacted biofuels mandates, at the national or subnational level to address the challenges limiting biofuel uptake. Most of these mandates require a certain proportion of fuel sales to be biofuels, or require a biofuels to be blended with their fossil fuels equivalent at a certain percentage. For example, in Queensland, 4 per cent of the total volume of regular unleaded petrol sales and ethanol-blended fuel sales by liable fuel retailers must be ethanol.

Some of the advanced economies not only have biofuels mandate based on fuel sales volumetric targets or biofuel blend targets, but also clean/renewable fuel standards based on the carbon intensity of transport fuels (which is based on the lifecycle emissions of fuels). For example, California's Low Carbon Fuel Standard requires a 20 per cent reduction in carbon intensity of transport fuels by 2030.

[14] Hale and Twomey, *Biofuels price forecast*, 22 January 2021.

## 2.2 What regulatory system(s) are already in place?

In 2008, the Government introduced a biofuels sales obligation, with an aim to incentivise the use and domestic production of biofuels. Had this obligation been implemented, it would have required suppliers of petrol or diesel in New Zealand to also supply a minimum proportion of biofuels. The biofuel proportion was initially 0.5 percent of a liable supplier's petrol and diesel sales, rising to 2.5 percent over four years. However, it was repealed shortly after the General Election in 2008 before it was to come into effect. Between 2009 and 2012, the Government implemented a biodiesel grants scheme, which was discontinued when the Government at the time shifted its focus from subsidising conventional biofuels to investing in research and development of advanced ones.

Since then, the main policy incentives for biofuels remaining in New Zealand have been the New Zealand Emissions Trading Scheme (NZ ETS), a short-lived grant programme for biofuel production in New Zealand, the excise tax exemption for bioethanol and some R&D support to research institutions, such as Scion.

The NZ ETS zero-rates the biofuel component of transport fuels, but the current carbon price translates to only around 10 cents per litre for diesel and 9 cents per litre for petrol.[15] The carbon price under the NZ ETS is just below $40 per tonne of CO2-e, while the Climate Change Commission's modelling indicates that "meeting the 2050 [emissions reduction] target will involve marginal abatement costs higher than these NZ ETS auction price control settings, at around $140 in 2030". Nevertheless, the NZ ETS will continue to evolve over time and the ETS carbon price could potentially rise to a much higher level in light of international and domestic climate change developments, including the carbon budgets that are to be set later this year.

The petrol excise duty is 70.024 cents per litre, while bioethanol is exempt from excise duty. The bioethanol excise tax exemption was introduced in the 1980s mainly for managing the risks associated with oil dependence. Biodiesel and other biofuels do not have the same tax advantage.[16]

In combination, the price signals from the NZ ETS (the carbon price as well as zero-rating of the biofuel component) and the excise tax exemption for bioethanol has to date been insufficient to incentivise higher sales of petrol-ethanol blends.

As biofuels prices are and will likely remain higher than their fossil fuels equivalent, the private sector does not have the incentive to switch from fossil fuels to biofuels in the absence of further government intervention. This is evidenced by the low uptake of biofuels in New Zealand, Z Energy's mothballing of its Wiri biodiesel plant, and Gull's recent decision to withdraw from supplying biodiesel blend to New Zealand.

In parallel with the development of the biofuels mandate proposal, to which this Regulatory Impact Statement relates, Te Uru Rākau has been undertaking an initiative called New

[15] MBIE Weekly Fuel Price Monitoring (https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/weekly-fuel-price-monitoring/)

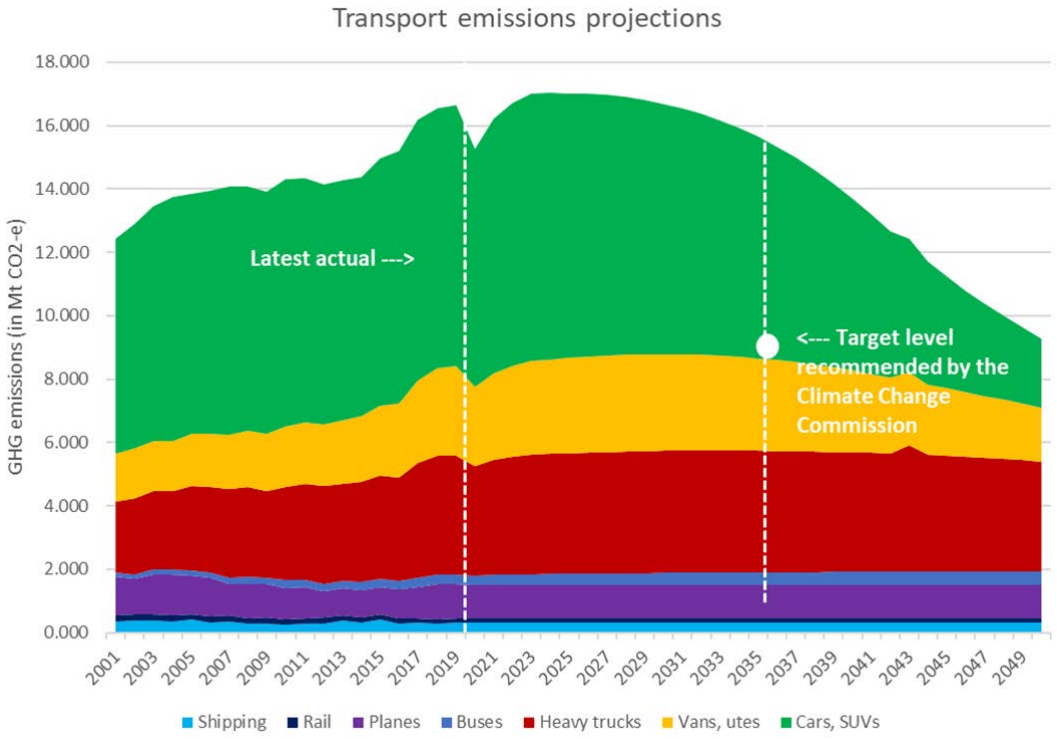
[16] Diesel is not subject to excise tax but diesel vehicles pay broadly comparable road user charges (RUC). There is a RUC exemption for BEVs but no comparable RUC exemption for biodiesel vehicles (because there is no simple way to administer it).

Zealand Wood Fibre Futures, which is looking into the business case for producing biofuels and biocrude oil (among other products) from woody biomass in New Zealand.

There are also maximum biofuel blend levels under the Engine Fuel Specifications Regulations. Those limits were set based on a range of criteria, such as technical and commercial viability, environmental outcomes and consumer protection. The bioethanol blend limit in petrol is 10% by volume, while the biodiesel limit in diesel is 7% by volume.

## 2.3 What is the policy problem or opportunity?

Decarbonising transport is key to New Zealand being able to achieve net zero $CO_2$ emissions and future carbon budgets. With the Ministry of Transport's base case projection, transport emissions are expected to continue to increase until around 2026. Emissions are then projected to plateau before slowly declining around 2032. This projection assumes the rate of uptake of electric vehicles (EVs) will speed up once EVs achieve price parity with conventional vehicles. The emission trends for transport are shown in the graph below.




Source: Ministry of Transport (2021)

*Electrification of the light fleet will not happen fast enough and little decline in emissions is expected in the other areas of transport*

It is clear from this projection that EVs and the future possibility of hydrogen will not transition transport fast enough to help meet our 2030 and 2050 emission targets. Our first commitment is to reduce emissions to 30 percent below 2005 levels for the period 2021–2030. To contribute to this target, road transport emissions would have to be lower than they were in 2005 in each year of the period 2021–2030. In 2030 transport emissions are expected to be over 20 percent higher than in 2005.

As well, with existing policies emissions from heavy trucks can be expected to remain above 2005 levels even by 2050. Levels from aviation, ships and rail are not expected to decline significantly between now and 2050.

A stronger and fuller set of measures are needed to effect rapid cuts in transport emissions to the level recommended by the Climate Change Commission. The magnitude of their recommended decline is marked on the graph.

If New Zealand's government policy settings remain unchanged, New Zealand will fall short of its 2050 net zero GHG emissions (excluding methane) target and will not be able to contribute its fair share to the global efforts to limit global warming to 1.5°C above pre-industrial levels. If global warming is not contained, New Zealand, as well as other countries, will be exposed to higher climate risks, such as drought, flooding, forest fires and storms. More discussion on the climate change impacts and risks can be found in the joint report published by the Ministry for the Environment (MfE) and Statistics New Zealand, *Our atmosphere and climate 2020,* which is available at https://www.mfe.govt.nz/sites/default/files/media/Environmental%20reporting/our-atmosphere-and-climate%202020.pdf.

The analysis of marginal abatement costs shows that biofuels provide a valuable opportunity to decarbonise:

- The existing ICE transport fleet, which is likely to remain in use for a long time
- Areas of transport where the current upfront cost of battery electric vehicles is a barrier to their uptake

As discussed section 2.1, biofuels from sustainable sources, particularly advanced biofuels can achieve significant emissions savings relative to fossil fuels.

However, there are a number of challenges that limit the production and use of biofuels in New Zealand. The key ones are that:

- **Biofuels are not cost-competitive with their fossil fuel equivalents.** This is particularly so for advanced biofuels (such as renewable diesel and sustainable aviation fuel). In New Zealand, existing policy measures, such as carbon pricing under the ETS, are not sufficient to close the price gap between biofuels and fossil fuels. There is therefore no economic incentive for fuel users to switch to biofuels.
- **There is past uncertainty in biofuels policy.** The removal of the Biofuels Sales Obligation in 2008 and the Biodiesel Grants scheme has made the market wary of biofuels. This is of particular concern to the ability of the forestry and biofuel sectors to pursue the commercial opportunity of turning woody biomass into liquid biofuels.
- **Biofuels production faces significant co-ordination challenges.** Feedstock producers are unlikely to commit to growing a crop for a biofuel producer without a guaranteed market, while a producer would not build a conversion plant without guaranteed supply of a sustainable feedstock. Nor would producers invest without more certain demand from customers. Also, producers would ideally like

to have certainty in the pricing of feedstocks for biofuels for an extended period to ensure good returns on capital investments, but such certainty is unlikely to exist.

