Vanuatu Fuel Standards Policy Brief

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Vanuatu Background

Vanuatu is composed of 83 islands covering an area of 12,200 square kilometers. With an almost entirely Melanesian population of 300,019 people, registered in the 2020 census[1], Vanuatu is the fourth largest country in the Pacific following Papua New Guinea, Fiji, and Solomon Islands. The population growth rate in 2020 was 2.3%, with 22.3% of the population residing in urban areas.

Vanuatu is a 100% petroleum importer with no proven crude oil reserves or refining infrastructure. The dispersed nature of its islands makes pipeline distribution unfeasible. The downstream infrastructure is, therefore limited to import, storage, and distribution facilities. Under the updated Vanuatu National Energy Roadmap 2016-2030 (NERM) it is planned to aim for cost reduction of petroleum distribution of 5-10 per cent, by investment in a barge to switch from delivery of fuel in drums to bulk deliveries. The document also states that distribution costs are not monitored and regulations monitoring petroleum prices are not currently in place[2]. Vehicle and fuel standards contribute to emissions by reducing GHG emissions and air pollutants from the operation of vehicles. However, Vanuatu currently has no fuel quality standards.

In 2020 there was an estimated total of 8,517 vehicles, consisting of 3,153 Motorcars, 2,470 Pick-ups, 1,618 Buses, 681 Trucks and 596 Bikes[3]. The number of vehicles is growing rapidly, despite the limited road network, with a 6.2% growth per year between 2007 and 2016[4]. The enhanced National Determined Contributions (NDC) state that "The number of vehicles in Vanuatu will likely increase in the future due to increased economic activity, GDP per capita income, and overall transport infrastructure. The estimated cumulative number of new vehicles will reach over 25,000 in 2025 and over 32,000 by 2030, compared to just around 5,000 in 2010. Diesel and gasoline (petrol) consumption are likely to increase by 227 per cent and 147 per cent, respectively, compared to 2010. In addition, overall GHG emissions from the transport sector are estimated to reach 87.81 Gg CO_2e in 2025 and 98.60 Gg CO_2e in 2030."

The energy sector currently contributes 20% of the total GHG emissions and has become Vanuatu's largest GHG emitter and fossil fuel consumer[5]. 83% of fossil fuel consumption and GHG emissions from 2010 to 2015 can be attributed to the land transport sector. In its NDC, Vanuatu aims to approach 100% renewable energy in the electricity sub-sector and set 30% GHG reductions in the energy sector, including the transport sector. The National Air Quality Policy Concept note acknowledges fuel quality as a contributor to vehicle emissions. Establishing vehicle emission standards has been prioritized in Vanuatu's Enhanced NDC, the NERM and the Low Emission Development Strategy 2050 (currently under development).

The UN Climate Technology Center & Network (CTCN) conducted a feasibility study in August 2020, which highlighted Vanuatu's alarming dependency on imported fossil fuels for its energy and transport needs. Over 56 million litres of fuel are imported each year with diesel being the largest volume (63%), from which land transport has a vast 50% followed by 38%

1 Vanuatu National Statistics Office (VNSO), 2021. 2020 National Population and Housing Census
2 Vanuatu National Energy Road Map, 2016-2030, Implementation Plan
3 UNIDO, 2022, Feasibility Study for Low Emission Land Transport in Vanuatu
4 UNDP, 2020, Vanuatu's Enhanced Nationally Determined Contributions (NDC) 2020-2030
5 UNDP, 2020, Vanuatu's Enhanced Nationally Determined Contributions (NDC) 2020-2030

contributing to electricity. Consequently, it is safe to say that the largest contributor to GHG emissions in Vanuatu comes from the land transport sector. The subsector analysis of total CO_2 emissions suggests that they come primarily from the transportation subsector (47.27%), including road transport (80%) domestic aviation (12%) and domestic water-borne navigation (8%). Energy follows (32.5%), and the remainder comes from other sectors (4.96%), including the commercial, institutional, and residential subsectors.

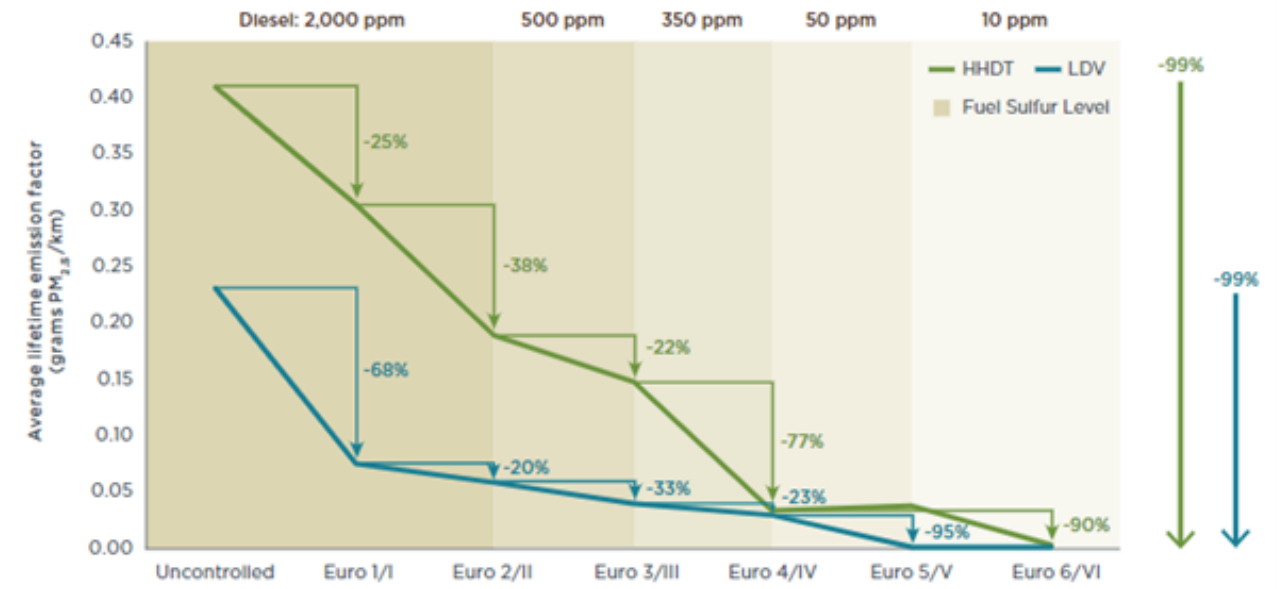
Vanuatu's main fuel supplier is Pacific Petroleum, a Pacific Islands-based company. They purchase product from the Asian market and ship it to various Pacific Island Countries (they operate in more than 10 countries) on Medium Range (MR) tankers. Vanuatu can only take a small amount from a tanker so it is supplied as part of a voyage that also supplies other countries such as Fiji, New Caledonia, and Solomon Islands among others. A smaller supplier, Vanuatu Refuelling Services, receives fuel in isotainers[6] on container ships from New Zealand.

