

Review of a Star Rating Scheme for Japanese Used Vehicles in New Zealand

*Prepared for
NZ Ministry of Transport*

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Executive Summary

In New Zealand there is keen government support to publish fuel consumption rates of vehicles to enable New Zealanders to make better informed vehicle purchase decisions. In her recent State Opening of Parliament the Prime Minister reiterated the need to reduce energy consumption.

The New Zealand vehicle market is heavily dominated by passenger cars from Japan, both new and used. New Zealand registered 228,797 cars in 2004, including new cars and ex-overseas or used imports. In 2004, 67% of all new registered cars were previously registered overseas, and of the used-imports, some 95% were previously registered in Japan.

The Vehicle Fuel Consumption Information programme is an information disclosure programme that aims to allow consumers to compare fuel consumption when making purchase decisions. To enable such comparisons, fuel efficiency of the vehicle is measured under specific drive cycle tests to produce a Fuel Consumption Rate (FCR), usually expressed in litres/100 km. However, it is not currently possible to publish comparable FCR information for all new vehicles and used Japanese imports due to the incompatibility of results derived from differing fuel consumption test methods.

Consequently, the Ministry of Transport has been directed by the Government to consider representing the FCR information to consumers in a different format for Japanese used vehicles. A star rating – based on information from the Japanese domestic test – will be used to represent the FCR of used Japanese imports, while the FCR figure, based on results of the European test will be used for new vehicles. The scheme for Japanese used vehicles would be modelled on the widely recognised and successful six star rating scheme used for appliances.

It is proposed to present to consumer the star rating of the used vehicles on a scale of 1 – 6 Stars in ½ star increments, effectively making 12 star rating categories. The star rating for the used vehicles will be placed on a web site which can be accessed by potential buyers of new cars. The star ratings will be developed so they relate to vehicle FCR in a consistent manner, as shown in the following table:

FCR bands (litres per 100km) and Stars

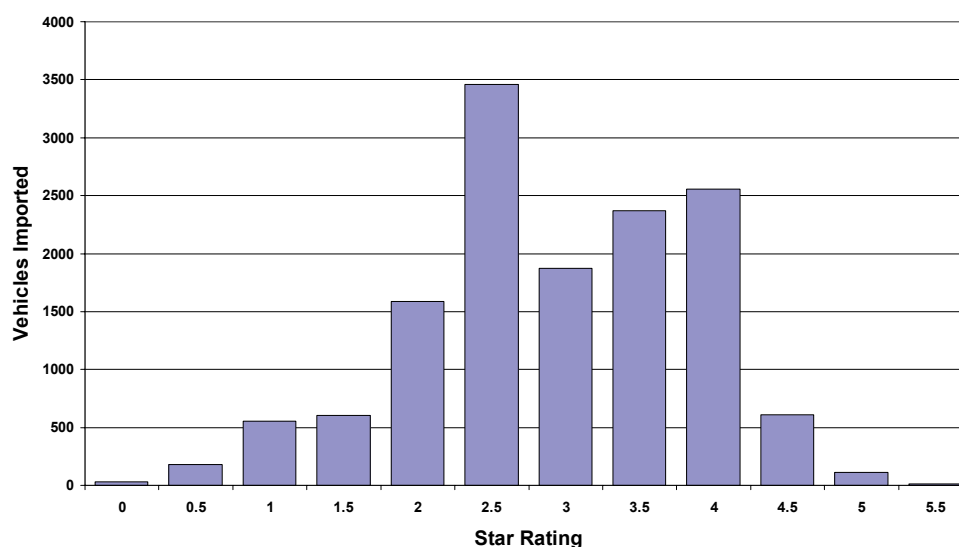
FCR Greater Than	is FCR Than	is Less Than	Stars
0	2		6
2	3		5.5
3	4		5
4	5		4.5
5	6		4
6	7		3.5
7	8		3
8	9		2.5
9	10		2
10	11		1.5
11	12		1
12	13		0.5
13	50		0

The purpose of this report is to review the proposed Star Rating Scheme for Japanese Used Vehicles. The report also provides a summary the Ministry of Transport proposal for a Star Rating Scheme.

This review has found that the use of FCR data based on new Japanese vehicle specifications is regarded as appropriate for the Scheme. FCR data is only available for post 1999 vehicles, which presently cover approximately 20% of existing imports. This report is based on data from the database containing vehicles (including number of imports) and their FCR, weight, engine size and fuel type. The analysis of this data has indicated there is sufficient variation in the type of vehicles being imported and star ratings by different vehicle characteristics. In relation to the potential improvement in FCR over time, there appears to be no apparent relationship between FCR and vehicle year within the data provided by the Ministry. The review considers that should the average FCR of vehicles improve over the next few years, there is sufficient reach within the system to allow for increases in star ratings.

The figure following demonstrates the range of star ratings for the 14000 used Japanese vehicles imported between March and September 2005, that were manufactured after 1999.

Used Japanese Imports by Star Rating



A summary of issues that may need further investigation were identified. Considering the above issues respectively, the following recommendations are made:

1. Consider modifying the fuel cost calculation on the website to incorporate a normalisation factor that accounts for the different tests methods used to derive FCR for new and used vehicles. The Pew Center report may provide the appropriate conversion factors for this exercise, however further investigation of this study and the relevance of this methodology is required. It is not within the scope of this current study to undertake this investigation as it will apply to the later display of fuel running costs for both new and used vehicles.
2. The display - or relative rating - of greenhouse emissions based on FCR, fuel type and emission factors relevant to the test cycle (i.e., Japan, EU etc) should be incorporated into the consumer information on the web site.
3. Analysis of the potential improvements in predicting actual FCR based on an age related deterioration factor for used Japanese vehicles would be advised. As the majority of vehicles imported with FCR data were from the year 2000, the age based deterioration could increase the FCR by as much as 15%, however this is more likely to be under 10% for these used Japanese imports. Due to the small improvement to the representativeness of the scheme, the use of a deterioration factor for the current fleet coverage is not considered worthwhile.
4. Ideally, information should also be displayed on the other emissions; however this may not be possible if the data is not collected. If this is the case, the Ministry should investigate options to collect this information as soon a practical. At a minimum, the rating or display of information relating to the relevant emission

standard that is required for registration should be provided. In this way, air quality performance can be assessed along with greenhouse emissions to allow for greater consumer choice and assist with promoting air quality policy goals.