- **Global competition for sustainable feedstocks has led to high prices.** Most biofuels today use feedstocks grown on land that can otherwise be used for food, feed or material production. An increase in biofuel consumption can lead to cropland expansion through land-use changes, which could have flow-on impacts on food security, biodiversity and emissions. To combat this, advanced countries with biofuels mandates usually specify sustainability criteria for biofuels to ensure that the biofuels they use come from sustainable sources. These criteria also mean that biofuels from sustainable sources are in higher demand, driving up the prices of the feedstock for such biofuels, and therefore the prices of such biofuels. This is particularly true for renewable diesel where large industrial users in those countries are looking for alternatives to diesel use.
- **Conventional biofuels can only be used at low blend levels.** The use of conventional biofuels is limited by "blend walls", which means that unmodified road vehicles can only use conventional biofuels in low-percentage blends. Higher blends risk engine damage and void vehicle manufacturers' warranties. For bioethanol, there is a "blend wall" of 10 percent, and retail sales of biodiesel are limited to blends of 7 percent. However, some newer models of vehicles can handle higher biodiesel blends and some commercial customers can enter into agreement with fuel suppliers to source higher biodiesel blends.
- **There are high financial and technical barriers to increasing production capacity for advanced biofuels.** While advanced drop-in biofuels can be blended at a much higher level and have much higher emissions reduction potential, they face high financial and technical barriers to developing advanced biofuels production capacity. The capital cost of developing an advanced biofuels plant is typically in the order of hundreds of millions of dollars. New conversion technologies have to be proven to operate reliably at scale before commercial deployment can occur. Proving a technology can create a catch-22 situation. To convince investors to fund construction and operation of a large-scale production facility, developers effectively need to have a large-scale production facility in place to persuade them that their conversion technologies will be successful and cost effective at scale.

## 2.4 What do stakeholders think about the problem?

- *Who are the stakeholders? What is the nature of their interest?*
- *Which stakeholders share the Agency's view of the problem and its causes?*
- *Which stakeholders do not share the Agency's view in this regard and why?*

The fuel sector, fuel users (including private vehicle owners, freight operators, airlines and shipping companies), interest groups (such as AA, the Motor Trade Association and the BusinessNZ Energy Council) are the key stakeholders.

Different fuel companies may have different views on a biofuels mandate. Some fuel companies, which have a strong strategic focus on green investments and biofuels production facilities, such as Z Energy and Neste, are strongly supportive of a biofuels mandate. On the other hand, fuel companies that do not currently sell biofuels in the New

Zealand market have reservations about the implementation of a biofuels mandate. Some of them noted that it will take time and money for them to invest in biofuels-related infrastructure, such as biofuels storage and blending facilities, and they may find it challenging to source biofuels.

We have engaged with some major fuel users but not all of them. Based on feedback provided for the Ministry of Transport's Green Freight project in 2020, we understand that road freight operators noted some uncertainty about how well diesel vehicles perform using higher blends of conventional biofuels. Road freight operators could also be concerned about the relatively high costs of biofuels, particularly given that road freight is a highly price competitive market.

Air New Zealand is supportive of a biofuels mandate, as it considers sustainable aviation fuels to be key to decarbonising long-haul flights. Air New Zealand notes that "being able to access Sustainable Aviation Fuels at a competitive price will be very important"[17].

Other fuel users, including private vehicle owners, bus operators and businesses, are likely interested in the cost implications of a biofuels mandate and compatibility of biofuel blends with the engines of the vehicles they use or own. We will find out more about the stakeholders' views on biofuels mandate, once public consultation on the biofuels mandate proposal is underway.

## 2.5 What are the objectives sought in relation to the identified problem?

The objectives are to:

- enable a just transition to a zero carbon and climate-resilient economy and society through increasing the supply and use of green fuels for transport, particularly for hard to abate transport modes
- ensure that New Zealand's energy and transport systems are sustainable, affordable and secure.

[17] Air New Zealand, *Air New Zealand backs Government's biofuels mandate*, 28 January 2021, https://www.airnewzealand.co.nz/press-release-2021-airnz-backs-governments-biofuels-mandate.

# Part 2: Supplementary analysis (for December 2020 Cabinet decision)

## Section 3: Option identification

### 3.1 What options are available to address the problem?

*This section of the document contains the supplementary analysis to support the decision taken by Cabinet in December 2020 to implement a mandate for biofuels in transport in principle. The more detailed options for a biofuels mandate that we have identified and the analysis of them are contained in Part 3 of* the *document (sections 6, 7 and 8).*

There is a broad range of options for increasing the demand for and supply of biofuels in New Zealand transport. There are regulatory and non-regulatory options, and some options work in combination with others. The options have been further described in Table 2 including a description of how they would address the opportunity.

To develop these options, we reviewed interventions overseas. Some of these are referred to in the table.

The options are:

**Option 1**: a mandate for biofuels in transport

**Option 2:** a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas)

**Option 3:** a price subsidy for biofuels at the pump

**Option 4:** a pilot scheme for using biofuels in the transport fleet

**Option 5:** grants for the development of biofuel-related facilities

**Option 6:** tax incentives for biofuels, such as an excise tax exemption

**Option 7:** an information and communication campaign about the benefits of biofuels (e.g. reduction in GHG emissions)

**Table 2 - Options to increase the use of renewable fuels in transport**

| Option | Description of the option | Overseas examples |
|---|---|---|
| **Option 1:** a mandate requiring sustainable biofuels to be used in transport | Fuel suppliers would have annual obligations to sell biofuels. This could be achieved in several different ways:<br><br>A. Blend mandate: All fuel sold in New Zealand would need to be blended with biofuels to a specified level. The regulator would enforce compliance with the biofuels blend mandate by sampling fuels sold at the pump.<br>B. Sales obligation: All fuel suppliers (including both refiners and importers) would have annual obligations to sell biofuels which were a certain percentage of transport fuels (calculated either by volume or energy content). However, this option would offer some flexibility in the types of biofuels and at what levels they would be blended with traditional fuels[18].<br>C. Emissions reduction mandate: All fuel suppliers (including both refiners and importers) would have annual obligations to sell biofuels to meet an annual percentage reduction in emissions. Fuel suppliers would be required to reduce the average carbon intensity of their fuels by the target percentage.<br><br>Fuel suppliers would need to prove the origin of biofuels with official certificates. There are a number of There would also be the ability for fuel suppliers to trade these certificates, which would allow obligated parties to purchase biofuels from other suppliers if their own supply falls short.<br><br>For all of these options, certification, annual returns and auditing would be needed to ensure that fuel suppliers meet their biofuels sales obligations.<br><br>An emissions reduction mandate (discussed in the bullet point C above) would require the calculation, certification and verification of the greenhouse gas emissions from biofuels. These would need to be based on a standard methodology. | Biofuels mandates of various forms are common overseas. Examples include:<br><br>• The United States: under the US Renewable Fuel Standard, there is a volume requirement for different types of biofuels<br>• Canada: across different provinces, ethanol blend mandates range from zero to 8.5 per cent, while renewable blend mandates for diesel range from zero to 4 per cent.<br>• European Union: under the Renewable Energy Directive II, EU member states must require fuel suppliers to supply a minimum of 14 per cent of the energy consumed in road and rail transport by 2030 as renewable energy.<br>• Queensland: closer to home, the Queensland sustainable biofuels mandate requires that 4 per cent of the volume of petrol sales must be ethanol, and 0.5 per cent of the volume of diesel sold by fuel wholesalers must be biodiesel. |
| **Option 2:** a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas) | A low carbon fuel standard (LCFS) would set an annual carbon intensity target for all transport fuels. Fuel suppliers would be required to reduce the average carbon intensity of their fuels by the target percentage.<br><br>The fuel standard would require calculation, certification and verification of the carbon intensity of all types of transport fuels.<br><br>Under LCFS-style schemes, fossil fuels (as well as other fuels above the carbon intensity target) generate deficits, while low carbon fuels generate credits. A fuel producer must offset their deficits, either by supplying low carbon fuels (e.g. biofuel blends) or purchasing credits.<br><br>Credits under LCFS-style are created in a number of ways:<br><br>• Providers of low carbon fuels (not limited to biofuels) obtain a certified carbon intensity for their fuels. Credits are calculated relative to the annual carbon intensity target.<br>• Credits are issued to low carbon fuels projects based on lifecycle emissions reductions of the project.<br>• Credits are issued for infrastructure for low-emissions vehicles, based on the capacity of facility (e.g. hydrogen station or EV fast charging site) minus actual fuel dispensed.<br><br>The market for credits creates a financial incentive to rewards low-carbon fuels in proportion to the amount of real, measurable emissions reductions they yield when substituted for conventional fuels.<br><br>This option is similar in some respects to option 1c, except that it has broader coverage and could also provide credits for the development of low-carbon fuel infrastructure (such as electric vehicle charging stations). | There are a few examples of low carbon fuel standards internationally:<br><br>• The California Air and Resources Board (CARB) low carbon fuel standard (LCFS) and Oregon's clean fuels standard. These are in addition to the national mandate scheme administered by the EPA.<br>• British Columbia's low carbon fuel standard (BC-LCFS). |
| **Option 3:** a price subsidy for biofuels at the pump | Consumers would receive a discount on biofuels if they buy neat biofuels or biofuel blends at fuel retail outlets. The subsidy could be funded out of general taxation or fuel taxes and paid to fuel suppliers or direct to households. A subsidy could be based on the price differential between fossil fuels and biofuels. | • A biofuel price subsidy is available in Thailand but is being phased out. |

[18] This option is the most similar option to the Biofuel Bill (148-2) passed by a previous Government in September 2008. This created an obligation for oil companies to sell biofuels beginning in October 2008. This was at an amount equal to 0.5% of petrol and diesel on an energy equivalent basis, and was to be increased annually to reach 2.5% by 2012 (this legislation was repealed in December 2008 before it came into effect).