6 Isotainers are container sized liquid fuel tanks holding approximately 20,000 litres (also called tanktainers).

Fuel Quality Standards

According to the World Health Organization (WHO), approximately one in eight global deaths in 2012 was a result of air pollution exposure, making this the world's single largest environmental health risk. The main cause is fine particles (PM2.5). Vehicles are significant sources of PM2.5 and in many cities the major source. To reduce PM2.5 emissions from vehicles there is an urgent need to introduce low-sulfur fuels – fuels with no more than 50 parts per million (ppm) sulfur, and ideally ultra-low 10 or 15 ppm sulfur[7]. Apart from health risks by PM2.5, the reduced emissions from improved fuel standards also bring substantial climate benefits by GHG emission reduction.

The below table shows the sulfur contents by emission standard and the PM2.5 average lifetime emission factors for diesel vehicles[8]:



The ICCT recommends that "progressing to Euro 6/VI–equivalent standards for new and imported vehicles as expeditiously as possible is of paramount importance, either in a single leap or through intermediate standards. Governments should coordinate the implementation of vehicle emission standards with a national pathway to ultra-low-sulfur fuel, which is not only required for the most advanced emission controls but can also reduce emissions from the legacy vehicle fleet."[9]

Regulations

This regulation aims to address the issue in reduction of vehicle emissions contributing to air pollution under the Pollution Control Act No 10 of 23.

7 CCAC Secretariate (UNEP), 2016, Cleaning up the Global On-Road Diesel Fleet – A Global Strategy to introduce Low-Sulfur Fuels and Cleaner Diesel Vehicles

8 The International Council on Clean Transportation, 2013, The Impact of Stringent Fuel and Vehicle Standards on Premature Mortality and Emissions

9 The International Council on Clean Transportation, 2013, The Impact of Stringent Fuel and Vehicle Standards on Premature Mortality and Emissions

Regional Context

The following table provides key regional fuel standards and supply data to provide context for the recommended fuel standards for Vanuatu. It reflects recent fuel standard updates in many Pacific Island Countries.

Memorandum of Understanding (MOU) with fuel supplier

While Vanuatu does not have any legislated fuel standards, Pacific Petroleum signed a MOU with the Department of Energy (DOE) in 2012/2013 which we understand includes fuel quality standards. This can be a way of ensuring fuel standards while regulated standards are put in place, although should be done with all importers if it is going to take some time to put regulations in place.

TABLE 1 Comparing other Pacific Island Countries

Country	Standards	Pricing	National or regional standards authority	Standards adequate/ properly enforced	National testing laboratories
Fiji	Fuel quality and standards are similar to Euro 5/VI at max 10ppm sulphur for petrol and diesel[10]. No MTBE[11] is allowed in petrol. Petrol is 95 RON minimum	Fijian Competition and Consumer Commission (FCCC) determines the regulated prices of Unleaded Petrol, Premix, Kerosene, Diesel and LPG	Yes	Yes, Ministry of Trade, Cooperatives, Small and Medium Enterprises is responsible for enforcement of the fuel standards in Fiji	Yes, with the ability to fully test fuel
New Caledonia	Diesel is similar to Euro VI (10 ppm sulphur). Petrol specification is currently similar to Euro 4 (50ppm) but is being updated. Actual supply is already at 10ppm.	Regulated	Yes	No information	No known
Papua New Guinea	No information	ICCC plays an active role in monitoring the ex-refinery price of petrol, diesel and kerosene prices in PNG and also domestic transport costs	Yes	No information	Yes

10 The importation of 500pm fuel will only be permitted for re-export purpose. In this regard, the importer must apply for import licence from the Ministry of Trade, Cooperatives, Small and Medium Enterprises.