Introduction & Scope

Background

Internationally, governments are encouraging consumers to move towards using more fuel efficient vehicles. This reflects the increasing concern of the international community in the environmental, especially greenhouse emission, impacts of transport and in some cases also reflect the local economic concerns of importing increasingly expensive fuels.

In New Zealand there is keen government support to publish fuel consumption rates of vehicles to enable New Zealanders compare rates prior to making their purchases. In her State Opening of Parliament the Prime Minister reiterated the need to reduce energy consumption.¹ Government cooperation agreements include energy efficiency as part of a broader programme on sustainable energy and climate change and an important step to reducing New Zealand's energy use and preparing for the end of cheap oil.²

Both the National Energy Efficiency & Conservation Strategy of 2001 and New Zealand Transport Strategy 2002 seek reductions to fuel consumption through giving New Zealanders information to so that they can purchase more fuel efficient vehicles. This information is to be provided via the Vehicle Fuel Consumption Information programme, administered by the Ministry of Transport (the Ministry).

Vehicle Fuel Consumption Information programme

The programme is an information disclosure initiative that aims to allow consumers to compare fuel consumption when making purchase decisions. To enable such comparisons, fuel efficiency of the vehicle is measured under specific drive cycle tests to produce a Fuel Consumption Rate (FCR), usually expressed in litres/100 km. Rates are typically recorded through government requirements, and made available through websites and labelling schemes.

The goals of the programme are to:

- Measure and benchmark the fuel efficiency of the present New Zealand vehicle fleet in order to enable comparisons with the efficiency of fleets internationally and to measure changes over time.
- To produce fuel efficiency targets, and to suggest mechanisms for achieving those targets

¹ Speech from the Throne, State Opening of Government, Rt. Hon Helen Clarke, November 2005

² Labour-led Government Co-operation Agreement with Greens, Jeanette Fitzsimons & Rod Donald, Green Party Co-Leaders, 17th October 2005

- To inform consumer choice and reduce the FCRs of vehicles being purchased through consumer demand
- To inform government's policy instruments which may increase consumer demand for more fuel efficient vehicles. Instruments may include: rebates, fees, and grants; labelling; and procurement policies.
- To reduce CO2 emissions. This is a goal which is met as a consequence of reducing fuel consumption as, assuming vehicle numbers remain constant, increasing the fuel efficiency of the fleet will lead to a decrease in fossil fuel burning and hence in greenhouse emissions from this source.

Purpose and Scope of Report

The purpose of this report is to summarise and review the proposed Star Rating Scheme for Japanese Used Vehicles.

This review aims to assess the appropriateness and effectiveness of:

- the objectives and goals of the scheme;
- the test method for determining fuel consumption
- the scope of vehicles included;
- the assumptions and data availability;
- information delivery methods;

In addition, EnergyConsult have reviewed the technical criteria and algorithms for the Scheme, including:

- the spread of vehicles, by fuel consumption, category and sales or registrations and fuel type, ;
- the assumptions and calculations; and
- the potential for future efficiency improvements within the rating criteria

Any issues found in the review have been highlighted and recommendations made as required.

New Zealand Car Market Composition

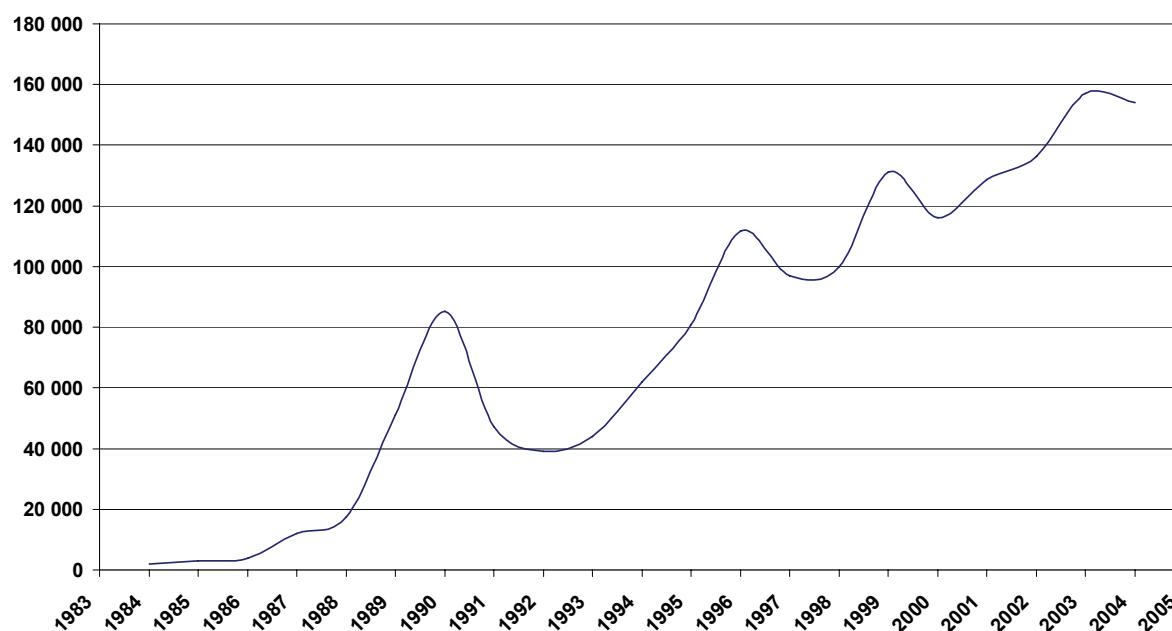
The New Zealand car market is heavily dominated by vehicles from Japan, both new and used. New Zealand registered 228,797 cars in 2004, including new cars and ex-overseas or used imports. Table 1 shows 67% of all new registered cars were previously registered overseas, and of the used-imports, some 95% were previously registered in Japan. It is known that a small percentage of the cars that were previously registered in Japan are not manufactured in Japan (i.e., some European cars like BMW or Mercedes-Benz). In 2004, the Japanese car manufacturers made up over 70% of all new car registrations (including ex-overseas).

