Review of the Engine Fuel Specifications Regulations 2011

February 2025

Ministry of Business, Innovation and Employment (**MBIE**)
Hīkina Whakatutuki – Lifting to make successful

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Executive Summary

The *Engine Fuel Specifications Regulations 2011* (**the Regulations**) set the parameters for the quality of marine fuel oils, petrol, diesel, ethanol, biodiesel, and blends of these fuels, that are sold or supplied to the public in New Zealand.

The Regulations need to be reviewed periodically to ensure they keep up with innovations in the fuel and vehicle technology sectors. The last time that the Regulations were fully reviewed was in 2017.

To work effectively, our fuel standards and vehicle standards should be aligned. With out-of-date fuel standards, newer vehicles that are designed to run on cleaner fuel risk being damaged.

This document outlines a number of proposals to update our engine fuels specifications. Where possible, we have aligned our proposed amendments to the European fuel standard Euro 6, which is generally considered the global benchmark for fuel standards. Care has been taken to avoid requirements that would be impractical, or costly to implement. In many instances, we seek to lock-in specifications that are already met by fuel importers.

The feedback received from this consultation will inform final advice to update the Regulations.

Petrol

- Reduce the maximum limit for aromatics in fuel from 45 per cent to 35 per cent.
- Introduce a silver strip corrosion test for active sulphur.
- Relax the 10ppm maximum allowable sulphur level for ethanol denaturants.
- Introduce a fuel density specification of 720-775 kg/m³.
- Amend the definition of petrol to reflect a boiling point of 210 °C.
- Amend the silver strip test standard in Schedule 1A to ASTM D7667 or ASTM D7671.
- Change the ethanol range in fuel ethanol by lowering the range starting from '70 per cent to 85 per cent' to '51 per cent to 83 per cent' as in ASTM D5798.

Diesel/biodiesel

- Reduce the allowable density of diesel to 845kg/m³ (from 850kg/m³) and reduce the allowable density of fatty acid methyl ester (**FAME**) in a similar fashion.
- Reduce the polycyclic aromatic hydrocarbon (**PAH**) limit from 11 per cent to 8 per cent.
- Reduce filter blocking tendency from 2.5 to 2.0.
- Introduce a renewable diesel specification.
- Replace the maximum limit for diesel's total contamination of 24 mg/kg with 20 mg/l in Schedule 2.
- Add an appearance test and remove the colour test for both diesel and FAME.
- Revise Regulation 5 to reflect a biodiesel blending limit of up to 7 per cent.
- Clarify the distinction between Regulation 15 ('Requirements relating to diesel sold by non-retail sale') and Regulation 17A ('Requirements relating to marine fuel oil sold by non-retail sale').

Implementation of the Fuel Quality Monitoring Programme

- Revise Regulation 4 so that it is clear that the Regulations apply to marine fuel oil
- Revise Regulation 5 to clarify that the definition of 'engine fuel' includes marine fuel oil.
- Update Regulation 21 so that it does not refer to a specific year of issue for ISO standard 9001, and so that it instead refers to a requirement for accreditation to ISO 9001, ISO17020 or ISO 17025.
- Update regulation 21 so that it refers to accreditation of an organisation or agency, rather than an individual person or employee.
- Review and update Custom's Excise and Excise Equivalent Duties Table to align with terminologies for fuel products used in the Engine Fuel Specifications Regulations where possible.

Introduction

Purpose

This discussion document seeks views on the proposed changes to the *Engine Fuel Specifications Regulations 2011*.

Background

The Ministry of Business, Innovation and Employment (**MBIE**) is responsible for administering the *Engine Fuel Specifications Regulations 2011* (**the Regulations** or **EFSR**). The Regulations set out minimum standards for fuels supplied to New Zealand and help to ensure that fuel is appropriate for New Zealand's vehicle fleet and climatic conditions, that motorists know they are getting what they pay for, and that the environmental and public health impacts of fuel are limited.

MBIE's Trading Standards Team is responsible for fuel quality monitoring and ensuring that the specifications set out in the Regulations are met by fuel importers.

The Regulations currently provide fuel specifications for petrol, petrol/ethanol blends, diesel, biodiesel and diesel/biodiesel blends.

The Regulations are periodically reviewed to ensure they are fit-for-purpose and keep pace with developments in technology. While the regulations were expanded in August 2022 to include new requirements for maritime fuels (to support the implementation of the International Convention for the Prevention of Pollution from Ships (**MARPOL**) Annex VI), the last time they were fully reviewed and updated was in 2017. It is timely to review the Regulations again in view of international trends in vehicle emissions standards and other technological developments.

Euro 6d/VI and vehicle emission standards

Fuel standards ensure that the quality of New Zealand's fuel meets the performance requirements of our vehicles, avoids engine damage, and avoids adverse impacts on human health and the environment.

To work effectively, fuel and vehicle standards should be aligned. Modern vehicles that require a particular quality of fuel can suffer damage if a poorer quality fuel (acceptable under out-of-date fuel standards) is used.

The global benchmark for fuel standards are the common standards adopted by Europe. Other countries (such as the United States) have similar requirements to the European standards. The current European standard is Euro 6 fuel, which was introduced in 2015. For vehicles, the standard is Euro 6d.