| | | |
|---|---|---|
| **Option 4:** a pilot scheme for using biofuels in the transport fleet | The Government could provide funding assistance for pilot schemes for biofuels use in the transport fleet. This could be through the use of a contestable grants scheme, similar to the Low Emissions Vehicle Contestable Scheme.<br><br>From July 2009 to June 2012, the Government ran a scheme which provided grants of up to 42.5 cents per litre to biodiesel producers who sold 10,000 or more litres of eligible biodiesel each month. | • Some pilot schemes for buses run by municipal bodies in the US and Europe. |
| **Option 5:** grants for the development of biofuel-related facilities | The Government could provide grants for building New Zealand's biofuels production capacity and biofuels-related infrastructure, e.g.:<br><br>• grants for development, construction, and retrofitting of commercial-scale biorefineries<br>• grants for the installation, retrofitting, or upgrading of biofuels fuelling equipment and infrastructure.<br><br>(Note: higher blends of bioethanol and biodiesel would require investments in infrastructure development, while lower blends would not. Renewable diesel is compatible with existing infrastructure but is much more expensive than biodiesel.) | • Various biofuel grants in the US, for example the Biomass Crop Assistance Program provides financial assistance to landowners and operators for advanced biofuel production facilities.<br>• Queensland Waste to Biofutures (W2B) Fund |
| **Option 6:** tax incentives for biofuels, such as an excise tax exemption | In New Zealand, bioethanol has been exempt from excise tax since 2003. This means that when bioethanol is blended with petrol, excise of 50.5 cents per litre is only paid on the petrol portion of the fuel, and no excise is paid on the bioethanol portion.<br><br>There is no excise tax exemption for biodiesel because diesel road vehicles pay a road user charge (RUC) in lieu of excise tax as their contribution to the land transport fund[19]. | • Tax credits for biofuels producers in the US, for example the Biodiesel Income Tax Credit<br>• Excise tax reduction or exemption in some European countries (e.g. Latvia, Czech Republic, Croatia, Slovenia and the Netherlands).<br>• In Sweden and Denmark, the taxation is reduced based on carbon intensity of the fuels.<br>• In Finland, transport fuels are taxed on their energy content and COs footprint. |
| **Option 7:** an information and communication campaign about the benefits of biofuels | Government agencies would run an information and communication campaign which aimed to communicate to the public about the advantages and practicalities of biofuels, such as emissions reduction potential, fuel consumption, power output and compatibility of biofuels with vehicle engines. | |

[19] A large portion of diesel is used off-road (on farms, construction sites, etc), and excise tax would not be able to discriminate between on-road and off-road use. Also, the RUC can more easily vary with size and type of vehicle, reflecting the amount of wear and tear caused to roads so an excise tax exemption for biodiesel was never introduced.

### 3.2 What criteria, in addition to monetary costs and benefits have been used to assess the likely impacts of the options under consideration?

The criteria that were used to assess the likely impacts of the options under consideration were:

a. Emissions reduction—how much emissions reduction in transport can be achieved through the option?
b. Environmental sustainability (other than emissions reduction) — the other environmental impacts of the option e.g. the impact on water and air quality.
c. Energy equity (namely universal access to reliable affordable and abundant energy) — what are the impacts on fuel costs faced by different households and businesses?
d. Compliance burden — what are the costs for businesses of the option?
e. Wider economic effects (including impacts on regional and national economy) — this takes into account impacts on GDP, imports, exports, regional development, industrial development and employment.
f. Energy security — will the option affect security of fuel supply in New Zealand?
g. Government administration costs and complexity — what does the design of the option mean for government administration, including compliance and enforcement?

*These criteria have been used to evaluate options in both Part 2, the supplementary analysis as well as Part 3, the detailed analysis of biofuels mandates.*

### 3.3 What other options have been ruled out of scope, or not considered, and why?

An option that was considered but ruled out of scope is to increase the carbon price under the New Zealand Emissions Trading Scheme (ETS).

In principle, with a strict cap on domestic emissions and whole-of-economy coverage, the NZ ETS would incentivise uptake of biofuels to the extent that the marginal abatement cost of biofuels is lower than other ways of reducing emissions. If the biofuels components of petrol and diesel were to continue to be zero-rated, this would give a further financial incentive to sustain a domestic demand.

However, increasing the carbon price (which could be achieved by lowering the cap on emissions at a faster rate) would have a significant impact on all other sectors that must surrender emissions, which is outside the scope of this work. Therefore, this option was ruled out early. Any ETS-related policy proposals will require systems thinking on how different sectors across the economy could contribute to meeting future emissions budgets.

Options to reduce transport emissions by accelerating uptake of EVs and promoting the use of other transport fuels, including hydrogen, are also not considered further here for the reasons given in section 2.1.

## Section 4: Supplementary Analysis of Impacts

**Marginal impact: How does each of the options identified in section 3.1 compare with taking no action under each of the criteria set out in section 3.2**
Refer to table 4 for further description of impacts

Table 3 – Impact analysis

| | **No action** | **Option 1:** a biofuels mandate | **Option 2:** a low carbon fuel standard | **Option 3:** a price subsidy for biofuels at the pump | **Option 4:** a pilot scheme for using biofuels in the transport fleet | **Option 5:** grants for the development of biofuel-related facilities | **Option 6:** tax incentives for biofuels, such as an excise tax exemption | **Option 7:** an information and communication campaign about the benefits of biofuels |
|---|---|---|---|---|---|---|---|---|
| Emissions reduction | **0** | **+++** | **+++** | **+** | **+** | **+** | **+** | **0** |
| Environmental sustainability (other than emissions reduction) | **0** | **+** | **+** | **+** | **+** | **+** | **+** | **0** |
| Energy equity (namely universal access to reliable affordable and abundant energy) | **0** | **-** | **-** | **0** | **0** | **0** | **0** | **0** |
| Compliance burden | **0** | **-** | **-** | **-** | **0** | **0** | **+** | **0** |
| Wider economic effects (including impacts on regional and national economy) | **0** | **++** | **++** | **-** | **0** | **+** | **-** | **0** |
| Energy security | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Government administration costs and complexity | **0** | **-** | **--** | **-** | **-** | **-** | **-** | **-** |
| Overall assessment | **0** | **+++** | **++** | **-** | **+** | **++** | **+** | **-** |

**Key:**

**+++** best outcome among all the options (including the status quo) **++** much better than doing nothing/the status quo **+** better than doing nothing/the status quo **0** about the same as doing nothing/the status quo

**-** worse than doing nothing/the status quo **- -** much worse than doing nothing/the status quo **- - -** worst outcome among all the options (including the status quo)

**Table 4 - Description of impacts**

| **Option** | **Option 1:** a mandate requiring sustainable biofuels to be used in transport | **Option 2:** a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas) | **Option 3:** a price subsidy for biofuels at the pump | **Option 4:** a pilot scheme for using biofuels in the transport fleet | **Option 5:** grants for the development of biofuel-related facilities | **Option 6:** tax incentives for biofuels, such as an excise tax exemption | **Option 7:** an information and communication campaign about the benefits of biofuels |
|---|---|---|---|---|---|---|---|
| Comment on the likelihood of increasing uptake of biofuels (we have included this in relation to the next two criteria) | The uptake of biofuels would likely be in line with the target (assuming the penalty for non-compliance is set at a high enough level to incentivise compliance). | The uptake of biofuels would certainly increase, however this would depend on the relative costs of other low carbon fuels, and in particular electric vehicles. | The effectiveness of tax incentives in increasing the uptake of biofuels would depend on its design (e.g. if the subsidy was provide to fuel companies, whether the passed it on to consumers) and the magnitude of the subsidy. | The uptake of biofuels for this option would be unlikely to be high because of the price premium. Although the previous government scheme which ran from 2009 – 2012 had some success in boosting the use of first generation biodiesel, the uptake of the scheme was less than expected with only a small proportion of the total grant funding allocated before it was ended in 2012. | Grants for building New Zealand's biofuels production capacity may assist with growing domestic biofuels production capacity. However, this option would not address the higher cost of biofuels. Therefore, on its own, the uptake of biofuels is not likely to increase significantly. | The effectiveness of tax incentives in increasing the uptake of biofuels would depend on whether fuel companies passed it on to consumers and the the magnitude of the subsidy.<br><br>The current use of bioethanol in New Zealand is negligible, even taking into account the current tax incentive. | On its own, this is unlikely to cause a significant increase in the uptake of biofuels as the price differential will have a greater influence on consumer behaviour. It may increase the use of biofuels slightly. |
| Emissions reduction | The reduction in greenhouse gas emissions (relative to fossil fuels) varies significantly based on the type of biofuel, its feedstock and its production process and other factors including indirect land use change (ILUC). Therefore, the amount of greenhouse gas emissions reduction achieved under option 1 and options 3-6 depends on what types of biofuels would be supplied.<br><br>For all of these options, it is assumed that the Government will specify a sustainability criterion concerning the minimum greenhouse gas emission reduction that a biofuel will need to achieve to qualify under that option. This is common in many schemes overseas, and has the effect of making the overall emissions reduction largely dependent on the level of biofuel uptake. Without such a standard fuel suppliers would have an incentive to import the lowest-cost biofuels from overseas markets, which typically have lower carbon emission reductions than advanced biofuels. Including such a standard would increase the cost to import or produce biofuels, as well as the compliance and administration costs (for both fuel suppliers and the government) as it requires certification of the biofuels and emissions reduction. This was taken into account in the analysis of options.<br><br>Option 2 has emissions reduction designed into it as an implicit part of the option. A low carbon fuel standard would reduce carbon emissions across the transport sector and incentivise the use of low carbon fuels (as well as the development of low carbon fuel infrastructure) because it would entitle the producers to credits. | | | | | | Minimal impact. |
| Environmental sustainability (other than emissions reduction) | Similarly, the achievement of environmental sustainability largely depends on whether sustainability criteria are applied in the design of that particular scheme (and how well they are monitored and enforced). Each of the options could, in theory, have sustainability criteria applied to them, and therefore we assume that they would. For example, for option 6, only biofuels that meet the sustainability criteria would quality for tax incentives. As above, this would increase the costs of those options which was factored into the analysis. In reality it is possible that the sustainability criteria are likely to be less stringent for non-regulatory options.<br><br>Fossil fuel use is reduced, which means less need to explore for and extract fossil fuels. Environmental impacts of oil exploration and extraction activities are therefore reduced. | | | | | | Minimal impact. |
| Energy equity (namely universal access to reliable, affordable and abundant energy) | Because biofuels are more expensive than traditional fuels and are likely to remain so, a biofuel mandate is likely to mean firms and households face higher energy costs. This | A low carbon fuel standard would have a similar type of impact on energy security and affordability as a biofuels mandate. However, it may be | This would depend on the design of the subsidy, for example a subsidy could target low-income households who are more | The impact on energy equity would be minimal. | The impact on energy equity would be minimal. | Although a tax incentive would (at least partially) mitigate the higher price of biofuels, it does not limit choices for firms and households – therefore the | No impact. |