Table 1: Main Countries of Origin of New Cars and Previous Registration of Ex-overseas Cars

Countries of origin		New cars (including ex-overseas)	Previous registration of ex-overseas (used-imports) cars
Australia	Total Registered	19,036	782
	<i>% of Grand Total</i>	<i>8.32</i>	<i>0.51</i>
Japan	Total Registered	167,932	147,769
	<i>% of Grand Total</i>	<i>73.4</i>	<i>95.93</i>
United Kingdom	Total Registered	5,449	466
	<i>% of Grand Total</i>	<i>2.38</i>	<i>0.3</i>
All others	Total Registered	36,380	5,025
	<i>% of Grand Total</i>	<i>15.9</i>	<i>3.26</i>
Grand total		228,797	154,042

Source: Land Transport New Zealand motor vehicle registration statistics 2004

The number of registrations of “ex-overseas” cars has also increased greatly over the period 1984 – 2004, as shown in Figure 1. The proportion of this type of vehicle within the NZ fleet is expected to increase if the current trends continue and hence their impact on the national average fuel consumption will also increase.

Figure 1: Annual registration of ex-overseas cars

Source: Land transport New Zealand motor vehicle registration statistics 2004

The government has agreed that the Ministry lead assessments of labelling, monitoring, and tracking of fuel consumption figures. It has agreed to a broad approach to include

Japanese used vehicles in such a labelling program, and to the development of a website to display fuel consumption information.

The inclusion of Japanese used vehicles in the scheme is important as a category. Japanese used vehicle imports dominate the registrations of new entrants into the New Zealand fleet. There is increasing concern within New Zealand of the environmental effects of vehicle use and the increasing contribution of these imported Japanese vehicles on the make up of the national passenger fleet. The Ministry is investigating how to provide information to consumers on the fuel based running costs of all vehicles being imported into New Zealand, and hence influence consumers to purchase vehicles with lower greenhouse emissions and greater fuel efficiency.

However FCRs for vehicles imported from the Japanese domestic market are not compatible with FCRs derived from tests required in Europe and Australia. Furthermore, no method has yet been found which reconciles, on a model by model basis, the figures derived from each test method with sufficient accuracy for labelling purposes. The reason for the incompatibility is that the European Union fuel efficiency test methods differ from the Japanese methods (see the Appendix II), and are conducted to different conditions, such as; hot versus cold starts, different distances, speeds, and numbers of stops. Comparisons of results of test methods have been achieved statistically on a fleet wide basis. Such comparisons have been made by the PEW Center on Global Climate Change³.

Consequently, for Japanese used vehicles the Ministry has been directed by the Government to consider representing the FCR information to consumers in different formats. A star rating based on information from the Japanese domestic test will be used to represent the FCR of Japanese used imports, while the FCR figure, based on results of the European test will be used for new vehicles. The scheme for Japanese used vehicles would be based on the widely recognised and successful six star rating scheme used for appliances.

³ http://www.pewclimate.org/global-warming-in-depth/all_reports/fuel_economy/index.cfm

Summary of Scheme

Rationale and Objective

The goal of the Vehicle Fuel Consumption Information programme (the “programme”) is to reduce two key statistics around the New Zealand vehicle fleet. One statistic, the National Average Fuel Consumption (NAFC) is the measure of the fuel efficiency of the national fleet which provides a snapshot of the average fuel consumption of all new passenger vehicles registered in any one year. The units are usually in litres/100 km. The second key statistic involves the average fuel consumption for the entire fleet, and is known as the Fleet Average Fuel Consumption, or (FAFC).

One mechanism to reduce these statistics, is by recording and publishing fuel consumption information to enable purchasers to compare efficiencies of the vehicles they buy. The proposed star rating scheme (the “scheme”) forms a part of the overall programme which is aimed at Japanese used vehicle imports and will provide relative star ratings of passenger vehicle fuel efficiency of these imports. Consumers may be targeted by government later with other promotional tools, such as labels and point of sale information (such as posters). It is assumed that some consumers when presented with information on vehicle FCR will purchase more fuel efficient vehicles, reduce the average fuel consumption rate of some vehicles entering the fleet, and hence reduce the national average fuel consumption rate (NAFC). Over time with incremental entrants of more efficient vehicles this is expected to reduce the fleet average fuel consumption (FAFC).

The reason for introducing a star system for Japanese used vehicle imports is twofold:

1. The FCRs for new vehicles differ from that of used vehicles due to vehicle deterioration. The FCR is applicable for the vehicle when it was manufactured, but would not allow direct comparison with new vehicles hence vehicle to vehicle comparisons are not possible.
2. The test cycle used to measure the FCR for vehicles imported from Japan is different from that used in Europe (see the Appendix II) and the USA, and again direct vehicle to vehicle comparisons are not possible.

The use of a six star rating scheme will enable model by model comparisons within the range of Japanese tested vehicle imports. The scheme is already well known to the public through the mandatory appliance energy rating label.

Description of the Proposed Star Rating Scheme

The goal of the star rating is to provide consumers with comparative fuel consumption information for Japanese used vehicles, in a distinct way from FCR figures for new vehicles, in order to divorce results of incompatible tests. The Ministry proposes to present to consumers the star rating of the used vehicles on a scale of 1 – 6 stars in ½ star increments, effectively making 12 star rating categories.

The star rating for the used vehicles will be placed on a web site which can be accessed by potential vehicle buyers. The star ratings will be developed so they relate to vehicle FCR in a consistent manner. The proposed approach is shown in Table 2. No differentiation is considered for fuel type.

Table 2: FCR bands (litres per 100km) and stars

FCR Greater Than	is FCR Than	is Less	Stars
0	2		6
2	3		5.5
3	4		5
4	5		4.5
5	6		4
6	7		3.5
7	8		3
8	9		2.5
9	10		2
10	11		1.5
11	12		1
12	13		0.5
13	50		0

Data Processes

The process for importing used Japanese vehicles into New Zealand is outlined at on the Land Transport New Zealand (LTNZ) website⁴. In summary, when a Japanese used vehicle enters New Zealand it undergoes a customs and bio-security check. At this point an identifier (usually a vehicle identification number or VIN) is allocated, and entered onto a database, together with other characteristics.