11 MTBE is an oxygenate which is discussed in the specific issues discussion in this document.

Tonga	No published standards but as fuel is supplied through Fiji, Fiji standards set the default	Set by the Tonga Competent Authority supported by the Ministry of Trade and Economic Development	No, as fuel imported via Fiji standards are to Fiji National Standards	No	Only local cargo receipt testing. Major tests are done in other countries.
Kiribati	Fuel quality standards are to international specifications	Government sets the fuel price for some products, but new legislation is underway to regulate all petroleum products under the Ministry of Infrastructure and Sustainable Energy.	No (Standards in process for regulatory approval by MISE – Energy Division)	No	No (Testing is done in NZ)
Solomon Islands	National: Based on Australian and New Zealand standards	Set by the Price Advisory Committee supported by the Price Control Division of the Ministry of Commerce, Industry, Labour & immigration	No	No	Only local cargo receipt testing. Major tests are done in other countries.
New Zealand	Standards set and are similar to Euro 6/VI for most specifications (10ppm diesel). No MTBE is allowed in petrol. Petrol has 91, 95 and 98 RON grades	No regulation but prices monitored by the Commerce Commission	Yes	Yes, testing mechanism funded by a levy on fuel sales	Yes

Fuel Standards Discussion

Fuel standards need to cover both environmental and operability standards. Some countries (e.g. the Euro standards) focus the regulated standards on specifications that manage the environmental performance (e.g. sulphur) and leave the operability standards to be managed by industry. This means in some cases regulated standards are not as comprehensive as a quality certificate from a supplier. Some countries (e.g. New Zealand) cover both factors in the regulated standard.

The agencies reporting on the market pricing (primarily Platts[12] in this region) also publish fuel specifications that are associated with each market product benchmark. Currently for the Singapore Platts petrol benchmark the quality is similar to Euro 4 (50ppm sulphur) while for diesel it is similar to Euro V/VI at 10ppm sulphur. If a company is purchasing a product that is higher than the market specified quality (e.g. 10ppm for petrol), they would expect to pay a premium against the benchmark.

National specifications should as much as possible reflect the supply dynamic of the region and not the supply ability of any one specific company. Specifications should not be used in this way as it could restrict competition.

We should note the Euro 5/V[13] and Euro 6/VI have the same fuel specification. Euro 6/VI have much tighter emissions standards for the vehicle fleet rather than a change in fuel quality. This document refers to Euro 5/VI in terms of fuel quality (i.e. 10ppm sulphur) and references Euro 6/VI when considering the fleet emissions targets.

12 Platts is a global market price assessment agency owned by S&P Global

13 For Euro standards the numeral (e.g. 5) refers to the petrol standard, whereas the Roman numeral (e.g. V) refers to the diesel specification.

Supply Dynamic and Impact on Fuel Standards

It is important to consider other Pacific Island Countries' fuel standards in the development of fuel standards for Vanuatu, as Vanuatu's fuel is supplied on ocean tankers that also supply these countries on the same voyage. During consultation (detailed in Appendix 2), Vanuatu's main supplier (Pacific Petroleum) noted that Vanuatu's fuel was supplied on tankers that can also supply New Caledonia, French Polynesia, Fiji and the Solomon Islands. There is limited ability for tankers[14] to load different fuel grades noting that they already need to keep petrol, jet fuel and diesel in separate compartments. For a country with relatively small demand like Vanuatu, it needs to have similar standards as these countries to ensure efficient bulk supply.

Small quantities of fuel can also be delivered in isotainers[15] on container ships, and this method is used by Vanuatu's smaller supplier. In this case the fuel will meet the fuel specification of the source country. It is important for Vanuatu to have fuel standards to ensure fuel is only sourced from countries that have an appropriate fuel standard.

14 A typical fuel Medium Range fuel tanker may have at most six segregations, with the smallest segregations usually around 5-6 million litres. As diesel dominates most Pacific Islands supply demand, that leave very little room to segregate other fuel qualities. Refineries will also set minimums on supply of a single product grade, and these are a similar level (i.e. at least 5-6 million litres). A tanker supplying product to Vanuatu will usually only be supplying 5-6 million litres of all products so there is no possibility of having different standards to other countries on the supply route.

15 A single isotainer contains around 20,000 litres so is small in the context of the total demand.

Specific Issues Impacting the Fuel Standards

Petrol

A key factor determining the specification for petrol is the octane desired and additives allowed. While Europe has moved to only premium octane fuel (at least 95 Research Octane Number (RON)[16], many countries in Asia still use a regular fuel (91 RON). Higher octane fuel allows car manufacturers to design engines to run at higher compressions improving efficiency. Many vehicles (particularly those from Europe) now require at least 95RON/85MON petrol.

While larger countries usually have a variety of grades to cover different vehicle requirements (e.g. Australia and New Zealand have 91, 95 and 98 RON fuel grades) for most Pacific Island Countries the smaller demand means only one petrol grade is feasible. Because of this most Pacific Island Countries (since Fiji moved to 95RON in 2019) now use 95RON fuel. In terms of enabling the fleet to capture the emissions improvements available, this is a sensible decision, although there is a cost premium associated with higher octane fuel.

Higher octane components in petrol are more expensive to refine and many countries use high octane oxygenate additives called methyl tert-butyl ether (MTBE) or ethyl tert-butyl ether (ETBE) to help blend high octane grades. While vehicle manufacturers are typically against additives in fuel, they are comfortable with MTBE and ETBE as these have been used in petrol for many decades and have been components of their test fuels. However, MTBE (and to a lesser extent ETBE) is controversial as it is very soluble in water, and in the event of a spill can taint water supplies even at parts per billion concentrations. The United States banned MTBE/ETBE decades ago following some spill incidents. Europe and much of Asia have taken a different approach and said it is about correct product management, and MTBE is fine to use if the product is handled correctly. Australia, New Zealand and most Pacific Islands have followed the USA approach and have banned MTBE in fuel. This is done for risk management reasons.

This is a very complex debate, and our recommendation is Vanuatu standards reflect the current Pacific Islands position and not allow MTBE/ETBE. As most Asian fuel (and the benchmark standards used for price setting) allow MTBE, generally a premium is paid for non-MTBE (also referred to as non-oxy) fuel. It also means that the aromatics are higher than they might be for the same octane fuel containing MTBE (aromatics[17] are high octane components in petrol blends). For this reason, most fuel in this region has higher aromatic specification than the Euro 5 standard of 35% maximum.