New Zealand still uses the Euro 5 standard from 2009 but we will be moving to the Euro 6d vehicle standards from December 2025 for new imports and July 2028 for used imports.[1] Our out-of-date fuel standards, and their misalignment with the Euro 6d vehicle standard, could mean that Euro 6d

[1] *Land Transport: Vehicle Exhaust Emissions Rule 2007.*

vehicles that are designed to run on cleaner fuels may suffer engine damage, or that we miss out on vehicles with the latest emissions reduction technologies.

Scope

The Regulations are reviewed periodically to keep up with developments in engine and fuel technology and test methods. Reviewing the Regulations also provides an opportunity to ensure New Zealand is keeping pace with international standards and other areas of government policy.

This review focuses on the technical specifications for petrol, diesel, ethanol, biodiesel (**FAME**) and renewable diesel (**HVO**). Jet fuel specifications are out of scope as they are set by ASTM International.

This review also does not examine specifications for gaseous fuels and liquefied gaseous fuels. We do not anticipate that these will be used for transport on a commercial scale in New Zealand in the near future.

Objectives and Evaluation Criteria

The Regulations have become more stringent over the years. This has reduced harmful emissions from vehicles and enabled uptake of more efficient and cleaner vehicle and fuel technologies.

When we reviewed the Regulations, we wanted to ensure our fuel specifications are up-to-date, and avoid potential engine damage, costs to consumers and harmful emissions (including greenhouse gas emissions). Increasingly, modern engines need cleaner fuels to operate and it is important we keep up with international developments.

Where there are options in this paper, they are assessed against the following criteria:

- Emissions reduction — including keeping pace with international vehicle harmful emission standards, and facilitating adoption of low-carbon emissions fuel.
- Ensuring consumer protection - ensuring that fuel is fit for purpose.
- Avoiding disproportionate economic cost to consumers (taking into account impacts on fuel prices and difficulty in sourcing fuel products from overseas refineries).
- Optimising government administration (taking into account fuel quality monitoring costs and regulatory burden).

Petrol

Reducing the maximum aromatics limit to 35 per cent

We propose to reduce the maximum allowable aromatics limit to 35 per cent for all petrol grades.

What are aromatics?

Petrol is a blend of components produced in refineries rather than a straight-run product distilled from crude oil, like jet fuel and diesel. Depending on the requirements of the final specification, different volumes of each component are used.

Aromatics are generated in the refining process to increase the petrol's octane rating. Typically, higher-octane petrol will have a higher aromatic content. Octane enhancers are used in fuel to reduce engine knocking. Historically, lead was a petrol additive used to raise octane until it was removed due to the damage it did to people's health (and along with other metallic additives is banned in most petrol, including New Zealand's).

However, fuels with high aromatic levels can lead to onboard diagnostic failures, and potentially early failures and warranty issues for emissions critical hardware for newer vehicles that are designed to meet Euro 6. Further, the combustion of aromatics can create carcinogenic benzene in exhaust gases. Lowering aromatic levels reduces noxious emissions.

Current Regulations

The current New Zealand specification has a 45 per cent maximum aromatic limit for fuel batches. This is high by international standards. Europe currently has a 35 per cent aromatics limit and Australia will introduce a 35 per cent limit for 95 petrol from December 2025. Even in New Zealand, aromatic levels for all grades of petrol that are imported fall below this 45 per cent maximum limit on average.

The former Marsden Point Refinery produced a petrol that was much higher in aromatics than most imported petrol. Since the refinery's closure, we have seen a large decrease in the aromatic content of our fuels. In 2019, the average aromatic content that was tested by MBIE was 35.5 per cent. In 2023, this had dropped to an average of 26.8 per cent.

However, while the pool average[2] quality of New Zealand petrol meets the limit for Euro 6d quality fuel (35 per cent), premium grades of petrol tend to have higher than average aromatic levels. For instance, premium 98 fuel, which has the highest octane level available for retail sale, had an average aromatic level for 2022-23 of 34.8 per cent.

[2] In Schedule 1 of the Regulations (Requirements for Petrol), aromatics have a prescribed maximum limit of 45 per cent, and a pool average limit of 42 per cent. The maximum limit means that the aromatics content for a single batch of fuel cannot exceed 45 per cent. The pool average limit means that the combined, weighted "average" aromatics content for all of an importer's fuel batches for a specified period of six months cannot exceed 42 per cent. In practice, this means that the regulations allow fuel importers some flexibility to import fuel batches that occasionally exceed the pool average limit of 42 per cent (but not the maximum 'per batch' limit of 45 per cent) for a specified six-month period.

Alternative octane enhancers, such as ethanol, would likely be needed to make higher octane grades, particularly 98 RON petrol.

What are the options?

The options for the maximum aromatic level are:

1. Retain the maximum level of aromatics at 45 per cent (ie retain the status quo).
2. Reduce the pool average level of allowable aromatics to 35 per cent and keep the maximum at 45 per cent.
3. Reduce the pool average level of allowable aromatics to 35 per cent and reduce the maximum to 40 per cent.
4. Reduce the maximum allowable aromatics level to 35 per cent for regular and 95 RON fuel but allow up to 40 per cent on 98 RON fuel.
5. Set a maximum 35 per cent aromatic level on all fuels and leave the market to adjust.