At the same time, the Ministry has acquired fuel consumption information for Japanese used vehicles from the Society of Automotive Engineers of Japan, Inc⁵(JSAE), so that FCRs can be allocated to the make, model, and variant of vehicles entering New Zealand. Using the database of VINs, Land Transport New Zealand translate the Japanese JSAE data into English and supply the FCRs for the specific makes, models, and variants.

The FCRs are made available to importers via a portal at LTNZ⁶. Requests for Fuel Consumption Statements are submitted and resulting statements are printed. Importers may then make the vehicle available to an entry certifier with required documentation (Fuel Consumption Statement and De-registration certificate). The vehicle is then

⁴ <http://www.landtransport.govt.nz/publications/infosheets/infosheet-2-09.html>

⁵ http://www.jsae.or.jp/index_e.php

⁶ <http://www.landtransport.govt.nz/importing/fuel-consumption/search.html>

processed according to standards compliance, roadworthiness, title, and entitlement to register. The importer then registers and licenses the vehicle before being lawful for New Zealand roads.

Appropriateness and Effectiveness

Objectives and Goals of Scheme

The proposed star rating scheme forms a part of the overall programme, but is specifically aimed at Japanese used vehicle imports. It will provide relative star ratings of passenger vehicle fuel efficiency, and intends to reduce the FCR of the Japanese used imports entering the New Zealand fleet.

The objective of the scheme is to provide consumers with a star rating which will inform them of the fuel efficiency of vehicle models as compared to other models. The star ratings will also fulfil the objective of providing a FCR which can be used in promotions concerning fuel efficiency. Consumers may be targeted by government later with other promotional tools, such as labels and point of sale info (such as posters).

Appropriateness of FCR Data Collection

The appropriateness of the FCR data was evaluated having regard to:

- The nature of the FCR data
- The data collection processes and its integrity
- The coverage of vehicle imports by the FCR data.

Nature of FCR Data

The source of the FCR data is the Japanese “10-15 Light Duty Test Cycle” test method (see Appendix III). This test data is based on the Japanese manufacturer supplied data at the time of manufacture. A limitation on this data is it applies to new vehicles but not to used vehicles. As the fuel efficiency of vehicles deteriorates with use and age, the FCR of a used vehicle imported into NZ will not be the same as the FCR measured when the vehicle was originally produced.

The issue of deterioration is analysed in more detail on page 20. The main implication of that analysis is that though deteriorating fuel efficiency in used vehicles does lead to significant changes in FCR, they may not significantly affect the star rating of a vehicle. For example, a large deterioration in efficiency of up to say 10% would mean less than a ½ star difference to the vehicle ratings. Consequently the use of FCR data based on new Japanese vehicle specifications is regarded as appropriate for the scheme.

Data Collection Processes and Integrity

Various controls and procedures are in place to ensure the integrity of the FCR data, however it is not within the scope of this project to review all these processes. Land Transport New Zealand’s InfoSheet 2.15, Process 2.2 (Appendix III), state that applicants must obtain the fuel consumption information by contacting the Land Transport New Zealand Helpdesk to find out more about the correct procedures. Most of the FCR data

is preloaded by LTNZ and the Ministry have reported that systems are in place to ensure that errant data is not inadvertently entered when a model/variant is not found in the FCR database.

The Independent Motor Vehicle Dealers' Association, Inc (IMVDA) and the Motor Trade Association (MTA) are offering assistance to vehicle importers, for a fee, and may be able to assist in supplying this data, but ultimately the data come from the same source, the translated Japanese tables made available through the Land Transport NZ importer website⁷.

The process for collection of data from Japanese manufacturers appears to be appropriate for the star rating scheme, however detailed analysis of the process administered by Land Transport NZ has not been included in this report.

Coverage of Vehicle Imports by the FCR Data

The scheme is confined to Japanese used passenger vehicles imported into New Zealand. It is intended that only passenger vehicles that were previously registered in Japan and manufactured after 1999 are included as data is only currently available on the FCR of these types of vehicles (see Land Transport NZ Info sheet 2.15 in Appendix III). The types of vehicles included are as follows:

- Vehicle type:
 - Japanese used imports;
 - Passenger vehicles subject to NZ vehicle classes MA (passenger cars), MB (forward control passenger vehicles) and MC (off road passenger vehicles), MD1 and MD2 (omnibuses), and NA (light goods vehicles);
 - Japanese vehicles manufactured after 1999
 - Vehicles with a gross mass of up to 3.5 tonnes
- Fuel type
 - Petrol, hybrid (petrol or diesel) and diesel vehicles
 - Factory fitted LPG are excluded

At this time no consideration has been made to include FCR on vehicles fuelled by non-traditional fuels, such as LPG, CNG, or ethanol/biodiesel blends. However as currently the proportion of imported vehicles using non-traditional fuels seems to be a fraction of a percent, their exclusion will not reduce the coverage or effectiveness of the scheme, though this may need to be reviewed in the future.

Fuel quality is excluded from consideration as any potential impact of fuel quality between Japanese fuels and New Zealand would apply equally to all Japanese used vehicle imports,

⁷ <http://www.landtransport.govt.nz/importing/fuel-consumption/search.html>

hence the star ratings of the scheme should maintain their relative comparisons. Again this limitation will not affect the effectiveness of the scheme.

As FCR data is only available for post 1999 vehicles, which presently cover approximately 20% of existing imports⁸, the coverage of the Star Rating scheme will initially be confined to a minority of Japanese vehicles. However, with time the coverage of the scheme will rapidly grow as the proportion of imports that are post 1999 vehicles increases.

This current limitation in the scope of vehicles covered means the scheme will accordingly be limited in achieving its goal of reducing the FCR of Japanese used vehicle imports in the short term. However as the scope of vehicles covered by the scheme will increase over time, the scheme will become progressively more relevant to the majority of used vehicle imports.