These include the following:

- New Zealand: 45% maximum on an individual blend, and 42% maximum on pool average[18]
- Australia: 45% maximum on an individual blend, and 35% maximum on pool average across all grades[19]

16 There are two main octane measurements on fuel, RON and MON (Motor Octane Number) They both measure a fuels resistance to premature ignition (call anti-knock properties), with RON reflective of economy performance and MON the power.

17 Aromatics are cyclic hydrocarbon compounds, that together with naphthenes (branched hydrocarbons) and paraffins (straight chain hydrocarbons) make up fossil fuels. Aromatics are limited in fuel as when combusted they can from volatile organic compounds the contribute to the formation of ground-level ozone and smog

18 New Zealand is looking to review this specification as the closure of its refinery has resulted in lower aromatic fuel being supplied

19 This was implemented from January 2022

- New Caledonia: Currently 50% with a proposal to move to 45% maximum
- Fiji: Maximum 45%
- Pacific Petroleum import specification: Maximum 45%

Although the aromatic specification in this region is quite high relative to the Euro standard, based on analysis of Australian and New Zealand fuel, we expect most (but not all) imported fuel to be below a 35% aromatic level[20]. However, if a 35% maximum aromatic specification is implemented in an unplanned way, without coordination between other countries and suppliers, it could lead to higher prices as the number of possible fuel suppliers may be restricted.

Higher levels of aromatic in petrol can result in higher toxic emissions so it is important that efforts are made to reduce them. In addition, for Euro 6 designed vehicles lower emissions levels are required to ensure correct working of the exhaust controls to meet the vehicle emissions reductions required under those standards. Emissions will still be reduced using higher aromatic fuel, but not to the same extent, and the manufacturers' warranties in this area may be voided. Australia and New Zealand are both investigating this issue, and it makes sense for Pacific Islands to review both their fuel specifications and requirements for the vehicle fleets in light of decisions made by those countries (expected for 2025).

Diesel Standards

Diesel is similar in that most Pacific Island Countries have moved to a 10ppm sulphur maximum standard (Euro V). The 10ppm quality diesel is now the main traded grade in the Asian region, and the grade used for setting benchmark prices. While 10pppm diesel is more expensive than higher sulphur grades (requires more refining), the incremental cost has reduced as 10ppm diesel has become more common.

While most 10ppm diesel in the region aligns with Euro V, there are a few minor differences. These include the polyaromatic hydrocarbon (PAH) level and density. The PAH level is normally restricted as they can have adverse health and environmental effects when combusted. The typical restriction in Pacific fuel is 11% maximum (as are the Australian and New Zealand specifications), whereas Euro V fuel is 8% maximum. Most modern refineries actually produce diesel with much lower PAH's and analysis of New Zealand fuel show typical levels around 2%[21].

The maximum diesel density currently allowed in most Pacific fuel (and Australia and New Zealand) is 0.850 kg/m3. The Euro VI specification is a maximum of 0.845 kg/m3. The lower maximum ensures not too many of the heavier components that can result in more particulate emissions are included. Again, most modern refineries produce less than 0.845 kg/m^3 of fuel density to meet all the other specifications when producing 10ppm sulphur diesel. In fact, the Platts specification for diesel in Asia (the benchmark used for purchase) has a 0.845 kg/m3 maximum.

While most imported fuel is likely to meet these tighter specifications, we expect the vehicle manufacturers would rather guarantee that through a tighter specification. These moves should be made in future, but like aromatics in petrol, this should be done in a coordinated fashion with suppliers and other countries. This would minimize any cost impact from the change.

20 The quality certificate of the imported from Singapore in December 2022 had a 29.3% aromatic level

21 https://fuelquality.tradingstandards.govt.nz/about-us/fuel-quality-monitoring-annual-reports/ pg 37

Options for Fuel Quality Standards

The Department of Environmental Protection & Conservation (DEPC) has the mandate to implement the Pollution Control Act No 10 of 2013 (PCA).

Under the PCA, the Director of the Department of Environmental Protection and Conservation, or their delegate, is currently empowered to issue prescribed standards dealing with, amongst other things, the quality of fuel:

The standard for the quality of fuel to be under section 27 of the Pollution (Control) Act:

Section 27(2), Pollution Control Act No.10 of 2013 Regulations

(1). Regulations may be made under this Act for the proper management and regulation of pollutant discharges and emissions and for the effective implementation of this Act.

(2). Without limiting the generality of subsection (1), regulations may be made to:

- prescribe pollution control measures and standards;
- prescribe measures and standards for the quality of fuel;

Drafting instructions from Minister of Climate Change Adaptation, Meteorology & Geo-Hazards, Environment, Energy and Disaster Management (MCCA) to legal consultant Jones Day

- "- Fuel, in the form of petrol and diesel, is imported into Vanuatu. There is currently one importer who delivers fuel to Vanuatu as part of shipping arrangements that also cover New Caledonia. As a result, Vanuatu obtains fuel that is designed to meet European Union (EU) standards. However, there is no requirement for fuel imported into Vanuatu to be of a particular quality and in the past, there has been at least one incident where the quality of fuel supplied was poor and resulted in the damage of many 2-stroke engines. The absence of quality standards meant that it was difficult for persons affected by the poor quality fuel to be compensated.
- Apart from these isolated incidences, fuel that meets the EU standards is generally of a higher quality than that used in other Pacific countries. As a result, the fuel imported into Vanuatu is more expensive than fuel available to other Pacific countries. In order to open the market to other potential suppliers, it is proposed to introduce standards for fuel in Vanuatu that are different to the EU standards while still meeting environmental and health requirements.