Proposal and rationale

We propose to set a maximum aromatic limit of 35 per cent from 1 December 2025 (option 5). It would allow us to keep pace with international vehicle emissions standards (such as Euro 6d), while its impact on supply and costs would be nil for regular petrol, minor (0.2 – 0.5 cents per litre) for 95 RON petrol, and manageable (about 3 cents per litre) for 98 RON petrol. While there might be supply constraints for premium fuel products with aromatics levels below 35 per cent, these constraints are expected to be minor. Further, as other refineries in the region are upgraded (such as in Australia) there could be more supply options for Euro 6-compatible petrol by the end of 2025.

Questions for consultation

1. **Should New Zealand reduce the allowable aromatic content of both regular 91, premium 95 and premium 98 petrol to 35 per cent? If not, why not? What level do you consider it should be set at?**
2. **Should proposed changes come into effect from 1 December 2025? If not, why not?**
3. **If these proposed changes were implemented from 1 December 2025, would this delay the supply of Euro 6d petrol vehicles to New Zealand? Why?**
4. **Do you have any information on the likely cost impact of changing the maximum aromatic level for 95 and 98 RON petrol?**
5. **Besides ethanol, do you consider that there are any other octane enhancers that could be used to produce premium petrol with a low aromatic level, which should be allowed by the Regulations? If not, why not?**

Assessment of options

The above options have been assessed below:

Table 1: Assessment of aromatics options					
	Option 1: Status quo	Option 2: Reduce pool average to 35% and maximum stays at 45%	Option 3: Reduce pool average to 35% and maximum limit reduced to 40%	Option 4: 35% maximum on regular and 95 RON but allow up to 40% on 98 RON fuel	Option 5: Set a 35% maximum on all fuels from 1 December 2025
Noxious emission reduction	0 There is no noxious emissions reduction benefit, since this option does not enable Euro 6 compatible fuel.	0 There is no noxious emissions reduction benefit, since this option does not enable Euro 6 compatible fuel.	0 This still does not achieve the ultimate outcome of fully Euro 6 compatible fuel and the associated noxious emission reduction benefits.	+ This is still not in line with the ultimate direction of fuel specifications although it is better than the status quo from the perspective of noxious emission reduction, as this option ensures lower aromatics on two grades and at least one Euro 6 compliant grade (95 RON).	++ This option would enable manufacturers to sell the latest engine technologies to the NZ market which will continue to improve fuel consumption and lower noxious emissions.
Consumer protection	- There is no guarantee that consumers who purchase Euro 6 vehicles will have access to compatible fuel. Vehicle damage may occur.	- There is no guarantee that consumers who purchase Euro 6 vehicles will have access to compatible fuel. Vehicle damage may occur.	- With this option, there is still no guarantee that consumers who purchase Euro 6 vehicles will have access to compatible fuel.	0 This option guarantees that 95 RON fuel becomes Euro 6 compliant, but not 98 RON fuel. Consumers who purchase Euro 6 vehicles which require 98 RON would not be protected.	++ This option best aligns the specifications for the future. From a vehicle emissions hardware perspective, capping aromatics at 35% would make New Zealand fuel

			Vehicle damage may occur.		fully compatible with Euro 6 engine/emission designs and enable manufacturers to sell the latest engine technologies to the NZ market which will continue to improve fuel consumption and lower noxious emissions.
Economic cost	+ No cost impacts are expected.	+ No cost impacts are expected. Based on MBIE's information on the pool average aromatic level, fuel suppliers can achieve this.	+ It is likely that there would be a minimal impact on fuel supply and cost, as a 40% maximum aligns with the quality of standard Asian fuel imports.	0 There would be minimal price impacts to 95 RON fuel (0.2 to 0.5 cent per litre), and no price impacts for 91 RON and 98 RON.	- It is not expected that this option would affect the price of regular petrol. However, this option would have an impact on the cost of premium petrol. It would likely lead to a small increase in 95 RON cost (0.2 to 0.5 cents per litre (**cpl**)) and a larger increase in 98 RON (about 3 cpl) with possible difficulty in meeting supply for 98 RON fuel. About 25 per cent of petrol consumed in New Zealand is premium

					petrol. We do not have a breakdown between 95 RON and 98 RON, but 98 RON is likely to be needed by about 4 per cent of the fleet.
Government administration	0 No change in government administrative burden is expected.	0 No change in government administrative burden is expected.	0 No change in government administrative burden is expected.	0 No change in government administrative burden is expected.	0 No change in government administrative burden is expected.
Summary	-1	-1	0	1	3

Adding a silver strip corrosion test to detect active sulphur

What is active sulphur?

Sulphur is found naturally in crude oil. It is normally reduced to an acceptable level during the refining process and is subject to a maximum limit by the Regulations.

Active sulphur is sulphur that reacts with other chemicals. In an engine, active sulphur can react with the silver alloy used in fuel sender units inside the fuel tank of certain vehicles, resulting in the fuel gauge displaying erratic readings. Active sulphur can also react with the copper on fuel pump bearings, disrupting the smooth operation of fuel pumps and risking the vehicle stalling.

The Worldwide Fuel Charter, an international voluntary code for fuel quality, recommends that the silver strip corrosion test be applied to detect the presence of active sulphur compounds in petrol.

Current Regulations

The Regulations require a test for copper strip corrosion for petrol, but not a silver strip corrosion test. Both a copper and silver strip corrosion test can identify sulphur compounds, but it is only the silver strip corrosion test that can detect *active* sulphur, which can corrode or tarnish silver alloy fuel gauge in-tank sender units and silver-plated bearings in engines.