| **Option** | **Option 1:** a mandate requiring sustainable biofuels to be used in transport | **Option 2:** a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas) | **Option 3:** a price subsidy for biofuels at the pump | **Option 4:** a pilot scheme for using biofuels in the transport fleet | **Option 5:** grants for the development of biofuel-related facilities | **Option 6:** tax incentives for biofuels, such as an excise tax exemption | **Option 7:** an information and communication campaign about the benefits of biofuels |
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| | would flow through to all parts of the economy which currently rely on fossil fuels (and may incentivise a switch to other fuels). | reduced depending on the relative uptake of electric vehicles and hydrogen as those are incentivised under the option. | vulnerable to energy hardship. | | | impact on energy equity would be minimal. | |
| Compliance burden (for businesses) | Businesses would have additional costs to ensure their compliance with the standard (including purchasing credits if they do not meet it), business planning and capital investment in fuel storage infrastructure. | There would be significant costs of compliance for businesses to ensure their compliance with the standard, business planning, capital investment in fuel storage infrastructure and back – office functions (due to the relative complexity of the scheme). | This option would impose some costs on fuel companies to administer, mostly related to the certification of biofuels for emissions reduction and sustainability. However, fuel companies are unlikely to absorb this cost themselves, meaning that the government subsidy would fund this. | This option would impose some costs on businesses to administer, mostly related to the certification of biofuels for emissions reduction and sustainability. | As for option 4. | As for option 3, with the tax incentive funding this. | No impact. |
| Wider economic effects (including impacts on regional and national economy) | Because of the higher costs of biofuels, consumers will end up spending a greater proportion of their income on the increased costs of fuels, reducing consumer spending. Therefore, this option is likely to have a net negative impact on the economy.<br><br>The size of this would depend on the targets under a mandate. | Because of the higher costs of biofuels, this option is likely to have a net negative impact on the economy.<br><br>The size of this would depend on parameters of the low carbon fuel standard. | This would depend on the design of the subsidy. | The wider economic effects are likely to be relatively small. | This option may stimulate domestic production of biofuels, although this depends strongly on the economics of specific investment proposals. Bio-refineries at a significant scale are likely to have more economic benefits, but they also require more capital funding.<br><br>Fuel companies have indicated that the capital cost of biofuel production and storage facilities is significant and would be a barrier to domestic biofuel production. | Introducing tax incentives for biofuels could have a distortionary effect, as some resources will need to be redirected from one sector to another: tax collected would have to increase (which would have a negative impact on the economy) or government spending would reduce elsewhere to compensate. | No impact. |
| Energy security | Because there is very little domestic production of biofuels for transport, and there is strong international demand for feedstocks, a biofuels mandate | This option could have a detrimental impact on energy security for the same reasons as option 1. However, it is likely to be a lower impact because | The impact on energy security is likely to be minimal. | The impact on energy security is likely to be minimal. | This option may increase New Zealand's energy security by providing another domestic energy production source (although this strongly | The impact on energy security is likely to be minimal. | No impact. |

| **Option** | **Option 1:** a mandate requiring sustainable biofuels to be used in transport | **Option 2:** a low carbon fuel standard, which would cover a range of alternative fuels (e.g. biofuels, electricity, hydrogen and biogas) | **Option 3:** a price subsidy for biofuels at the pump | **Option 4:** a pilot scheme for using biofuels in the transport fleet | **Option 5:** grants for the development of biofuel-related facilities | **Option 6:** tax incentives for biofuels, such as an excise tax exemption | **Option 7:** an information and communication campaign about the benefits of biofuels |
|---|---|---|---|---|---|---|---|
| | may also have a negative impact on energy security. | other low carbon fuels are available under the standard. | | | depends on the availability and cost of feedstocks). | | |
| Government administration costs and complexity | This would impose reasonably significant costs on the Government to administer; it would require a monitoring function to collect and maintain a register of biofuel sales and sustainability certificates. An enforcement function would also need to be set up, as well as an integrity function.<br><br>It will also impose additional monitoring requirements for fuel quality (biofuels are more complex to monitor then fossil fuels). | This is likely to be the most complex and costly for the government to administer, as it will require all of the functions for option 1, but will expand the scope across several different low carbon fuels.<br><br>There are also some difficulties with how certain low carbon fuels would be taken into account in the scheme.<br><br>Additional costs for monitoring biofuels. | The costs of subsidy could range from moderate to significant depending on the level and uptake.<br><br>There would be costs to monitor evidence of the emissions reduction and / or sustainability of biofuels to qualify for the scheme.<br><br>Additional costs for monitoring biofuels. | The costs of the pilot programme could be reasonably significant depending on the size. Administration costs would be minor.<br><br>Additional costs for monitoring biofuels. | The costs of giving grants could be significant depending on the size.<br><br>There would be costs to monitor evidence of the emissions reduction and / or sustainability of biofuels to qualify for the scheme.<br><br>Additional costs for monitoring biofuels. | The reduced tax take for the government could range from moderate to significant.<br><br>There would be costs to monitor evidence of the emissions reduction and / or sustainability of biofuels to qualify for the scheme.<br><br>Additional costs for monitoring biofuels. | No administration costs (other than the cost of the campaign itself). |

# Section 5: Conclusions of supplementary analysis

## 5.1 What option, or combination of options is likely to best address the problem, meet the policy objectives and deliver the highest net benefits?

Cabinet took a decision to implement a biofuels mandate in principle in December 2020, subject to public consultation. Based on the desired objectives and the analysis of options, increasing the use of biofuels is a reasonable way to pursue to achieve the desired objectives because:

- For light transport, although battery electric vehicles have the lowest marginal abatement cost, many of the ICE vehicles entering the fleet now are likely to remain in the fleet for up to 20 years. The use of biofuels provides an opportunity to reduce GHG emissions from existing ICE vehicles.
- For heavy transport, the upfront cost of battery electric vehicles represents a significant barrier to their uptake. Biofuels represent an opportunity to decarbonise both existing and new heavy transport.
- Sustainable aviation fuels are the most cost-effective alternative fuel for air transport.

Of the options available to increase the use of biofuels, a biofuels mandate (option 1):

- Is most likely to lead to a sustained and reliable reduction in GHG emissions from transport (alongside a low carbon fuel standard). Although other options may incentivise the use of biofuels, there was a degree of uncertainty around the uptake that would be achieved.
- Offers the most certainty that the risks to sustainability outcomes from biofuel production be mitigated (compliance with a regulated mandate, including sustainability criteria, is likely to be more active than if incentives are offered).
- Is likely to represent a compliance burden for businesses and administration costs for the government. However, we consider that these are likely to be reasonable in comparison to the outcome.

MoT and MBIE consider that implementing a biofuels mandate (option 1) would be most effective in increasing demand for biofuels to reduce transport emissions. Option 2 would also be effective but it would be more administratively complex than option 1.

Further, a biofuels mandate would stimulate demand for biofuels, but would likely need to be complemented by other supply-side mechanisms (such as options 4-6) to maximise the potential benefits of developing a biofuels industry in New Zealand through sufficiently incentivising development of a sizeable domestic biofuels industry. In the absence of option 1, options 4-6 on their own would not create a significant domestic biofuels industry because developing bio-refineries at scale requires a sizeable market and there would be little demand for biofuels in New Zealand in the absence of a biofuels mandate.

## 5.2 Summary table of costs and benefits of the preferred approach

This will be discussed in section 8.2.

### 5.3 What other impacts is this approach likely to have?

This will be discussed in section 8.3.

# Part 3: Analysis of options for public consultation

## Section 6: Option identification

### 6.1 What options are available to address the problem?

This RIS focuses on options in different forms of biofuels mandate, as Cabinet has already agreed in principle to implement a biofuels mandate. The other options for promoting the use and supply of biofuels, including non-regulatory options, are discussed in section 3.1.

**Option A : Transport fuels volume-based sales target focusing on conventional biofuels**

- This is similar to the repealed 2008 Biofuels Sales Obligation, which requires a certain proportion of fuel sales to be biofuels.
- A sales target of 1.5 per cent will be set for the period 2023-2025.
- There will be provisional fuel volume sales targets for the 2026-2030 period and the 2031-2035 period, and these targets will be reviewed in 2024 and 2029 respectively.
- The fuel sales target will cover petrol, diesel, and their conventional biofuels equivalent (namely bioethanol and biodiesel)
- The targets and fuels covered are based on those of the 2008 Biofuels Sales Obligation, and the blend limits of conventional biofuels.

**Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels**

- Annual emissions intensity targets will be set for transport fuels for the 2023-2025 period.
- There will be provisional emissions intensity targets for the 2026-2030 period and the 2031-2035 period, and these targets will be reviewed in 2024 and 2029 respectively.
- As emissions intensity targets will become more stringent over time, fuel suppliers are expected to sell more biofuels that have lower lifecycle emissions than fossil fuels to meet these targets.
- The targets will cover petrol, diesel, aviation fuel and their biofuels equivalent (including both conventional and advanced biofuels).
- Target of 3.5 per cent below baseline for petrol, diesel and aviation fuel by 2025. In the baseline scenario, biofuels are consumed at a negligible level.
- The annual targets for the period beyond 2025 will progressively increase over time (subject to future policy reviews). These targets are set based on the blend limits of conventional biofuels, and the assumption that drop-in biofuels that can be blended with fossil fuels in much higher concentrations will become increasingly prevalent.
- Emissions reduction associated with biodiesel and renewable diesel sales for use in marine vessels can be counted towards the target for diesel.

**Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels**

- Similar to option B, although there will be a separate lower target for aviation fuels, given that the worldwide production capacity of sustainable aviation fuel is relatively small compared to those of conventional biofuels and renewable diesel.
- Target of 3.5 per cent below baseline for petrol and diesel and target of 2 per cent below baseline for aviation fuel by 2025.
- The annual targets for the period beyond 2025 will progressively increase over time (subject to future policy reviews). These targets are set based on the blend limits of conventional biofuels, and the assumption that drop-in biofuels that can be blended with fossil fuels in much higher concentrations will become increasingly prevalent.

**Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel**

- Emissions intensity targets will be set for the 2023-2025 period for diesel and aviation fuel.
- There will be provisional emissions intensity targets for the 2026-2030 period and the 2031-2035 period, and these targets will be reviewed in 2024 and 2029 respectively.
- The targets cover diesel, aviation fuel and their biofuels equivalent (including both conventional and advanced biofuels)
- Target of 5.5 per cent below baseline for diesel and target of 2 per cent below baseline for aviation fuel by 2025.
- The annual targets for the period beyond 2025 will progressively increase over time (subject to future policy reviews). These targets are set based on the blend limits of conventional biofuels, and the assumption that drop-in biofuels that can be blended with fossil fuels in much higher concentrations will become increasingly prevalent.
- The relatively ambitious target for diesel/biodiesel/renewable diesel blends under this option reflects that the biofuels mandate will focus more on accelerating the uptake of drop-in renewable diesel under this option than under the other options discussed above.

The blend limits for different types of biofuels and the potential supply of these biofuels are taken into account when setting the biofuels mandate targets in the above options. Our understanding of the blend limits is based on literature review, and discussions with targeted stakeholders, such as fuel companies and Air New Zealand.

Overseas biofuels mandates, such as those in Australia, the UK, Scandinavia and North America, are also considered.

### 6.2 What other options have been ruled out of scope, or not considered, and why?

We have not considered any options with a specific aim to incentivise investments in building domestic biofuels production capacity. Te Uru Rākau is undertaking a separate project that would inform the development of such policy options. It is developing an Industry Transformation Plan (ITP) for the forestry and wood processing sector, which includes the New Zealand Wood Fibre Futures initiative.

The Wood Fibre Futures initiative has identified liquid biofuels and biocrude oil as two of the four key products made from woody biomass that are likely to be the most commercially viable opportunities in view of New Zealand's comparative advantage. Te Uru Rākau has recently commissioned further consultancy work to examine the business case for these key products.

## Section 7: Impact Analysis

**Marginal impact: How does each of the options identified in section 6.1 compare with taking no action under each of the criteria set out in section 3.2?**

| | No action | Option A : Transport fuels volume-based sales target focusing on conventional biofuels (1.5 per cent by 2025 and provisional more ambitious targets after 2025) | Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025) | Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) | Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) |
|---|---|---|---|---|---|
| **Emissions reduction** | **0** | + | +++ | ++ | ++ |
| **Environmental sustainability (other than emissions reduction)** | **0** | + | + | + | + |
| **Energy equity (namely universal access to reliable affordable and abundant energy)** | **0** | - | - - - | - - | - - - |
| **Compliance burden** | **0** | - | - - | - - | - - - |
| **Wider economic effects (including impacts on regional and national economy)** | **0** | - | - - - | - - | - - - |
| **Energy security** | **0** | **0** | - | - | - |
| **Government administration costs and complexity** | **0** | - | - | - | - |
| **Overall assessment** | 0 | Emissions reduction and wider economic effects are given more weight than other criteria in the assessment.<br>From the emission reduction perspective, it is the least favoured biofuels mandate option. | A biofuels mandate option, which will achieve a balance between different criteria. It will achieve more emissions savings than other options considered. | A relatively balanced biofuels mandate option. Similar to option B in many respects, with the main differences being that:<br>• Option C has a less ambitious target for aviation fuels and hence a smaller economic cost associated with increase in aviation fuel prices<br>• Under option C, fuel suppliers have less flexibility in how they meet their target because there is a separate target for aviation fuels. | Least favoured biofuels mandate option from the perspectives of compliance costs and energy equity. |

**Key:** **+++** best outcome among all the options (including the status quo) **++** much better than doing nothing/the status quo **+** better than doing nothing/the status quo **0** about the same as doing nothing/the status quo **-** worse than doing nothing/the status quo **- -** much worse than doing nothing/the status quo **- - -** worst outcome among all the options (including the status quo)

**Description of impacts**

Note: The estimates of the potential impacts of the various biofuels mandate options come from a modelling study that MBIE and MoT commissioned Sense Partners to undertake. Sense Partners' estimates of the economic cost impacts of biofuels may appear high relative to the estimates presented in the Ministry for the Environment's Marginal Abatement Cost Curves Analysis for New Zealand: Potential Greenhouse Gas Mitigation Options and Their Costs, which was mentioned in section 2.1. The caveats about the Ministry for the Environment's analysis are discussed in footnote 2. Furthermore, marginal cost curves analysis tend to represent the upfront or direct costs of an intervention, while Sense Partners' economic modelling takes into account both the direct costs and indirect impacts, which feed through the whole economy. Therefore, the two estimates are not a like-for-like comparison.

The modelling results from Sense Partners depend heavily on the modelling assumptions, and there are uncertainties in assumptions about biofuels prices, fossil fuel prices, EV uptake and potential domestic biofuels production capacity. The model currently assumes that biofuels are almost entirely imported. Sense Partners advised that the modelling results for the costs of introducing biofuels will be moderated, should biofuels prices fall, fossil fuel prices rise, and/or additional innovation into energy efficiency takes place in response to higher fuel prices and carbon prices. Sensitivity analysis indicates that changing the modelling assumptions about the biofuels prices relative to fossil fuels' prices can have a significant impact on the modelling results.

Sense Partners did not make assumptions about the potential positive impacts of a biofuels mandate on domestic biofuels production capacity,There are some uncertainties about whether a biofuels mandate alone will provide sufficient incentives for development of commercial-scale biofuels plants in New Zealand. A biofuels mandate policy, of itself, does not target domestic biofuels production but could support or complement other policies designed to support the development of the bioeconomy. Te Uru Rākau, through its Wood Fibre Futures project, is looking into the business case into developing domestic production capacity in biofuels and biocrude oil, among other woody biomass-based products. This could inform future decisions on government actions for supporting the development of a biofuels industry here.

The following points illustrate the potential benefits of developing a domestic biofuels production industry, but these benefits are not quantified in this assessment:

- In the US, in 2019, 121,093 jobs were associated with bioenergy production, and the majority of these jobs are associated with liquid biofuels production.[20] In the US, just below 1.2 million barrels of biofuels were produced per day in 2019. The US has policy mechanisms to support both the supply of and demand for biofuels.[21]
- Should sizeable biofuels plants be built in New Zealand, Northland and Central North Island could be potential locations for the plants, based on stakeholders' comments on feedstock supply (e.g. woody biomass) and existing infrastructure.
- Z Energy, Air New Zealand, Scion, LanzaJet and LanzaTech have prepared a 2050 Sustainable Aviation Fuel (SAF) Roadmap, which indicates that, if SAF is to account for 50% of New Zealand's jet fuel demand and domestically produced SAF is to meet domestic demand, thousands of jobs will be created by 2050, but this will also be dependent on billions of dollars being invested in developing domestic biofuels production capacity in the period to 2050.
- A Biojet consortium study in 2018 also indicated that a SAF plant with capacity to supply 6 per cent of New Zealand's jet demand would create 200-250 new jobs.

| | **Option A : Transport fuels volume-based sales target focusing on conventional biofuels (1.5 per cent by 2025 and provisional more ambitious targets after 2025)** | **Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025)** | **Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025)** | **Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025)** |
|---|---|---|---|---|
| **Emissions reduction** | Better than the status quo, but not as good as the other options.<br><br>Total emissions reduction (relative to baseline) could reach 0.362 million $tCO_2$-e below baseline in the period2023-2025. The monetary value of the emissions reduction is $36.5 million, assuming a shadow carbon price of $101/ $tCO_2$-e in 2025.<br><br>A sales volume target is not as effective as emissions intensity reduction target in encouraging | Better than the status quo, and could achieve more emissions reduction than all the other options.<br><br>Total emissions reduction (relative to baseline) could reach 1.134 million $tCO_2$-e in the period 2023- 2025. The monetary value of the emissions reduction is $114.5 million, assuming a shadow carbon price of $101/ $tCO_2$-e in 2025.<br><br>Better than option A in terms of incentivising fuels suppliers to source and supply biofuels with highest | Better than the status quo and option A, not as good as B, and similar to option D.<br><br>Total emissions reduction (relative to baseline) could reach 1.080 million $tCO_2$-e in the period 2023-2025. The monetary value of the emissions reduction is $109.1 million, assuming a shadow carbon price of $101/ $tCO_2$-e in 2025.<br><br>Better than option A in terms of incentivising fuels suppliers to source and supply biofuels with highest | Better than the status quo and option A, not as good as B, and similar to option C.<br><br>Total emissions reduction (relative to baseline) could reach 1.075 million $tCO_2$-e below baseline in the period 2023-2025. The monetary value of the emissions reduction is $108.6 million, assuming a shadow carbon price of $101/ $tCO_2$-e in 2025.<br><br>Better than option A in terms of incentivising fuels suppliers to source and supply biofuels with highest |