"Fortunately since these drafting instructions were given, most fuel quality in Pacific countries has moved close to Euro 5/V quality particularly for sulphur where 10ppm maximum is common for both petrol and diesel. The cost of those better fuels is built into current prices. The recommended specification ensures the benefits of the better-quality fuel are captured on a permanent basis.

Fuel Standards Upgrading Cost

Upgrading fuel standards can increase the refining costs which then feed through to higher fuel prices. However, with a global move to higher quality fuel, the benchmark grades reflect that improvement and become the new standard. In Asia, the benchmark petrol grade is similar to Euro 4 (50ppm sulphur maximum), whereas the benchmark diesel grade is already Euro V equivalent at 10ppm maximum and has been for a few years. There is minimal cost saving from reducing the standards compared to the benchmark quality available, and certainly not when the operability, health and environmental risks are taken into account.

The largest prospective cost impact for Vanuatu would be if its standards did not follow the typical qualities supplied in the region (e.g. Fiji, New Caledonia). To establish an independent supply chain (e.g. supply through isotainers) to get a special quality fuel is likely to be an order of magnitude more expensive than any saving in fuel quality cost.

Some of the future standard changes proposed could increase fuel costs if not implemented in conjunction with other countries and the suppliers. However, if done sensibly any cost impact should be minimal, and these changes will be required in time to fully ensure Euro 6/VI vehicles will provide the emissions reductions that they are designed to do.

It is important to note that fuel costs can be affected by various factors, and the impact of upgrading fuel standards on fuel prices will depend on the country's specific circumstances. Factors such as the availability of refining capacity, the cost of crude oil, and government taxes and subsidies can all impact fuel prices. Additionally, implementing Euro 5 standards could also lead to lower fuel consumption and less maintenance costs for vehicles, which in the long run will offset the increased cost of fuel.

It is also worth noting that upgrading fuel standards is often done to improve air quality and public health, and to reduce emissions from the transport sector, which in the long run could lead to a reduction of costs related to health and environmental issues.

Better quality fuel may only cost in the order of an additional 1-2 VUV/litre, which is very small in the context of the overall price of fuel. There are likely to be other parts of the Vanuatu supply chain where an efficiency focus could bring much more significant fuel price improvements.

Options to be Considered

OWN STANDARD NOT ADHERING TO ANY INTERNATIONALLY USED STANDARD

- Impacts: Potential impact on price levels could be severe as it would disrupt the current supply chain and is likely to result in a much more expensive supply cost (and less supply security).
- Cannot show clear emission reduction benefits from reference projects due to lack of comparable data.
- Cannot ensure that newer car model's engines are matching with the fuel standards – would require a difficult exercise to determine.
- Why would a small country invent their own standards- it loses the ability to take advantage of economies of scale by working together with other countries.
- Not recommended

APPLYING A EURO5 EQUIVALENT (SIMILAR TO FIJI, THE PROPOSED NEW CALEDONIA STANDARD AND CURRENT SUPPLY):

- Impacts: While this is better quality than the Asian benchmark, any price increment is already included in Vanuatu's price. Therefore, there is no further price impact.
- Most efficient for emission reduction when paired with vehicle standards – better fuel standards always work with older car models, but if fuel standards are not updated, they limit the newer vehicles on the market which can be imported.
- There are still some specifications that don't match Euro 5/V although, largely the fuel supplied will. At the appropriate time (in conjunction with fuel suppliers and other countries) certain specifications should be updated. In the meantime, the benefits from emissions controls on Euro 6/VI vehicles can still largely be obtained.
- Pro: Costs of fuel offset by:
  - Lower Public Health Cost – especially relevant as almost one-quarter of the population lives in urban areas.
  - If NERM is implemented – offset in addition by 5-10% decline in fuel distribution cost
  - Quality certificates can be provided with imports to ensure specifications are meet
  - Additional testing could be outsourced in agreement with other Pacific countries and/or private petroleum firms – no need for additional investment in administrative/technical staff and infrastructure
  - If bundled with matching vehicle standards – better fuel economy, lower demand and reduced consumer expenditure.

Applying the Euro 5/V equivalent is the recommended approach, and the specific specifications are included in Appendix 1 for petrol and diesel. These are very similar to the current Pacific Energy import specification and the specification for Fiji. They are also similar to the New Zealand specification so that a supplier purchasing product in New Zealand will also be compliant[22]. A table is provided outlining where these differ from either the Euro 5/V or the current import specification.

The recommended regulated standards do not cover all the specifications that suppliers may include in purchase specifications (this is the same with Euro specifications) as a supplier can build additional margins into a purchase specification or include new specifications coming into the market that may not yet be covered in regulated specifications. For example, the proposed specifications are generally more comprehensive than the Euro specifications. In some cases the Pacific Petroleum purchase specification is tighter than other regional specifications (and Euro 5/V fuel). In this case we recommend the more typical standard (Euro 5/V level) so there is no risk of restricting the supply to only one supplier.

22 Note Australian premium petrol is currently only Euro 4 standard, so until they improve the quality (expected at the end of 2024), Australia will not be a suitable supply point for Vanuatu

FUEL TESTING OPTIONS FOR STANDARD CONTROL AND ENFORCEMENT:

a. Establish a national testing laboratory in Vanuatu
b. Use testing facilities by private companies in Vanuatu
c. Use overseas testing facilities in Australia or NZ
d. Agreement with New Caledonia to accept testing results and use the same standard

It is important that a country can do sufficient tests to ensure fuel is acceptable for receipt from the vessel which can include appearance and density. However, the full suite of tests involves tests that require specialists and expensive equipment (e.g. octane engine) which are only sensible to have in larger countries where many tests are required. The supplier will have a certificate of quality from the load port (inspection and testing is done in the supplying country) and this should be submitted to the Vanuatu authorities with each import to ensure compliance with the specification. This will cover all the regulated specifications (and more when specified by the purchaser).