Information Delivery Methods

The star rating will be provided to consumers initially via a web based database that provides search facilities based on certain vehicle information. At this stage primary search criteria will include; the manufacturer, model, body style, fuel type, and engine size.

The search engine should provide a facility to search selected vehicle types, fuel type and some indication of vehicle size to assist consumers with selecting a more efficient vehicle that meets their decision making criteria. In this way, the user can select particular criteria and see what star rating various models achieve.

The site would also advise consumers that the star rating is based on the performance of the vehicle as it was when new, and that the age of the vehicle and other service conditions will affect the rating of the vehicle.

Whether the use of a web-based data base is an appropriate information delivery mechanism for the scheme will be depended on:

- The design, user-friendliness and execution of the web-based service
- The extent that the site is linked and promoted on other websites
- The promotion and advertising of the site through non-web based media and marketing channels
- The extent the site is supported by non-web based information dissemination media such as brochures, posters, pamphlets etc.

As the website is still under development, no conclusion could be made on the overall effectiveness of the web-based database as an appropriate information delivery mechanism.

⁸ Based on analysis of seven months of data on Japanese used vehicle imports for 2005.

The Ministry also gave consideration to providing the Star Rating on the Supplier Information Notice (SIN). Information on the SIN must be meaningful, accurate, and verifiable. Further investigations would be needed before determining whether these criteria are met sufficiently in order that fuel consumption rates could be published on SINS.

Technical Criteria and Algorithms

Distribution of Vehicles and Star Rating Variations

The distribution of FCR (and hence star ratings) of Japanese used vehicles varies widely. A database listing models (including number of imports), their FCR, weight, engine size, and fuel type was supplied by the Ministry in order to assess range of star ratings by different vehicle characteristics. Overall, the star rating shows a good spread of vehicles across star rating bands. Approximately 14000 Japanese used vehicle imports over the period March to September 2005 are displayed in the following charts and tables.

The number of used passenger vehicles imported from Japan that meet the star rating scheme criteria is shown in Figure 2 on page 12. Overall the spread of vehicles vs. star rating shows the majority of models currently imported are in the 2 to 4 star range, with a small percentage in the higher range of 4.5 to 6. This indicates that at the present time there will be sufficient spread of ratings to enable consumers to select from a range of higher rating vehicles if they wish. The vehicle ratings show a normal distribution toward the centre of the rating range. Bunching toward either end of the range would reduce the star rating's value as an information source to encourage the selection of low fuel consumption vehicles.

Figure 2: Used Japanese Imports by Star Rating

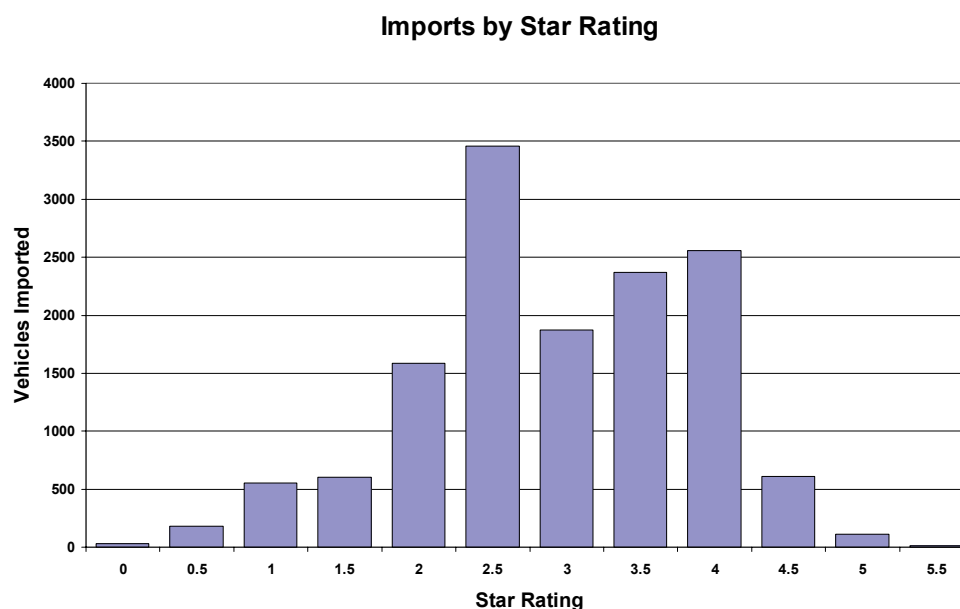
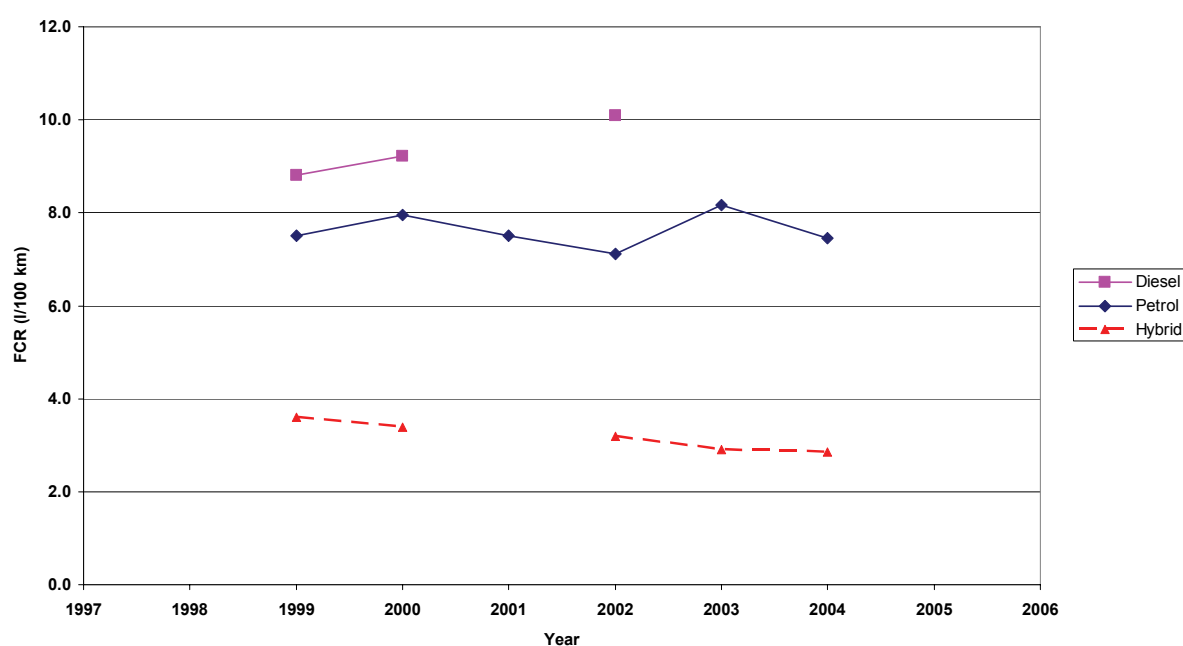