[20] National Association of State Energy Officials and Energy Futures Initiative, *2020 U.S. Energy & Employment Report*. https://www.naseo.org/data/sites/1/documents/publications/USEER-2020-US-Energy-Employment-Report.pdf

[21] U.S. Energy Information Administration, *EIA projects U.S. biofuel production to slowly increase through 2050*, https://www.eia.gov/todayinenergy/detail.php?id=43096

| | Option A : Transport fuels volume-based sales target focusing on conventional biofuels<br>(1.5 per cent by 2025 and provisional more ambitious targets after 2025) | Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025) | Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) | Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) |
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| | transport emissions reduction over time. Different types of biofuels have different lifecycle emissions, and a sales volume target will incentivise fuel suppliers to source and supply biofuels at least cost, rather than biofuels with highest emissions reduction potential. | emission reduction potential, and to keep track of their emissions savings through their sale of biofuels. | emission reduction potential, and to keep track of their emissions savings through their sale of biofuels.<br>Less ambitious target for aviation fuels than option B. | emission reduction potential, and to keep track of their emissions savings through their sale of biofuels.<br>Would achieve less emissions savings than option B because option D does not cover petrol and its biofuel equivalent, and has less ambitious target for aviation fuels than option B. |
| **Environmental sustainability (other than emissions reduction)** | All options are better than the status quo.<br>Less use of fossil fuels, which means less need to explore and extract fossil fuels. Environmental impacts of oil exploration and extraction activities are therefore reduced.<br>Less air pollution resulting from fossil fuel emissions.<br>Environmental sustainability criteria apply to biofuels that can be counted towards the target. | | | |
| **Energy equity (namely universal access to reliable affordable and abundant energy)** | Worse than the status quo, but better than options B, C and D.<br>Worse than the status quo because biofuels are more expensive than their fossil fuels equivalent, which will translate to lower energy affordability over time.<br>Better than options B, C and D because of relatively low impacts on transport costs.<br>Average petrol blend prices could be 0.4% (0.8 cents per litre) above the baseline petrol prices in 2025.<br>Average diesel blend prices could be 1.4% (1.7 c/L) above the baseline diesel prices in 2025.<br>Negligible change to jet fuel prices.<br>Road passenger transport prices but also other costs, such as faced by households could be 0.10% above baseline in 2025.<br>Negligible impacts on rail passenger transport prices and air passenger transport prices faced by households in the period to 2025. | Worse than the status quo, option A and option C, and similar to option D.<br>Worse than the status quo because biofuels are more expensive than their fossil fuels equivalent, which will translate to lower energy affordability over time.<br>Worse than option A because option B has higher cost impacts on public transport users than option A.<br>Worse than option C because option B affects affordability of air travel more than option C.<br>Average petrol blend prices could be 0.2% (0.4 c/L) above the baseline petrol prices in 2025.<br>Average diesel blend prices could be 5.8% (7.1c/L) above the baseline diesel prices in 2025.<br>Average jet fuel blend prices could be 11.2% (7.1c/L) above the baseline jet fuel prices in 2025.<br>Road passenger transport prices could be 0.30% above baseline in 2025. | Worse than the status quo and option A, but better than option B and option D.<br>Worse than the status quo because biofuels are more expensive than their fossil fuels equivalent, which will translate to lower energy affordability over time.<br>Worse than option A because option C has higher impacts on public transport users than option A.<br>Better than option B because option C affects affordability of air travel less than option B.<br>Better than option D because option C affects affordability of road passenger transport and air travel less than option D.<br>Average petrol blend prices could be 0.2% (0.5c/L) above baseline petrol prices in 2025.<br>Average diesel blend prices could be 5.8% (7.1c/L) above baseline diesel prices in 2025.<br>Average jet fuel blend prices could be 7.5% (4.8c/L) above baseline jet fuel prices in 2025. | Worse than the status quo, option A and option C, and similar to option B.<br>Worse than the status quo because biofuels are more expensive than their fossil fuels equivalent, which will translate to lower energy affordability over time.<br>Would lead to the biggest increase in road passenger transport prices (which tend to affect low-income households more) among the biofuels mandate options considered.<br>While worse than option B in terms of affordability of road passenger transport, option D is better than option B in terms of affordability of air travel.<br>Insignificant drop in petrol prices because of lower economy-wide demand.<br>Average diesel blend prices could be 7.1% (8.6c/L) above baseline diesel prices in 2025.<br>Average jet fuel blend prices could be 7.6% (4.8c/L) above baseline jet fuel prices in 2025. |

| | Option A : Transport fuels volume-based sales target focusing on conventional biofuels<br>(1.5 per cent by 2025 and provisional more ambitious targets after 2025) | Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025) | Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) | Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) |
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| | *Note: Transport prices faced by households could drop in the initial years of implementing a biofuels mandate because the introduction of the mandate has an initial contractionary impact on the economy and could result in a decrease in economy-wide demand.*<br><br>*Also, transport prices are not only affected by fuel prices but also other costs, such as costs of labour and maintenance of equipment.* | Negligible impact on rail passenger transport prices faced by households in the period to 2025.<br>Air passenger transport prices (which tend to affect high-income households more) could be 0.86% above baseline in 2025.<br>*Note: Transport prices faced by households could drop in the initial years of implementing a biofuels mandate because the introduction of the mandate has an initial contractionary impact on the economy and could result in a decrease in economy-wide demand.* | Road passenger transport prices could be 0.34% above baseline in 2025.<br>Negligible impact on rail passenger transport prices faced by households in the period to 2025.<br>Air passenger transport prices could be 0.56% above baseline in 2025.<br>*Note: Transport prices faced by households could drop in the initial years of implementing a biofuels mandate because the introduction of the mandate has an initial contractionary impact on the economy and could result in a decrease in economy-wide demand.* | Road passenger transport prices could be 0.44% above baseline in 2025.<br>Negligible impact on rail passenger transport prices faced by households in the period to 2025.<br>Air passenger transport prices could be 0.59% above baseline in 2025.<br>*Note: Transport prices faced by households could drop in the initial years of implementing a biofuels mandate because the introduction of the mandate has an initial contractionary impact on the economy and could result in a decrease in economy-wide demand.* |
| **Compliance burden** | More compliance costs than the status quo, but less compliance costs than options B, C and D.<br><br>Worse than the status quo because fuel suppliers will have to invest in additional infrastructure for storing, blending and selling biofuels. Fuel suppliers will also need to report its performance relative to the fuel sales target.<br><br>Better than options B, C and D from the perspective of performance reporting. Under option A, as the target is based on fuel sales rather than emissions intensity, fuel companies at point of obligation will have to report fuel sales data, but not their performance relative to emissions target.<br><br>Also, the biofuels mandate under option A covers only conventional biofuels. Conventional biofuels are relatively cheap, which means relatively low compliance costs, and there is some flexibility in for fuel suppliers in determining how they adjust the biofuel mix (in terms of percentage of bioethanol and biodiesel) to meet the fuels sales target. | More compliance costs than the status quo and option A, but less compliance costs than option D. It is unclear whether option B is better or worse than option C in terms of minimising compliance burden.<br>Worse than the status quo because fuel suppliers will have to invest in additional infrastructure for storing, blending and selling biofuels. Fuel suppliers will also need to report its performance relative to the emissions intensity reduction targets.<br><br>Heavier compliance burden than option A. Under option B, as the target is based on emissions intensity, fuel companies at point of obligation will have to undertake emissions accounting in addition to fuel sales accounting.<br><br>Smaller compliance burden than option D, as option B provides fuel suppliers at point of obligation with more flexibility in managing the compliance costs. As option B has one uniform emissions intensity target for all transport fuels, there is more flexibility for fuel suppliers in determining how they adjust the biofuel mix to meet the target. For example, fuel suppliers can supply a higher proportion of cheaper biofuels to meet the target. Option D has a separate emissions intensity target for aviation fuel and sustainable aviation fuel is relatively expensive. | More compliance costs than the status quo, option A and option B, but less compliance costs than option D.<br><br>Worse than the status quo because fuel suppliers will have to invest in additional infrastructure for storing, blending and selling biofuels. Fuel suppliers will also need to report its performance relative to the emissions intensity reduction targets.<br><br>Heavier compliance burden than option A. Under option C, as the target is based on emissions intensity, fuel companies at point of obligation will have to undertake emissions accounting in addition to fuel sales accounting.<br><br>Smaller compliance burden than option D because option C has a less ambitious emissions target for diesel and its biofuels equivalent. Under option D, the majority of emissions intensity improvements will be achieved through increasing the uptake of biodiesel and renewable diesel. If the emissions intensity target for transport fuels for heavy freight increases beyond 7 per cent after 2025, there will likely be high compliance burden on businesses using light diesel vehicles (e.g. vans and utilities). As light diesel vehicles are typically warranted to a 7 per cent biodiesel blend, these businesses will | More compliance costs than the status quo and options A, B and C.<br><br>Worse than the status quo because fuel suppliers will have to invest in additional infrastructure for storing, blending and selling biofuels. Fuel suppliers will also need to report its performance relative to the emissions intensity reduction targets.<br><br>Heavier compliance burden than option A. Under option D, as the target is based on emissions intensity, fuel companies at point of obligation will have to undertake emissions accounting in addition to fuel sales accounting. This means that the compliance burden is heavier than option A.<br><br>Heavier compliance burden than option B, as option B (with a uniform emissions target for all transport fuels) could provide more flexibility in managing compliance costs.<br><br>More compliance costs than all the other biofuels mandate options considered, as option D's emissions target for diesel and its biofuels equivalent is much higher than the other options'. The majority of emissions intensity improvements will be achieved through increasing the uptake of |