To ensure quality is maintained through the supply chain, Vanuatu could establish a testing procedure which randomly selects fuel from service stations to check for quality (this is often part of a process that also tests that the quantity dispensed is also accurate). The regulations to give the ability to test is important, although biannual testing frequency is probably suitable given the small volumes involved. In this case, samples would need to be sent to offshore facilities to do a full test (Australia or New Zealand). In New Zealand this testing regime is funded by a levy on fuel and more details are available on the regime at the Trading Standards website.[23] We understand some Vanuatu commercial fuel consumers request full certification testing from the supplier from time to time.

TIMELINE FOR IMPLEMENTATION:

There are two options for the implementation.

a. In one step
b. In gradual steps

Given the current fuel supply is already of quite high quality, the recommended specification could be implemented in a single step. There are no changes the two suppliers need to make as both suppliers would comply with the new standard (as long as Vanuatu Refuelling Services purchase premium quality fuel in New Zealand).

The current quality allows the standards for vehicle imports to be put in place as a parallel work stream. As both diesel and petrol are at 10ppm sulphur maximum the latest vehicle technology would find the current quality of fuel acceptable.

There are some proposed changes that should be considered in conjunction with suppliers and other countries in the region. These should be done as part of a future review process that is covered below.

The benefits from Vanuatu implementing a fuel standard will be to ensure all the market is receiving a high-quality fuel. The environmental benefits come from changes such as ultra-low sulphur levels resulting in lower emissions. In particular, the recommended standards will allow Euro 6/VI vehicles equipped with advanced emissions control technology to be imported. This results in substantial reductions in NOx and particulate matter emissions. This results in both health and environmental benefits for the people of Vanuatu.

23 https://fuelquality.tradingstandards.govt.nz/

Future Standards Updates

Fuel standards are improving globally, and Vanuatu has been receiving improved fuel as part of this progression despite not having any legislated fuel standards. Standards will continue to improve as more countries and vehicle manufacturers demand better fuel quality. An example is diesel in the Asian region, where the quality benchmark grade (typically the highest volume grade) has improved from 500ppm to 50ppm and then to 10ppm maximum sulphur over the past decade.

Due to this continuous improvement, we recommend there is a five-year review process put in place where Vanuatu fuel standards are reviewed with the relevant stakeholders and updated to reflect improvements where needed. Ideally this process would be carried out together with countries who are on the same supply network as Vanuatu.

The table below highlights key areas of improvement to make the fuel more consistently align with Euro 6/ VI fuel and vehicle standards.

TABLE 2 Proposed future adjustments for petrol

Specification	Suggested Change	Discussion
Aromatics	Reduce the maximum aromatics to at least 40% and preferably 35%	While more difficult when not using MTBE, it appears most 95 octane fuel available in Asia does have aromatic levels lower than 35%. However, implementing this specification without consultation could restrict supply options and lead to higher costs. Therefore, the move needs to be carefully considered.
Density	Reduce the maximum density to 0.775 kg/l to align with Euro 6.	We expect most fuel being supplied is well below this level, but a new limit should be implemented on a regional basis.

TABLE 3 Proposed future adjustments for diesel

Specification	Suggested Change	Discussion
Density	Reduce maximum density from 0.850 to 0.845 kg/l.	This is already aligned with the regional benchmark specification so it could be done without cost. However, it should be worked through with the suppliers and other countries to ensure supply security.
PAH	Reduce maximum PAH level from 11% to 8%.	Most 10ppm diesel fuel is likely to be well below the 8% level so this change can be made without cost. It would be good to make the change in line with a similar change to the benchmark specification which should ensure no cost is added for something the fuel generally already meets.

Recommendation

The recommended fuel specifications are provided in Appendix 1. In both cases they are similar to Euro 5/VI fuel and therefore likely to be enabling for a Euro 6/VI vehicle fleet. While some specifications still vary from the standard Euro specification, the fuel itself is likely to comply most of the time and meets the standard on the key sulphur restriction. The standards are developed based on the standard in Fiji, the proposed standard for New Caledonia and the standard in New Zealand. All these countries have similar fuel standards and are either supply points for Vanuatu (Fiji or New Zealand) or are supplied on the same voyage (Fiji, New Caledonia).

Both petrol and diesel biofuel components (ethanol for petrol and FAME[24] for diesel) are restricted. This is because they are not suitable for shipping with petroleum fuel. Should Vanuatu want to encourage biofuel at a local level, this should be done as a specific amendment to cover what can be used locally.

24 Fatty Acid Methyl Ester is a biodiesel produced from renewable sources. It needs to be blended in limited proportions when used in diesel vehicles.