Figure 3 shows the weighted average FCR by vehicle year for the used Japanese vehicles imported over the period March to September 2005. The value ranges from 8.16 l/100km to 7.11 l/100km for vehicles dated from 1999 to 2004. There appears to be

no obvious trend towards improving FCR by vehicle year based on the fleet wide average of approx 14,000 of Japanese imports over the above period. The 2005 JAMA⁹ *Motor Industry of Japan* reports that the national average FCR for new Japanese cars (the NAFC) has improved from 7.2 l/100km in 2000 to 6.6 l/100km in 2003, an improvement of approximately 9% over 3 years. There could be several factors that explain the difference between no apparent trend in the Japanese vehicles imported to NZ and an improving efficiency trend for those entering the fleet in Japan. However the most likely explanation is that the composition of the new vehicle fleet in Japan is different from that imported to NZ. Engine size, weight and other characteristics also significantly affect the NAFC, and these factors may obscure any intrinsic improvement in the Japanese domestic fleet being transferred to the Japanese used vehicle fleet in New Zealand.

Based on the data shown in Figure 3, no relationship between FCR and vehicle year is apparent, hence we can not make projections relating to the average FCR over the next 5 years. However, if the improvement in the Japanese new vehicle NAFC is eventually reflected in the NZ imports, the NAFC for these vehicles could move towards 6 l/100km, over the next 5 year period. If this was to occur, the average star rating would improve to 4 stars, from the current 3 star average. This would not significantly affect the effectiveness of the stars rating system in representing the available Japanese imports, as another 2 stars would be available for more efficient vehicles above the average. This suggests it is unlikely that the rating algorithm would need to be altered in the next 5 years.

Figure 3: Used Japanese Import Average FCR by Fuel Type and Year of Manufacture



⁹ JAMA. The Motor Industry of Japan 2005, May 2005, Japanese Automobile Manufacturers Association, Inc

The spread of used Japanese passenger vehicle imports, which could be assigned a star rating by vehicle year is shown in Figure 4. This shows a spread across star ratings for each vehicle year with most displaying a vehicle year of 2000. This is re-affirmed in Figure 5 which shows that the majority of the recorded vehicles with vehicle year of 2000. As is expected, with the average vehicle year for all Japanese imports being year 2000 and 10 months. The scheme provides a wide range of ratings across all years.