| | Option A : Transport fuels volume-based sales target focusing on conventional biofuels<br>(1.5 per cent by 2025 and provisional more ambitious targets after 2025) | Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025) | Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) | Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) |
|---|---|---|---|---|
| | | Unclear whether option B is better or worse than option C. On the one hand, option B could provide more flexibility in managing compliance costs because it has a uniform emissions target for all transport fuels, as mentioned above. On the other hand, option C has a less ambitious emissions target for aviation fuel than option B. A less ambitious emissions target for aviation fuel could translate to less biofuels-related infrastructure development costs and less transport costs for businesses. | either need to replace their vehicles earlier or use more renewable diesel, which is more expensive than biodiesel.<br><br>Unclear whether option C is better or worse than option B. On the one hand, option B could provide more flexibility in managing compliance costs because it has a uniform emissions target for all transport fuels. On the other hand, option C has a less ambitious emissions target for aviation fuel than option B. A less ambitious emissions target for aviation fuel could translate to less biofuels-related infrastructure development costs and less transport costs for businesses. | biodiesel and renewable diesel. If the emissions intensity target for transport fuels for heavy freight increases beyond 7 per cent after 2025, there will likely be high compliance burden on businesses using light diesel vehicles (e.g. vans and utilities). As light diesel vehicles are typically warranted to a 7 per cent biodiesel blend, these businesses will either need to replace their vehicles earlier or use more renewable diesel, which is more expensive than biodiesel. |
| **Wider economic effects (including impacts on regional and national economy)** | Worse than the status quo, but better than options B, C and D.<br><br>Real Net National Income (NNI), which takes into account changes in the terms of trade and overseas borrowing, could be $134m (0.021%) below baseline in 2025. For the 2023-25 period, the average annual GDP growth could be 3.191 per cent under option A, compared with 3.216 per cent in the baseline scenario (where no action is taken).<br><br>There will still be long-term economic growth, but the economy will grow at a slightly slower pace than in the baseline scenario.<br>For the post-2025 period, assuming that the biofuels sales volume target rises to 7% by 2035, the additional time required for the GDP to catch up to the December 2035 baseline level is around four months.<br><br>Industries with a heavy reliance on road transport and industries producing fossil fuels are most impacted.<br><br>*Note: Option A could help build some momentum for developing conventional biofuels production capacity in New Zealand (more momentum than the* | Worse than the status quo.<br><br>Worse than option A, based on modelling results for real NNI and real GDP.<br><br>Similar to option C but better than option D in the short term, Real NNI could be $668m (0.115%) below baseline in 2025. For the 2023-25 period, the average annual GDP growth could be 3.102 per cent under option B, compared with 3.216 per cent in the baseline scenario.<br><br>There will still be long-term economic growth, but the economy will grow at a slightly slower pace than in the baseline scenario.<br><br>Could be slightly worse than option C and option D in the long term. Depending on the final targets for the period 2025-2035, the pace of long-term economic growth post-2025 under option B could be slightly slower than those under options C and D, although the difference is expected to be very small. Option B has more ambitious targets than option C, and broader coverage than option D. Under options B, C and D, the additional time required for the GDP to catch up to the December 2035 baseline level is 15-17 months. | Worse than the status quo.<br><br>Worse than option A, based on modelling results for real NNI and real GDP.<br><br>Similar to option B and better than option C in the short term, Real NNI could be $612m (0.111%) below baseline in 2025. For the 2023-25 period, the average annual GDP growth could be 3.113 per cent under option C, compared with 3.216 per cent in the baseline scenario.<br>There will still be long-term economic growth, but the economy will grow at a slightly slower pace than in the baseline scenario.<br><br>Could be slightly better than options B and D in the long term. Depending on the final targets for the period 2025-2035, the pace of long-term economic growth post-2025 under option C could be slightly faster than those under options B and D. Note that option C has less ambitious emissions target for aviation fuels than option B, and less ambitious emissions target for diesel than option D—the model assumes that the relatively high biofuels prices will have a negative impact on the economy. | Worse than the status quo.<br><br>Worse than option A, based on modelling results for real NNI and real GDP.<br><br>Worse than option B and option C in the short term, Real NNI could be $688m (0.139%) below baseline in 2025. For the 2023-25 period, the average annual GDP growth could be 3.107 per cent under option D, compared with 3.216 per cent in the baseline scenario.<br><br>There will still be long-term economic growth, but the economy will grow at a slightly slower pace than in the baseline scenario.<br><br>Could be slightly worse than option C, but slightly better than option B in the long term. Depending on the final targets for the period 2025-2035, the pace of long-term economic growth post-2025 under option D could be slightly faster than that under option B but slightly slower than that under option C. Note: option D has the more ambitious emissions target for diesel, and an emissions target for aviation fuels not as ambitious as that of option B, and does not have an emissions target for petrol. |

| | Option A : Transport fuels volume-based sales target focusing on conventional biofuels<br>(1.5 per cent by 2025 and provisional more ambitious targets after 2025) | Option B: Emissions intensity reduction target for transport fuels across the whole transport sector, with one single annual target for all fuels (3.5 per cent below baseline by 2025 and provisional more ambitious targets after 2025) | Option C: Emissions intensity reduction targets for transport fuels across the whole transport sector, with a separate lower annual target for aviation fuels (3.5 per cent below baseline for diesel and petrol, and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) | Option D: Emissions intensity reduction targets focusing on diesel and aviation fuel (5.5 per cent below baseline for diesel and 2 per cent below baseline for aviation fuel by 2025 and provisional more ambitious targets after 2025) |
|---|---|---|---|---|
| | *status quo), but this is not factored in the modelling. Because the biofuels mandate target under option A covers conventional biofuels only, option A is not expected to contribute to incentivising the development of advanced biofuels production capacity in New Zealand.* | Industries with a heavy reliance on road and air transport and industries producing fossil fuels, are most impacted. Highlighted examples include fishing and aquaculture, fuel retailing, air and rail transport and non-metallic products manufacturing.<br><br>*Note: Options B, C and D could provide more incentives for developing domestic biofuels production capacity (both advanced and conventional biofuels) than the status quo and option A. However, this is not factored in the modelling.* | Industries with a heavy reliance on road and air transport and industries producing fossil fuels, are most impacted.<br><br>*Note: Options B, C and D could provide more incentives for developing domestic biofuels production capacity (both advanced and conventional biofuels) than the status quo and option A. However, this is not factored in the modelling.* | Industries with a heavy reliance on road and air transport and industries producing fossil fuels, are most impacted.<br><br>*Note: Options B, C and D could provide more incentives for developing domestic biofuels production capacity (both advanced and conventional biofuels) than the status quo and option A. However, this is not factored in the modelling.* |
| **Energy security** | Same as the status quo.<br><br>As target level is relatively low and the conventional biofuels market is relatively mature, no risk to fuel security is expected. | Worse than the status quo and option A.<br>Options B, C and D have more ambitious biofuels targets than option A.As New Zealand only has very limited biofuels production at present, we will be heavily reliant on biofuels imports at least in the first few years of implementing a biofuels mandate. Fuel suppliers will also need to develop infrastructure for storing, blending and selling biofuels in the initial years of implementation. Supply chains of advanced biofuels, particularly SAF, is yet to mature. There is also international competition for biofuels from sustainable sources. | | |
| **Government administration costs and complexity** | Additional monitoring, compliance and enforcement work, namely policing emissions certification and compliance with obligations to meet target. | | | |

# Section 8: Conclusions

## 8.1 What option, or combination of options is likely to best address the problem, meet the policy objectives and deliver the highest net benefits?

A biofuels mandate with an emissions intensity reduction target that applies to all transport fuels (option B) is the preferred option from the perspective of emissions reduction. It is preferred to a fuel sales volume-based target, which will incentivise fuel suppliers to source and supply biofuels at least cost, rather than biofuels with highest emissions reduction potential. There are limited abatement options for achieving significant reductions in transport emissions. In particular, biofuels are the only realistic option for significantly reducing emissions associated with long-haul flight.

The modelling results indicate that a biofuels mandate could come at an economic cost, especially if a biofuels mandate does not provide sufficient incentive for the development of a biofuels production industry. However, there are significant uncertainties in the underlying modelling assumptions about a range of factors, such as carbon prices, future technological advancements, feedstock costs, and their implications for the relative prices of biofuels and fossil fuels.

Some targeted engagement with fuel companies, such as Z Energy, Neste and bp, as well as Air New Zealand, has taken place. Z Energy, Neste and Air New Zealand are supportive of the introduction of a biofuels mandate because it could make a significant contribution to reducing transport emissions. Air New Zealand has highlighted the importance of access to affordable sustainable aviation fuels (which are currently more than three times the price of conventional jet fuel) though. Affordability of biofuels is likely to be the issue the general public and the transport sector would have strong views on. Some fuel companies may also have concerns about the readiness of their infrastructure for retailing biofuels.

A public consultation, which will follow Cabinet decision, will allow us to gain further insights into stakeholders' views on biofuels mandate, particularly the views of the major fuel users with whom officials have yet to engage.

## 8.2 Summary table of costs and benefits of the preferred approach

| **Affected parties** *(identify)* | **Comment**: *nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks* | **Impact** *$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts* | **Evidence certainty** *(High, medium or low)* |
|---|---|---|---|
| **Additional costs of proposed approach compared to taking no action** | | | |
| Regulated parties | Develop biofuels supply infrastructure (e.g. storage, | Biofuels blending facilities will cost $39-189 million[22], | Low-medium |

[22] This estimate is based on the assumption that bioethanol blending and storage facility at each terminal will cost $3 million per terminal, and the same applies to blending facilities for biodiesel and sustainable aviation fuels. It is assumed that 6-30 terminals will need bioethanol and biodiesel blending facilities, and 1-3

| | | | |
|---|---|---|---|
| | blending and production facilities) in New Zealand | depending on the number of fuel terminals that need to be upgraded. | Consultation with the fuel industry is required to test the cost estimate. |
| Regulated parties | Compliance costs, such as biofuels-related certification, emissions reporting and accounting | Relatively low cost for emissions reporting and accounting (compared with fuel infrastructure development cost) | Low |
| Regulators | Set up and administer monitoring, compliance and enforcement systems for biofuels mandate | $3 million per annum[23] | Medium<br><br>Consultation with overseas government and certification bodies is required to test the cost estimate. |
| Wider government | Government revenue could fall as the economy contracts relative to baseline | Nominal tax revenue could be $12.27 million below the baseline in the period to 2025 | Medium |
| Wider government | Higher fuel costs for government vehicle fleet and higher transport costs for officials' business trips | Road passenger transport prices could be 0.30% above baseline in 2025.<br>Air passenger transport prices (which tend to affect high-income | Medium |

terminals will need sustainable aviation fuels blending facilities. Officials referred to Hale and Twomey's 2006 report, *Enabling Biofuels: Biofuels Distribution Options,* and the regulatory impact analysis statement in Canada Gazette, Part I, Volume 154, Number 51: Clean Fuel Regulations, regarding the cost of blending facilities.