Appendix 1: Detailed Proposed Specifications

Requirements for premium grade petrol

Specification	Standard	Test
Research Octane Number (RON)	95.0 minimum	ASTM D2699
Motor Octane Number (MON)	85.0 minimum	ASTM D2700
Lead (mg/l)	5 maximum	ASTM D3237 or ASTM D5059
Density @ 15 ºC (kg/l)	Min 0.725 - 0.780 Max	ASTM D4052
Sulphur (mg/kg)	10 maximum	IP 497 or ASTM D5453
Percentage volume evaporated at 100ºC (E100)	46 minimum	ASTM D86
Percentage volume evaporated at 150ºC (E150)	75 minimum	ASTM D86
End point (ºC)	210 maximum	ASTM D86
Residue (% volume)	2 maximum	ASTM D86
Vapour Pressure (DVPE) (kPa)	Minimum: 45 kPa	ASTM D5191
	Maximum: 75Kpa	
Flexible Volatility Index [VP (kPa) + (0.7 x E70)]	96.0 maximum	Calculation
Colour	Not to be mistaken for water	Visual
Copper strip corrosion (3 hours at 50ºC)	Class 1 maximum	ASTM D130
Silver corrosion (3 hours at 50ºC)	Class 1 maximum	ASTM D4814
Doctor Test	Negative	ASTM D4952
Existent gum (solvent washed) (mg/100 ml)	4 maximum	ASTM D381
Oxidation stability induction period (minutes)	360 minimum	ASTM D525
Benzene (% volume)	1 maximum	ASTM 3606 or ASTM D5580
Total aromatic compounds (% volume)	45 maximum	ASTM D1319 or ASTM D5580
Olefins (% volume)	18 maximum	ASTM D1319
Ethanol (% volume)	1 maximum	ASTM D4815
Total oxygen (% mass)	1	ASTM D4815
Methyl tertiary butyl ether (% volume)	1.0 maximum	ASTM D4815
Phosphorus (mg/l)	1.3 maximum	ASTM D3231
No metallic additives added		

Variation from Pacific Petroleum (PP) current supply or Euro 5

All recommended specifications are the same as the current supply or Euro 5 except where specified in the table below.

Specification	Standard difference	Comment
Density @ 15 ºC (kg/l)	Max 0.780 rather than Max 0.775	Recommendation in line with PP, Fiji and NZ. Euro 5 is 0.775 max and that should be a future change
Percentage volume evaporated at 100/150 ºC	Similar	The recommendation is in line with Euro 5. PP specifications are similar but more extensive than industry specifications can be.
End point (ºC)	210 maximum rather than 205 maximum	Recommendation in line with Euro 5, Fiji & NZ. PP is tighter (industry choice).
Vapour Pressure (DVPE) (kPa)	Maximum: 75Kpa rather than 72Kpa	This specification varies on location and climate. Recommended using the Fiji level although current PP level is a little tighter (72kpa)
Total aromatic compounds	45% maximum rather than 35% maximum	Euro 5 is tighter than Pacific regional specifications. Suggested future improvement (see report for discussion)
Methyl tertiary butyl ether (% volume)	1.0 maximum rather than 15 maximum	Euro fuel allows MTBE. This is banned in most Pacific, Australian and NZ fuel.

Requirements for Diesel

Specification	Standard	Test
Density at 15ºC (kg/l)	0.820 minimum – 0.850 maximum	ASTM D1298 or ASTM D4052
Cetane index	46 Minimum	ASTM D4737
Cetane number	51 Minimum	ASTM D613 or ASTM D6890
Sulphur (mg/kg)	10 maximum	ASTM D5453
Distillation 95% volume recovered at (ºC) (T95)	360 maximum	ASTM D86
Distillation volume recovered %@250 ºC	65 maximum	ASTM D86
Distillation volume recovered %@350 ºC	85 minimum	ASTM D86
Polycyclic aromatic hydrocarbons (% mass)	11 maximum	IP 391
Acid number	0.3 max	ASTM D664
Appearance	clear & bright, free from visible sediment & water	ASTM 4176
Ash (% mass)	0.01 maximum	ASTM D482
Carbon residue (on 10% distillation residue) (% mass)	0.2 maximum	ASTM D4530
CFPP (Cold filter plugging point) (ºC)	-5 maximum	IP 309
Cloud Point (ºC)	-1 maximum	ASTM 2500 or ASTM D5773
Colour	2.0 maximum	ASTM D1500
Copper strip corrosion (3 hours at 50ºC)	Class 1 maximum	ASTM D130
Filter Blocking Tendency (FBT)	2.0 maximum	IP 387 or ASTM D2068
Flash point (ºC)	66 minimum	ASTM D93
Lubricity – HFRR wear scar diameter at 60ºC(µm)	460 maximum	IP 450 or ASTM D6079
Oxidation stability (g/m3)	25 maximum	ASTM D2274
Total contamination (mg/l)	20 maximum	ASTM D6217
Viscosity (mm per second at 40ºC)	2.0 minimum - 4.5 maximum	ASTM D445
Water content (mg/ kg)	200 maximum	ASTM D95
Water & sediment (% volume)	0.05 maximum	ASTM D2709
FAME	No FAME added	

Variation from Pacific Petroleum (PP) current supply or Euro V

All recommended specifications are the same as the current supply or Euro 5 except where specified in the table below.

Specification	Standard difference	Comment
Density at 15ºC (kg/l)	0.850 maximum rather than 0.845 maximum	Recommendation in line with PP, Fiji and NZ. Euro 5 is 0.845 max and that should be a future change
Polycyclic aromatic hydrocarbons	11% maximum rather than 8% maximum	Recommendation in line with PP, Fiji and NZ. Euro 5 is 8% max and that should be a future change
Carbon residue (on 10% distillation residue)	0.2% maximum rather than 0.3%	Recommendation in line with PP, Fiji and NZ. Euro 5 is looser at 0.3 % max.
Filter Blocking Tendency (FBT)	2.0 maximum rather than 1.3 maximum	Recommendation in line with Fiji & NZ. PP is tighter (industry choice). Euro 5 looser.