Figure 4: Used Japanese Imports by Star Rating and Vehicle Year

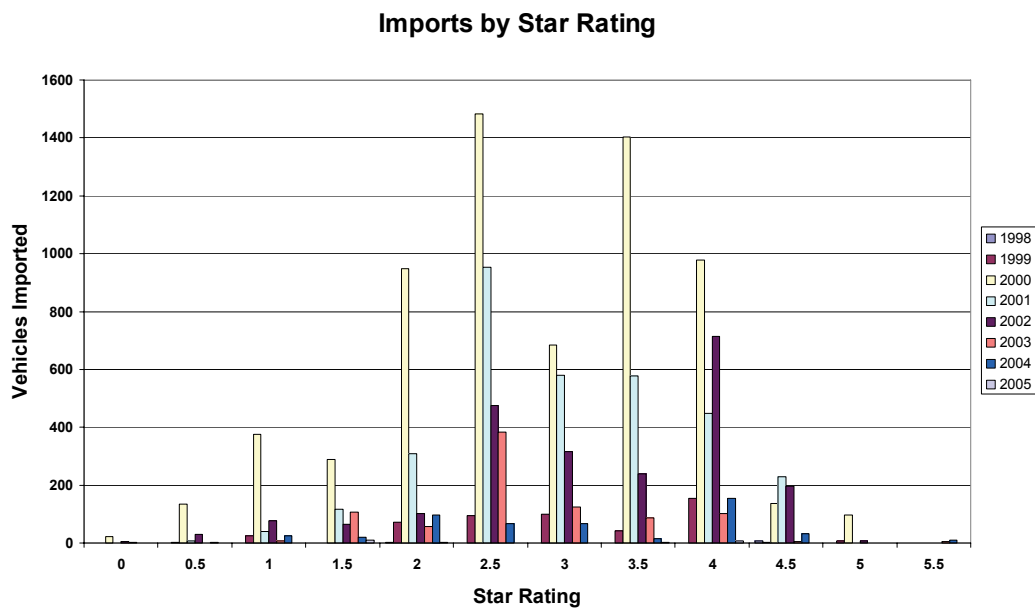


Figure 5: Number of Used Japanese Imports by Vehicle Year

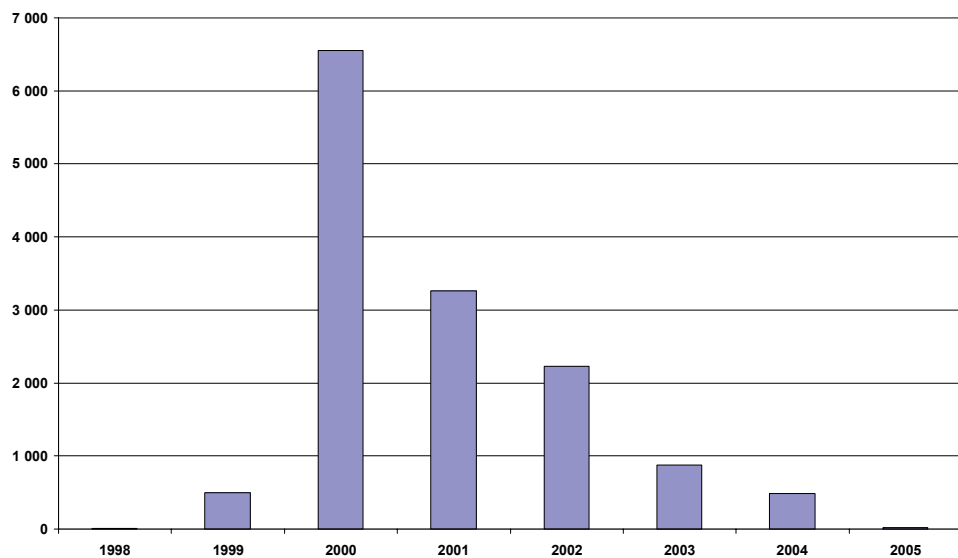
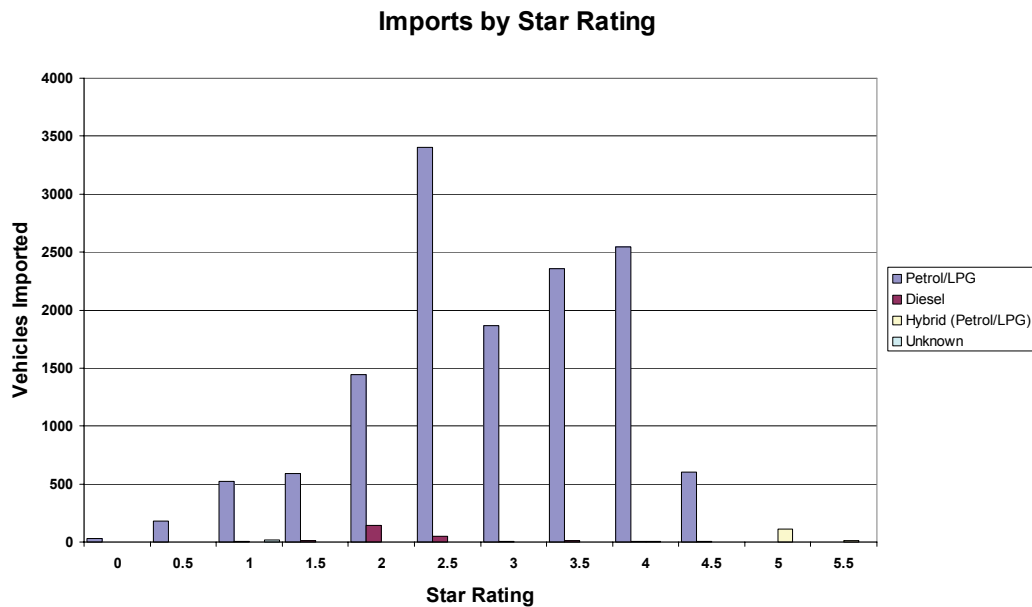


Figure 6 shows the number of star rated imports by fuel type, with petrol vehicles making up over 97% of the total imports. This figure also indicates the high star rating of the small number of hybrid imports.

Figure 6: Used Japanese Imports by Star Rating and Fuel Type



A total of 246 out of 14,000 vehicles imported over the 7 month period were powered by diesel. Interestingly, Figure 3 on page 13 suggests that diesel vehicles are generally of higher FCR compared to petrol vehicles. This is primarily due to the greater weight of diesel vehicles (most are larger 4WD of less than 3.5 tonnes) being imported compared to smaller petrol vehicles. The Japanese database supplied by the Ministry combines the Petrol/LPG fuel type as one identifier. However, it is also unlikely that any of these used vehicle imports are supplied were factory fitted LPG or CNG, as only 73 LPG and 2 CNG fuelled vehicles (new or used) were registered in 2004.

Figure 7 show the relationship between star rating and engine size, by fuel type. The overall inverse relationship between engine size and star rating is to be expected, with larger engines generally having higher fuel consumption. The diesel vehicles are generally larger engine size and the hybrids are small vehicles. There is sufficient spread of star rating by engine size to allow consumers to choose higher rating vehicles.