[23] This cost estimate is based on the assumption that 12 FTEs will be needed to administer the biofuels mandate and additional funding is needed for covering overhead costs, systems development and support (e.g. a database for registering emissions trade between fuel suppliers), and fuel testing.

| | | | |
|---|---|---|---|
| | | households more) could be 0.86% above baseline in 2025. | |
| Other parties | Higher fuel and transport costs | Average petrol blend prices, average diesel blend prices and average jet fuel blend prices could be 0.4 cents/litre (c/L), 7.1c/L and 7.1c/L higher than baseline prices of their neat fossil fuels equivalent in 2025 respectively. | Medium |
| Other parties | Real Net National Income (NNI) | Real NNI will be $670 million below baseline in 2025 (central estimate) | Medium |
| **Total Monetised Cost** | | $670 million in 2025 (central estimate)<br>(Note: the Real NNI has taken into account private spending, investment and government spending) | Medium |
| **Non-monetised costs** | | *Medium* | Low- Medium |

| **Expected benefits of proposed approach compared to taking no action** | | | |
|---|---|---|---|
| Regulated parties | Build capability in biofuels distribution (not including production) | Low | Medium |
| | Build domestic biofuels production capacity (Note: Other complementary measures are likely to be needed to provide sufficient incentive for this.) | High | Low |

| | | | |
|---|---|---|---|
| | Build green credentials for fuel suppliers at point of obligation, as well as biofuels feedstock suppliers (e.g. wood processors) | Low | Low |
| Regulators | N/A | N/A | N/A |
| Wider government | Lower emissions associated with the public sector's transportation | Low | High |
| Wider government | Ability to set relatively ambitious carbon budgets, enhancing New Zealand's position in international climate change negotiations | Medium | Medium |
| Other parties | Emissions reduction | $66 million in 2025, assuming a shadow carbon price of $101/ tCO2-e in 2025<br>Medium | Medium-High |
| Other parties | Reduce air pollution (which could exacerbate health conditions such as asthma and cardiovascular and respiratory issues) | High | High |
| **Total Monetised Benefit** | | Not quantified because it is very challenging to quantify many of the benefits beyond emissions reduction, e.g. value of green credentials and potential positive impacts on domestic biofuels production capacity. | Medium |
| **Non-monetised benefits** | | Medium | Medium |

### 8.3 What other impacts is this approach likely to have?

The higher fuel costs resulting from the introduction of a biofuels mandate will reduce energy equity. This may have a greater impact on some fuel consumers over others, particularly those who are dependent on private cars (with conventional internal combustion engines) for travel and where there are barriers to considering other options, for example the high up-front cost of EVs or the availability of public transport. Examples of fuel consumers who could be impacted more by higher fuel costs include rural households and low-income households that will likely be slower to switch to EVs.

The market for biofuels and feedstocks is an international market. There is some uncertainty in this market, and if biofuels become less available (and therefore more expensive) the mandate could compromise New Zealand's energy security.

On the other hand, technological developments and advances in the production of biofuels may reduce the costs of biofuels.

A biofuels mandate can also create some momentum for building domestic biofuels production capacity, although it will likely need to be complemented with other interventions. Should commercial-scale biofuels plants be developed in New Zealand, there will be some benefits in terms of employment and regional development. Bio-refineries that can achieve economies of scale and are internationally competitive are likely to bring more economic benefits. On the other hand, an expanding biofuels sector will compete with other sectors for resources, such as woody biomass, thereby necessitating reallocation of resources, including land.

## Section 9: Implementation and operation

### 9.1 How will the new arrangements work in practice?

The existence of a biofuels mandate would need to be implemented through new legislation or amendments to the Energy (Fuels, Levies, and References) Act 1989. The legislation would specify:

- the main elements of the biofuels mandate, including the point of obligation and the nature of the obligation (including the mandated target)
- establishing the obligation to monitor and report on emissions reductions
- establishing the penalty regime
- establishing the ability for producers to trade credits between each other, or to bank surplus emission reductions or borrow for shortfall.

There would need to be supporting regulations to specify the detail required for the mandate. This includes:

- the methodology for assessing greenhouse gas emissions reductions achieved by obligated fuel suppliers through selling biofuels
- the requirements for certifying that biofuels meet the sustainability criteria
- default values for fuel energy content (petrol, diesel and common biofuels)
- penalty levels.

The Engine Fuel Specifications Regulations 2011 will also need to be reviewed to ensure that the fuel specifications for biofuels and the limits on biofuel blends will achieve the right balance between achieving emissions reduction and ensuring that biofuels and biofuel blends sold in New Zealand are appropriate for our transport fleet and climatic conditions.

MBIE and MoT may establish a biofuels working group made up of officials and representatives from the fuel and transport sectors to test proposals for the regulation or provide an exposure draft of the regulations. It would also serve as a sounding board for communicating and testing ideas about the implementation of the mandate, including considering technical feasibility of biofuels specification requirements, and confirming which government agency will administer the mandate.

The arrangements are proposed to come into effect at the beginning of the calendar year once legislation is passed and regulations are in place, currently projected to be 2023.

**The regulating agency**

We have not reached a firm view on which agency will take on the role of regulating the biofuels mandate and the achievement of emissions reduction targets. MBIE is a potential candidate, as it already plays a role in monitoring fuel quality and has existing relationships with fuel companies.

The Trading Standards team in MBIE is responsible for fuel quality monitoring. Monitoring the quality of biofuels is more complex than fossil fuels, as the feedstock for biofuels has more variability and the statistical sampling used for fossil fuels is unlikely to be adequate. MBIE's Trading Standards team already has some expertise in monitoring the quality of biofuels, although it will need to build capability and increase its capacity ahead of the biofuels mandate coming into effect.

**Public communications**

The introduction of the mandate will need to be supported by communications about what it might mean for households and businesses. This would need to cover:

- What the different biofuel blends are and what they would mean for vehicle use, for example blend walls for different types of cars.
- Whether there are specific blends that could not be used in some cars. For example the United Kingdom has a website where vehicle users can check this using the make, model and year of manufacture.

**Transitional regime for compliance**

During the first two years of the biofuels mandate, there is a risk that some suppliers may not be able to source sufficient biofuel volumes quickly enough to meet their required emissions reductions. This is because of the long lead-in times associated with increasing biofuel production and supply.

## 9.2 What are the implementation risks?

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

- **Fuel infrastructure readiness:** there is a risk that not all fuel suppliers will have the biofuels-related infrastructure, such as biofuels storage and blending facilities, in time for when the biofuels mandate comes into effect. The two-year deferral of compliance with the mandate from the date it begins will provide some flexibility to fuel suppliers.
- **Risk of non-compliance:** there is a risk that regulated parties do not comply with the regime, and instead choose to buy their way out of the scheme by paying the penalties – this creates a risk that it is not effective at reducing greenhouse gas emissions, and is simply an extra tax on firms and households that consume fossil fuels. This risk can be mitigated by setting the penalties at a level which creates an incentive for compliance.
- **Security of biofuels supply and energy security risk:** there is a risk that fuel suppliers struggle to ramp up production or secure reliable supply chains for biofuels, creating energy security issues. This can be mitigated by the flexibility mechanisms of the mandate (i.e. banking, borrowing and trading of emission reduction), ability to switch between fuels for meeting the target, and the two year deferral of compliance from the date the mandate begins. The details of these design features will be subject to public consultation before Cabinet agrees to the final shape of the mandate.
- **Risk of fuel quality problems or incompatibility with vehicles:** There is a risk that there could be unexpected issues with the quality of biofuels, which could damage vehicles or have negative environmental impacts. This risk can be mitigated by ensuring that Trading Standards have adequate time and funding to establish a robust biofuels monitoring framework, before the mandate comes into effect.
- **Risk of higher than anticipated compliance costs:** There is a risk that the cost of complying with the biofuels mandate could be higher than anticipated. For example, the costs associated with certification of greenhouse gas emissions and achievement of sustainability criteria and biofuels-related infrastructure development could be higher than expected. This can be mitigated by consulting with fuel suppliers to understand whether and how the particular design of the mandate could impact their cost structures in an unexpected way.
- **Environmental integrity of biofuels certification:** There is a risk that the lifecycle emissions of the biofuels sold by fuel suppliers are higher than claimed or the environmental integrity of the biofuels sold is questioned, unless a credible certification framework is in place. Officials will consult with experts in the EU and other advanced economies to identify the best practice for certifying lifecycle emissions and sustainability of biofuels.

# Section 10: Monitoring, evaluation and review

## 10.1 How will the impact of the new arrangements be monitored?

As part of the regime, the regulator will collect certificates for all biofuels which are counted under the biofuels mandate. This will allow the regulator to collect data on the quantity and type of biofuels sold, and the resulting emissions reduction. This data would also be useful in the review of the biofuels mandate.

The regulator should also periodically ensure the integrity of the voluntary certification scheme.

## 10.2 When and how will the new arrangements be reviewed?

The mandate will be reviewed early in its second year of operation, 2024. This review would include:

- Whether the emissions reduction percentages for 2024 and 2025 are appropriate, and how much emissions reduction has been achieved under the mandate.
- Its impact on fuel prices.
- Any issues that fuel suppliers have experienced in implementing the mandate.
- A review of the penalty levels.
- Whether there are any issues with the trading of credits between fuel suppliers.

The timing of the first and subsequent reviews will coincide with when the emissions budgets are set (2024 for the 2026-2030 budget and 2029 for the 2031-2035 budget).