The current international standard methods for silver strip corrosion test are ASTM D7667 and ASTM D7671. In either method, a strip of silver is immersed in the test sample for a specified time and at a controlled temperature. It is then removed, assessed, and classified in one of five classes for colour and tarnish, from zero (no tarnish) to four (blackening).

There is a voluntary industrial specification for testing active sulphur in New Zealand, but compliance with it is not required under the Regulations. The fuel industry uses specific tests for Copper Corrosion (ASTM D130) and Silver Corrosion (ASTM D7667 or ASTM D7671) to identify if there are any reactive sulphur compounds in fuel, and prevent the release of problematic batches (where reactive sulphur compound is present in significant enough amounts to corrode test strips).

Proposal and rationale

We propose to add the silver strip corrosion test to Schedule 1 of the Regulations, with Class One standard (slight tarnish) being the limit, and ASTM D7667 or ASTM D7671 being the test method.

We prefer this option to the status quo because it formalises the need for a silver strip corrosion test. This would improve protection for consumers by minimising the risk of damage for fuel system parts, while the cost of a silver strip corrosion test would be minimal. Furthermore, introducing a silver strip corrosion test brings our fuel regulations more into line with international standards like the WWFC (Worldwide Fuel Charter).

Questions for consultation

6. **Do you agree that we should add a silver strip corrosion test to the Regulations, Schedule 1, using either ASTM D7667 or ASTM D7671?**
7. **Do you have a preference on whether to use ASTM D7667 or ASTM D7671, or both?**

Relaxing the specification to allow petrol with the 10ppm sulphur requirement to be used as a denaturant

What is denatured ethanol?

Ethanol is denatured (made unfit for human consumption) by blending it with another product or chemical. This is usually done before importation to avoid paying additional excise duty on alcohol.

Current regulations

The current regulations in New Zealand state that ethanol needs to be denatured with unleaded petrol. When unleaded petrol is used as a denaturant, it must comply with the regulations for retail sale (Regulation 8(3)(b)) and non-retail sale (Regulation 14(3)(a)) of petrol/ethanol blends.

Schedule 4 of the Regulations requires that:

- the denaturant must be 1-1.5 per cent of the volume; and
- the unleaded petrol used as the denaturant must have 10 ppm (parts per million) or less of sulphur.

If unleaded petrol is used to denature ethanol before ethanol is imported, it is possible that the ethanol will not comply with New Zealand regulations requiring the petrol to have 10ppm, or less, of sulphur.

This will be particularly true of ethanol that could be imported from Australia. Australia's maximum allowable level for sulphur in unleaded petrol is between 100 and 150 ppm, although legislation has been introduced that would reduce this level to 10ppm in 2025. In some instances, fuel from some Asian refineries can have sulphur of up to 500 ppm.

In effect, this regulation requires fuel companies to import undenatured ethanol and denature it in New Zealand to meet the requirement that the denaturant is petrol with 10ppm or less of sulphur.

Proposal and rationale

MBIE proposes to relax the New Zealand standard to allow denaturants that have more than 10ppm sulphur, provided the denaturant is petrol and the final denatured ethanol has less than 10ppm sulphur.

Questions for consultation

8. **Do you agree that the maximum allowable sulphur requirement for ethanol denaturants should be relaxed, so long as the final denatured ethanol is less than 10ppm sulphur? If not, why not?**
9. **If the requirement is relaxed, should there still be a maximum allowable level of sulphur for denaturants? If so, what should that level be? If not, why not?**

Introducing a density specification

What is fuel density?

Fuel density is the mass of fuel per unit volume. Density is determined by both the quality of crude oil used to produce the fuel and the refining process.

Current Regulations

The New Zealand specification does not currently have a density specification for petrol.

Many countries' specifications have density ranges including the detailed EN228 (Euro 6) standards (eg BS EN228) where the density range allowed is 720-775 kg/m^3. This is the same range as that recommended by the WWFC category 5 grade and Platts and Argus use a minimum specification of 720 kg/m^3 for their petrol specification.[3]

If the density of petrol is below 720 kg/m^3, then it is likely to mean the volumetric energy content is lower than expected, increasing fuel consumption and costs to the consumer. While infrequent, MBIE testing shows that petrol with a density below 720 kg/m^3 does occur.

Proposal and rationale

The preferred option is to introduce a density range for petrol of 720–775 kg/m^3. This would bring our specification into line with Euro 6 Standards. We understand this range is already in line with import standards set by the fuel industry and as such we do not expect the introduction of a fuel density range to have an impact on fuel security and price.

Questions for consultation

10. **Should we introduce a petrol density range to the specifications? If not, why not?**
11. **If a range is introduced, should the density range be 720-775 kg/m^3. If not, why not?**

[3] Platts and Argus are two separate price reporting agencies that publish market prices that are used by the fuel industry to price their crude oil and products. They both report on the Asian product market and for each product quote there is a published specification that reflects the quote they are reporting on (generally a reflection of the most commonly traded specification).

Miscellaneous technical amendments for petrol and ethanol specifications

We also propose several technical amendments. We do not anticipate that these technical amendments will have any impact on fuel prices or emissions.