Appendix 2: Stakeholder Consultations in Vanuatu

Date & Time	February 1, 2023, 11:00 AM – 12 PM
Meeting Participants	• Paul Kaun, CEO, URA Utilities Regulatory Authority • Jesse Benjamin, Senior Officer, Vanuatu Country Office, GGGI • Julia Hollnagel, Senior Officer – Sustainable Mobility Pacific, GGGI
Notes	URA Role on fuel Standards • Focuses on the Act - Water and Electricity, not Transport and Fuel • Act is under discussion, if legislation passed, some functions on fuel will be under URA's scope. • Launched URA 5-year strategic plan – aligned with regulatory functions and government priorities. If the topic is included in the government's policy, they will closely examine it with the government and utility operators. • Working with the Department of Energy for a draft bill for petroleum regulations. The Department of Energy will need to take it through the process. Roles need to be discussed and clearly stated – related to enforcement of the legislation (URA and Department of Energy) • The bill has not been passed through Parliament yet – need to check with the Department of Energy. • Energy efficiency act: Challenges in enforcement • Pollution control act: through the Department of Environment – the act delegates powers to enforce. Suggests adding fuel and vehicle standards there.

Date & Time	February 1, 2023, 3:00 PM – 4:00 PM
Meeting Participants	• Glenn Niowenmal, Operations Manager, Pacific Petroleum • Jesse Benjamin, Senior Officer, Vanuatu Country Office, GGGI • Julia Hollnagel, Senior Officer – Sustainable Mobility Pacific, GGGI • Andres Toro, Advisor, Climate Finance Advisor Network (CFAN)

Notes	• Main importer of fuel products to Vanuatu. Few other small players importing from NZ and Australia – probably also Euro5 standard, but would need to verify.
	• Follows with the flow of standards in New Caledonia and Tahiti. Fiji also Euro5 standard.
	• Operation is too expensive to have 2 dedicated compartments in the vessel.
	• Routes:
	  • Singapore-Honiara-Fiji-New Cal-Vanuatu-Singapore
	  • Singapore-?-Tahiti-Fiji-Vanuatu-Singapore
	• (Vanuatu last due to draft issues in Port Vila -needs to be empty; and no tug boat in Santo)
	• Testing: Sample sent to an independent lab in NZ
	• Vehicle dealerships also ask for samples sometimes.
	• Says that if Vanuatu was to set Euro 5 standard, there would be no price increase.
	• Volume: 60 million litres annual of which: 10ml jet fuel, 12-15 ml for power generation, remains for transport (road and maritime).
	• Coconut Oil blending- UNELCO used to blend in the past. Issues:
	  • Coconut oil became more expensive than fuel, driven by food prices.
	  • Quality problems
	• Follow up on distribution of imported volume for land and maritime transport.
	
	Current Import testing process for Pacific Petroleum
	• This information came from a meeting with Pacific Petroleum and Envisory on 9th of May 2023.
	• Pacific Petroleum (PPC) self-monitors fuel quality on receipt of a cargo. Envisory understands that PPC is in discussions with the Department of Energy for voluntary reporting of the fuel standards under its revised Memorandum of Understanding (MOU).
	• The following visual checks and preliminary testing is done at import terminals (Port Vila and Santo)
	  1. Appearance
	  2. Colour
	  3. Density
	  4. Conductivity
	  5. Temperature
	  6. Flash
	• Jet A1 fuel samples are sent for petroleum testing in New Zealand for quality testing. Upon request from commercial customers, diesel samples are sent for testing from time to time. We were informed that Toyota Vanuatu conducts its own independent quality diesel testing.
	• Apart from petrol, diesel and jet/kerosene, PPC imports Aviation gasoline and a range of lubricants from Asia.
	• PPC has two bulk oil storage terminals, one each in Port Vila and Santo. Two terminals are under construction; one in Tanna and one in Malekula for fuel distribution to outer islands. PPC has 19 service stations across Vanuatu.

Fuel & Vehicle Emission Standards Stakeholder Interview Summary

Date and Time	18 April 2023, 10:30 – 11:45
Stakeholder	Mr. Julien Lenglet – Owner, Vanuatu Refuelling Services (VRS)/Top Signs
FVES Rep(s)	Jesse Benjamin, Brian Phillips
Notes	• VRS as a business commenced around 2008/2009. • At that time the business focused solely on the resupply of fuel purchased through SSP. • SSP were unable to deliver small quantities of fuel (1000-2000 litres etc) to small business operations, particularly outside of Port Vila, so SSP was established to supply this small market. • A legal battle over contaminated fuel in 2018 (see court judgement uploaded to shared drive) resulted in SSP refusing to supply fuel to VRS. This prompted VRS to import low sulphur fuel from NZ to supply its clients. • VRS has been importing diesel fuel only from NZ. COQ from ExxonMobil for the current fuel selling/ distributing in Port Vila is available/attached. These are the documents that prove the quality of the fuel at time of loading in the tanktainers exported from Pacific Bulk Fuel in New Zealand; these are sealed at loading and the seal stays on until VRS opens them up and starts dispatching. Once the tank is empty, it goes back to NZ for inspection, cleaning, refill and sent back. • VRS receives a shipment every 3 weeks with 75'000 litres stored in tanktainers. • The fuel is from NZ so it is Euro5 and Euro6 compliant. All fuel tests are conducted in NZ. • COQ provided by VRS for a batch imported in Jan 2022. • The only tests done in Vanuatu are for water content. A new lab, GeoLab, has recently been established in Port Vila and hopefully they can assist with future tests to save on the costs for having to ship samples abroad. • VRS has a growing customer base. Many customers and members of the public have been approaching VRS and asking if they can import Euro5/6 vehicles and use VRS fuel. • Establishing fuel standards is supported; however, measures to ensure consistent quality control are essential for fuel suppliers within the local supply chain – from fuel depot to customers. • Fuel contamination court case and judgement highlight need for quality control. • VRS is involved in the annual local Rally scene and participates in regional and international events. F90 is an ethanol blend that has been used in these events.

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