Table 2: Miscellaneous technical amendments for petrol and ethanol specifications

Proposed change	Reason
Revising the upper boiling point limit for petrol to 210°C in the definition of 'petrol' in Regulation 5.	For consistency with the specification for petrol in Schedule 1 of the Regulations.
Correcting the test standard for silver strip corrosion test in fuel ethanol — Schedule 1A should refer to ASTM D7667 and D7671 (the test standard for silver strip corrosion) rather than ASTM D130 (the test standard for copper strip corrosion). **Note that this proposal refers to the *existing* silver strip corrosion test for fuel ethanol (Schedule 1A). It is different from the above proposal to add a silver strip corrosion test requirement for petrol (Schedule 1).**	This corrects a technical error and will help avoid issues with corrosive compounds in fuel damaging engine components.
Changing the ethanol content range in fuel ethanol by lowering the range from the range of 70 – 85 per cent to a range of 51 – 83 per cent as in ASTM D5798.	ASTM D5798 is the latest international standard for petrol-ethanol blends. Alignment with this standard would ensure proper vehicle starting, operation, and safety in varying temperature conditions.

Questions for consultation

12. **Do you support these technical amendments for petrol and ethanol specifications? Are there any that you disagree with? Why?**

Diesel

The current New Zealand diesel fuel standard as prescribed in the Regulations differs from the fuel specifications required for Euro 6 and Euro VI[4] in two respects:

- The maximum diesel density specification; and
- The maximum polycyclic aromatic hydrocarbon (**PAH**) limit.

If New Zealand diesel fuel standards are not aligned with the European standards, these differences will affect the emissions performance of Euro 6 vehicles.

Maximum density

What is maximum density?

Generally, higher quality diesel is lower in density. The process to remove sulphur to improve diesel's quality also saturates the carbon chains making the diesel more paraffinic (lighter). New Zealand diesel contains low amounts of sulphur (less than 10ppm), so it tends to be lower density.

A maximum density specification is included in the specification to avoid longer chain (heavier) components being retained in the diesel blend. These longer chain components can create more particulate matter (which is harmful to human health) when combusted.

Current Regulations

The New Zealand specification currently has a maximum diesel density specification of 850 kg/m³, which can be relaxed to a 854 kg/m³ maximum when blended with a maximum of 7 per cent fatty acid methyl esters (FAME). The reasoning behind relaxing the standard with a FAME blend is based on a worst-case of a maximum density diesel (850 kg/m³) being blended with a worst-case FAME (900 kg/m³) at 7 per cent.

By contrast, the Euro 6 specification (EN:590) has a maximum specification of 845 kg/m³, with no allowance to be relaxed when blended with FAME.

Specifications for Euro 6 and Schedule 2 of the Regulations all have the same minimum specification for diesel of 820 kg/m³.

While our maximum permitted diesel density is higher than the Euro 6 standard, in practice, our diesel would meet the European standard. Our 2022-23 Fuel Quality Monitoring Report[5] shows that all density results for diesel were between 830 and 840 kg/m³.

Proposal and rationale

We propose to reduce the maximum allowable density specification for both neat diesel and diesel/FAME blends to 845 kg/m³, in line with Euro 6 quality. This would ensure that the emissions

[4] Note that Euro VI is the standard for heavy vehicles (vehicles with a gross vehicle mass over 3.5 tonnes) and Euro 6 is the standard for light vehicles

[5] https://fuelquality.tradingstandards.govt.nz/assets/FuelQualityMonitoring/documents/fuel-quality-monitoring-annual-report-2022-23.pdf

reduction benefits from meeting the maximum allowable diesel specification required by Euro 6 would be achieved.

As New Zealand's diesel already meets this lower specification, we do not anticipate any fuel price impacts.

Questions for consultation

13. **Should the maximum allowable diesel density be reduced to 845 kg/m³? If not, why not?**
14. **For FAME blends, should the density relaxation be removed (845kg/m³) or reduced in line with the proposed maximum density change for diesel (849kg/m³)? If not, why not?**

Limiting Polycyclic Aromatic Hydrocarbons

What are PAHs?

Polycyclic Aromatic Hydrocarbons (**PAHs**) are hydrocarbons that can be found in natural sources, such as crude oil and bitumen, or produced from combustion processes.

The presence of PAHs in exhaust fumes can irritate eyes and breathing passages. Several PAHs, and some specific mixtures of PAHs, are considered to be cancer-causing chemicals.[6] PAHs can contribute to harmful particulate matter being formed, as PAHs can bind with air to form small particles.

Current Regulations

PAHs are regulated on human health grounds. New Zealand's current specification for PAH is set at a maximum of 11 per cent. This is higher than the equivalent Euro 6 standard for PAH of 8 per cent.

However, MBIE's Fuel Quality Monitoring Programme test results from 2017 to 2022 found that PAH content in diesel was routinely below four per cent. Of the 210 PAH results in the 2022-23 Fuel Quality Monitoring Report[7], only four results had PAH levels of up to 4.3 per cent.

For markets with "more stringent requirements for emission control" the WWFC recommends that the maximum limit for PAH be 3 per cent.[8] For markets with "advanced requirements for emission control" the WWFC suggests a PAH maximum limit of 2 per cent.[9] However, we understand that 2 per cent would be difficult for many refineries to meet.

Proposal and rationale

We propose to reduce the PAH maximum in diesel from 11 per cent to 8 per cent in line with Euro 6. This would reduce the risk to human health from PAHs. As the PAH in our diesel is routinely below 4 per cent, we do not anticipate any fuel price impacts.

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[6] https://www.who.int/europe/publications/i/item/9789289056533

[7] https://fuelquality.tradingstandards.govt.nz/assets/FuelQualityMonitoring/documents/fuel-quality-monitoring-annual-report-2022-23.pdf

[8] https://www.acea.auto/uploads/publications/Worldwide_Fuel_Charter_5ed_2013.pdf

[9] https://www.acea.auto/uploads/publications/Worldwide_Fuel_Charter_5ed_2013.pdf

Questions for consultation

15. **Do you agree with lowering the maximum PAH percentage from 11 per cent to 8 per cent? If not, why not?**

Filter blocking tendency

What is filter blocking tendency?

The fuel filter screens out any contamination from fuel. If the filter is clogged, it can prevent proper circulation, and cause serious engine operation problems. Fuel with a high filter blocking tendency (**FBT**) is more likely to block filters in engines.

FBT is a relative figure from 1 to 4 (or higher), with a figure of 1 being a perfectly clean fuel/filtering, and that of 3 and above starting to cause serious operating issues for diesel engines.

Current Regulations

The current New Zealand diesel specification has a Filter Blocking Tendency specification with a maximum of 2.5 with a general statement regarding its fitness for use. This is less stringent than the 2.0 maximum standard applied in Australia.

Fuel monitoring data shows that the FBT of diesel supplied in New Zealand is typically below the established maximum limit. Most test results for FBT in New Zealand fall within the range 1.00 to 1.05, which means almost perfect filtering.[10]

Proposal and rationale

We propose that the maximum FBT specification should be reduced from 2.5 to 2.0 for New Zealand diesel, to align with Australia's maximum level. As the internal acceptance limits for fuel importers is generally between 1.4-1.8, we do not anticipate that this change will affect current practice or impact on prices. Based on MBIE's fuel monitoring data, the diesel currently used in New Zealand easily meets the tighter specification.

Questions for consultation

16. **Do you agree with reducing the filter blocking tendency limit from 2.5 to 2.0? If not, why not?**

[10] https://fuelquality.tradingstandards.govt.nz/assets/FuelQualityMonitoring/documents/fuel-quality-monitoring-annual-report-2022-23.pdf

Renewable diesel (HVO) specification

What is renewable diesel?

Renewable diesel (or HVO / hydrotreated vegetable oil) is a biofuel made from fats and oils, such as used cooking oils, tallow, or vegetable oils, that is processed to be chemically the same as (or very similar to) petroleum diesel.

Because it is so chemically similar to petroleum diesel, renewable diesel is referred to as a 'drop-in' fuel, since it can be used instead of fossil diesel. This is different to other types of biofuels that may need to be blended with fossil fuels to be combusted in internal combustion engine vehicles. Renewable diesel tends to have a very good cetane number.[11] As well as this, "the majority of the available literature… agrees that using renewable diesel reduces carbon monoxide, hydrocarbons and particulate matter emissions when compared to regular diesel".[12]

In theory, as renewable diesel is so similar to petroleum diesel, we should not need a special specification. However, there are some ways in which renewable diesel does not meet the current New Zealand diesel specification (set out in Table 3 below). For instance, since renewable diesel is paraffinic, it is much less dense than petroleum diesel. This means that, if it were to be sold in unblended form, renewable diesel may not meet the minimum density specification for diesel in the Regulations.

Table 3: Renewable diesel (HVO) property comparison with NZ diesel and FAME[13]

Property	Unit measure	NZ Diesel	FAME	HVO
Oxygen	Wt%	0	11	0
Specific gravity		0.835	0.88	0.78
Sulphur	Ppm	<10	<1	<1
HHV[14]	MJ/kg	~45	38	44
HHV	MJ/l	37.6	33.4	34.3
Cloud point	°C	-2 to -8	-5 to +15	-10 to +20

[11] Cetane rating, also known as cetane number, is a measurement of the quality or performance of diesel fuel.
[12] S d'Ambrosio, A Mancarella, A Manelli (2022) Utilization of Hydrotreated Vegetable Oil (HV)) in a Euro 6 Dual-Loop EGR Diesel Engine: Behavior as a Drop-In Fuel and Potentialities along Calibration Parameter Sweeps, *Energies,* 15(19), 7202
[13] This table was originally sourced a journal publication, and has been updated to include values for NZ fuel: https://www.researchgate.net/publication/236677156_New_developments_in_renewable_fuels_offer_more_choices_-_Vegetable_oil-based_diesel_can_offer_better_integration_within_crude-oil_refineries_for_fuels_blending
[14] Higher heating value. Also referred to as the energy or calorific value of a substance. It is the amount of heat released during the combustion of a specified amount of fuel.

Distillation	°C	180-360	320-380	200-320
Cetane number		51 minimum	51-65	70-90
Stability		good	marginal	good

Current Regulations

New Zealand has a specification for biodiesel and a blend percentage allowable in the regulated diesel grade (7 per cent). However, there is no specification for renewable diesel. As renewable diesel does not fit the definition of diesel under the Regulations (as neither a petroleum distillate nor a biodiesel) it is not regulated in New Zealand. This risks substandard renewable diesel being sold in New Zealand and creates uncertainty for fuel importers.

In some instances, fuel companies can sell diesel or diesel blends according to a slightly different specification, via non-retail sale to commercial customers (regulations 15-17 of the *Engine Fuel Specification Regulations 2011*). However, the Regulations are not clear about how these slightly relaxed requirements for non-retail sale of diesel (in certain instances) would apply to renewable diesel. This may be creating confusion for commercial customers (such as trucking businesses), who might wish to use a 100 per cent renewable diesel fuel.

Proposal and rationale

The European Union has developed a specific specification (EN 15940) for renewable diesel. We propose to use EN15940 as the basis for a New Zealand specification covering renewable diesel / HVO and other paraffinic diesels.

Since renewable diesel is so chemically similar to petroleum diesel, we do not propose to impose a blending limit on diesel/renewable diesel blends or labelling requirements for diesel/renewable diesel blends. Due to its renewable source (and higher expected cost), we anticipate that suppliers will want to highlight it for the consumer.

We propose that, for retail sale of renewable diesel, the diesel/renewable diesel blends must meet the density specification for diesel. This would ensure that consumers purchasing fuel from retailers would obtain similar levels of energy (and tailpipe-specific CO_2 emissions) from diesel/HVO blends and petroleum diesel. The density specification would also allow for retailers to blend renewable diesel to a reasonably high level, up to 25 per cent, with current technology.

For non-retail sale of renewable diesel, we propose that renewable diesel can be sold in neat form, without any need to meet the diesel density specification. This would also allow fuel wholesalers and their customers to negotiate commercial agreements to procure blends with very high renewable diesel content.

Questions for consultation

17. **Do you agree that EN15940 should be used as the basis for a New Zealand specification covering renewable diesel (HVO) and other paraffinic diesels? If not, why not?**

18. **Do you agree that the Regulations do not need to prescribe the blending limit on diesel / renewable diesel blends? If not, why not?**
19. **Do you agree that the Regulations do not need to prescribe labelling requirements for diesel / renewable diesel blends? If not, why not?**
20. **Do you agree that, for retail sale of HVO, the diesel/HVO blends should be required to meet the proposed density specification for diesel (820-845 kg/m³)? If not, why not?**
21. **Do you agree that, for non-retail sale, renewable diesel should be able to be sold in neat form?**
22. **Do you agree that, for non-retail sale, any diesel / renewable diesel blends would be exempt from the diesel density specification that would otherwise apply to the retail sale of renewable diesel? If not, why not?**
23. **If we clarify the regulations for renewable diesel, would you expect to see more renewable diesel on the market?**

Miscellaneous technical amendments for diesel specifications

We also propose the following technical amendments for diesel specifications. We do not anticipate any impacts on fuel prices and emissions as a result of these proposals.

Table 4: Miscellaneous technical amendments for diesel specifications

Proposed change	Reason
Replace the maximum limit for diesel's total contamination[15] of 24 milligram per kilogram (**mg/kg**) with 20 milligram per litre (**mg/l**) in Schedule 2.	Correction of the unit of measurement in the test method for total contamination for diesel, in line with international standard ASTM D6217. The proposed level for the specification maximum in mg/l is 20 and this is consistent with the current specification on 24 mg/kg.
For the purpose of estimating the presence of suspended free water and solid particulate contamination in diesel, remove the colour test (ASTM D1500) and add an appearance test using ASTM D4176 with the requirement of "clear and bright, free from visible sediment and water".	For consistency with the latest international standards, such as the WWFC and EN590 (Europe).
For the purpose of estimating the presence of suspended free water and solid particulate	For consistency with the latest international standards, such as the WWFC and EN590 (Europe).

[15] Contaminants may enter the fuel in many ways both intentionally and unintentionally, and many of these contaminants can cause significant harm the powertrain, fuel, exhaust or emission control systems.

contamination in biodiesel (FAME), add appearance test by using ASTM D4176.	
Revise regulation 5 to reflect a biodiesel blending limit of up to 7%, instead of 5%.	European Standard 'EN 590' has been included in the list of 'Generally applicable requirements and test methods for automotive diesel fuel' since 2013. EN 590 allows that diesel fuel may contain up to 7% volume of fatty acid methyl ester (**FAME**), complying with EN 14214.
Clarify the distinction between Regulation 15 ('Requirements relating to diesel sold by non-retail sale') and Regulation 17A ('Requirements relating to marine fuel oil sold by non-retail sale').	Introducing Regulation 17A ('Requirements relating to *marine fuel oil* sold by non-retail sale'), creates ambiguity in how to interpret Regulation 15, especially, 15(1) ('Requirements relating to *diesel* sold by non-retail sale'). Marine fuel oil is defined by the Regulations as "any engine fuel other than petrol delivered to a ship, and intended for combustion purposes for propulsion or operation on board a ship." We need to clarify the distinction between 15 and 17A.

Questions for consultation

24. **Do you support these miscellaneous technical amendments for diesel specifications? If not, why not?**

Implementing the Fuel Quality Monitoring Programme

We also propose the following technical amendments that are related to how MBIE implements our fuel quality monitoring programme.

Table 5: Technical amendments related to fuel quality monitoring

Proposed change	Reason
Revise regulation 4 so that it is clear the Regulations apply to marine fuel oil.	The current wording of Clause 4 is too focused on petrol diesel, biodiesel and ethanol. It should be clear that marine fuel oil is covered by the Regulations.
Revise regulation 5 so that the definition of 'engine fuel' includes marine fuel oil. Currently, 'engine fuel' means "any gaseous or liquid fuel that can be used as a fuel for engines, and includes biofuel, diesel, petrol, synthetic fuel, and blends of these."	The current definition does not expressly include marine fuel oil that was recently introduced in the Regulations.
Update Regulation 21 so that it does not refer to a specific year of issue for ISO standard 9001 (currently it refers to the year 2000), and so that it instead refers to a requirement for accreditation to ISO 9001, ISO 17020 or ISO 17025.	Regulation 3 already specifies that "ISO 9001" always means the latest version of that document. So, it is not necessary to specify a year of issue for ISO 9001. Additionally, ISO 9001, ISO 17020 and ISO 17025 reflect the latest ISO accreditation that the industry has adopted for fuel sampling and testing.
Update regulation 21 so that it refers to accreditation of an organisation or agency, rather than an individual or employee.	Currently, individuals who collect samples are required, according to the Energy Act 1989, to obtain written authorization from MBIE. Since MBIE usually sub-contracts fuel sampling and testing tasks to large third-party organisations (which tend to have many employees), individual, written authorisation to an individual in every instance can be challenging. Changing the requirement so that it is instead organisations that require accreditation, would practically streamline the authorisation process.
Review and update the Excise and Excise Equivalent Duties Table to align with	The Table and Regulations should be harmonised to provide clarity about how legal

terminologies for fuel products in the Engine Fuel Specifications Regulations where possible.	requirements, such as those relating to the petroleum or engine fuel monitoring levy, apply to different fuel products imported and supplied to New Zealand.

Questions for consultation

25. Do you support these proposed changes to the implementation of MBIE's Fuel Quality Monitoring Programme? If not, why not?

Summary of questions:

1. Should New Zealand reduce the allowable aromatic content of both regular 91, premium 95 and premium 98 petrol to 35 per cent? If not, why not? What level do you consider it should be set at?
2. Should proposed changes come into effect from 1 December 2025? If not, why not?
3. If these proposed changes were implemented from 1 December 2025, would this delay the supply of Euro 6d petrol vehicles to New Zealand? Why?
4. Do you have any information on the likely cost impact of changing the maximum aromatic level for 95 and 98 RON petrol?
5. Besides ethanol, do you consider that there are any other octane enhancers that could be used to produce premium petrol with a low aromatic level, which should be allowed by the Regulations? If not, why not?
6. Do you agree that we should add a silver strip corrosion test to the Regulations, Schedule 1, using either ASTM D7667 or ASTM D7671?
7. Do you have a preference on whether to use ASTM D7667 or ASTM D7671, or both?
8. Do you agree that the maximum allowable sulphur requirement for ethanol denaturants should be relaxed, so long as the final denatured ethanol is less than 10ppm sulphur? If not, why not?
9. If the requirement is relaxed, should there still be a maximum allowable level of sulphur for denaturants? If so, what should that level be? If not, why not?
10. Should we introduce a petrol density range to the specifications? If not, why not?
11. If a range is introduced, should the density range be 720-775 kg/m3. If not, why not?
12. Do you support these technical amendments for petrol and ethanol specifications? Are there any that you disagree with? Why?
13. Should the maximum allowable diesel density be reduced to 845 kg/m^3? If not, why not?
14. For FAME blends, should the density relaxation be removed (845kg/m^3) or reduced in line with the proposed maximum density change for diesel (849kg/m^3)? If not, why not?
15. Do you agree with lowering the maximum PAH percentage from 11 per cent to 8 per cent? If not, why not?
16. Do you agree with reducing the filter blocking tendency limit from 2.5 to 2.0? If not, why not?
17. Do you agree that EN15940 should be used as the basis for a New Zealand specification covering renewable diesel (HVO) and other paraffinic diesels? If not, why not?
18. Do you agree that the Regulations do not need to prescribe the blending limit on diesel / renewable diesel blends? If not, why not?
19. Do you agree that the Regulations do not need to prescribe labelling requirements for diesel / renewable diesel blends? If not, why not?
20. Do you agree that, for retail sale of HVO, the diesel/HVO blends should be required to meet the proposed density specification for diesel (820-845 kg/m^3)? If not, why not?
21. Do you agree that, for non-retail sale, renewable diesel should be able to be sold in neat form?

22. Do you agree that, for non-retail sale, any diesel / renewable diesel blends would be exempt from the diesel density specification that would otherwise apply to the retail sale of renewable diesel? If not, why not?
23. If we clarify the regulations for renewable diesel, would you expect to see more renewable diesel on the market?
24. Do you support the miscellaneous technical amendments for diesel specifications? If not, why not?
25. Do you support the proposed changes to the implementation of MBIE's Fuel Quality Monitoring Programme? If not, why not?

List of abbreviations

MBIE	Ministry of Business, Innovation and Employment
ASTM	American Society for Testing and Materials
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2-e	Carbon Dioxide equivalent
Cpl	cents per litre
FAME	Fatty Acid methyl ester
FBT	Filter blocking tendency
H_2S	Hydrogen sulphide
HC	Hydrocarbons
HHV	Higher heating value
HVO	Hydrotreated Vegetable Oils
ICE	Internal combustion engine
NOx	Nitric oxide
PAH	polycyclic aromatic hydrocarbons
PM	particulate matter
Ppm	parts per million
RON	Research Octane Number
WWFC	World Wide Fuel Charter