Figure 7: Used Japanese Imports Star Rating by Fuel Type and Engine Size

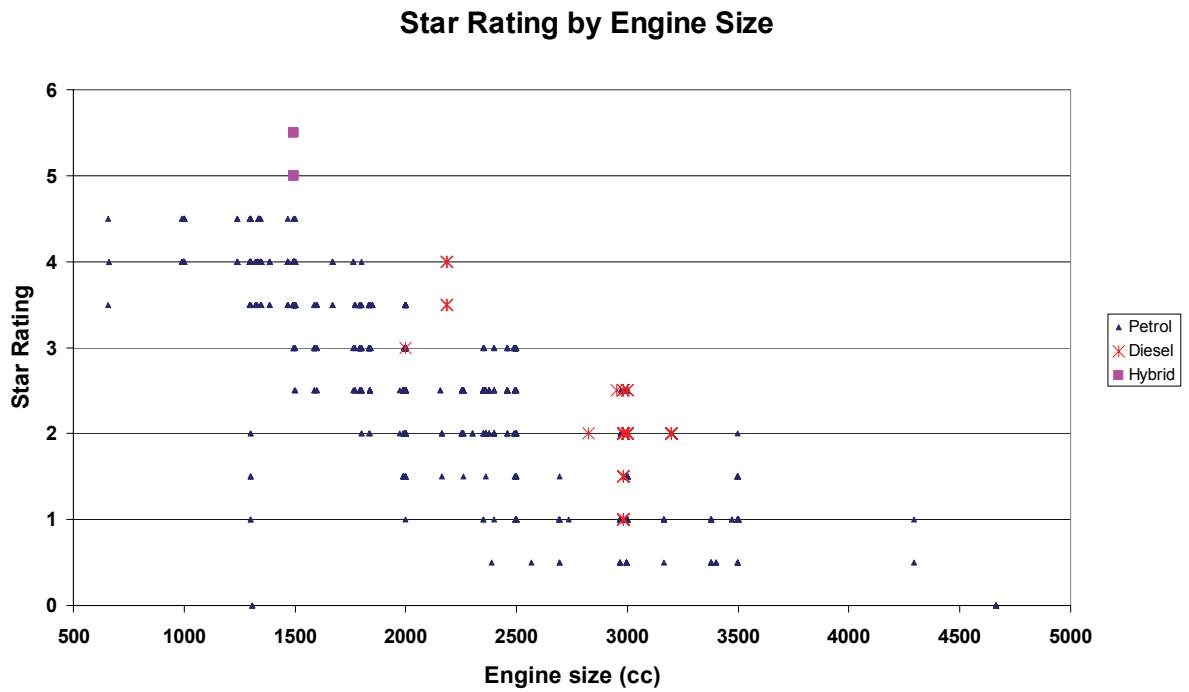
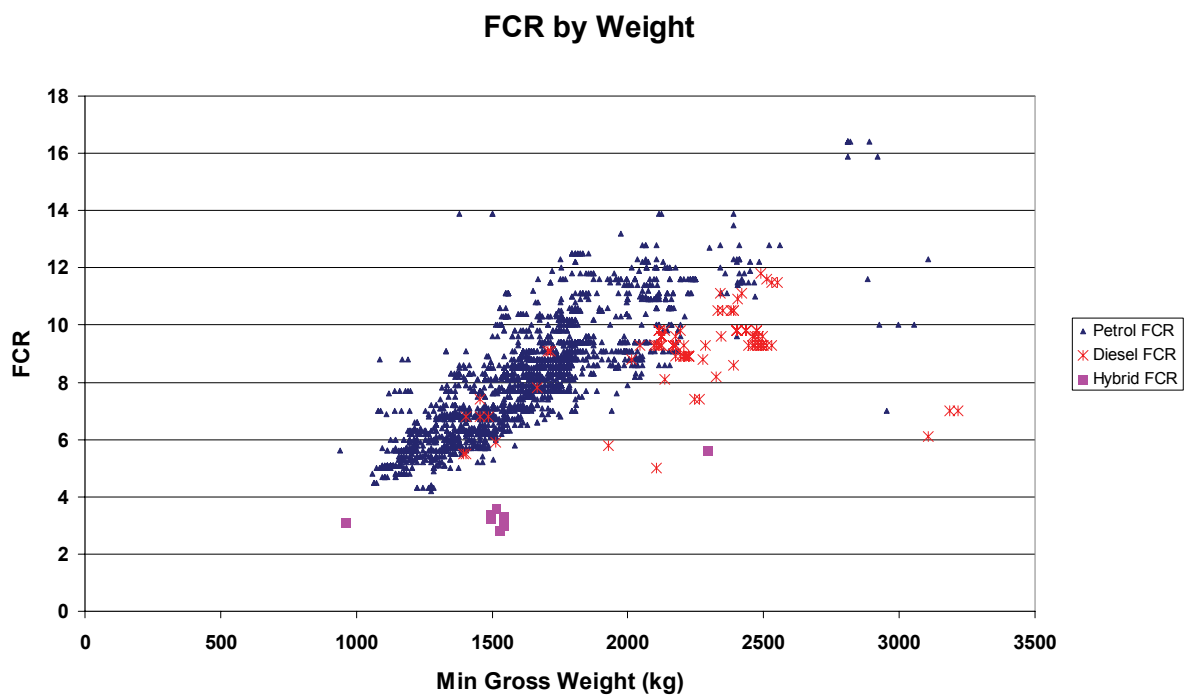


Figure 8 shows the range of FCR for imported Japanese vehicles by weight and fuel type. The majority of diesels are used in heavier vehicles, presumably four-wheel drives, while a few are used in lighter and more fuel efficient vehicles.

Figure 8: Used Japanese Imports FCR by Fuel Type and Gross Weight



In summary, the analysis of the data from the database containing vehicles (including number of imports) and their FCR, weight, engine size and fuel type indicated there was considerable variation in the type of vehicles being imported and star ratings by different vehicle characteristics.

Assumptions and Calculations

Consideration of Fuels Type and Emissions

The current star rating does not discriminate between fuel type. There exist significant differences between the FCR of vehicles by fuel type, which reflect the nature varying efficiency of engines using different fuels and the type of vehicles which use engines with the different fuel types. In Australia, during 2002/03 the average fleet wide FCRs for passenger vehicles by fuel type are shown in Table 3.

Table 3: FCR by Fuel Type in Australia¹⁰

Fuel Type	FCR (l/100km)
Unleaded	10.7
Leaded	11.5 (reflecting the older age profile of leaded vehicles)
Diesel	13.9 (The higher value reflects the disproportionate share of 4WDs. The issue of mass is dealt with below)
LPG	16.3
CNG	18.8
All fuels	11.5

It should be noted that of the 14 000 records for Japanese used vehicles supplied by the Ministry, most vehicles are powered by petrol, diesel or hybrid engines, with 22 vehicles recorded as “fuel type unknown”.

The Ministry is concerned about the greenhouse gas emission impact of various fuels and may publish emissions information onto the website together with star ratings for each model when practicable. In doing so, it would account for fuel type and perhaps indicate the relative environmental impact of each fuel type, particularly with regard to CO₂ emissions.

With regard to greenhouse emissions only and using CO₂ as a proxy for these emissions, the selection of fuel type has a bearing as shown in Table 4, as fuels vary in their CO₂ emissions per litre.

¹⁰ Apelbaum Consulting Group Pty Ltd (2005), “Australian Transport Facts”

Table 4: CO₂ emission factors by fuel type (g/l)¹¹

Fuel Type	CO₂ Emission Factors (g/l)
Petrol	2234.6
Diesel	2663.5
LPG	1511.3
CNG	2030.3

The table shows that diesel fuel has higher CO₂ emissions per litre of fuel compared to petrol. However, the FCR of diesel vehicles will be generally lower than a similar petrol model of the same configuration, hence reducing the impact of the higher CO₂ emissions. The use of a common FCR to star rating table for petrol and diesel is likely to provide higher ratings for diesel vehicles compared to similar petrol models, which could encourage consumers to buy diesel vehicles, which may produce greater CO₂ emissions, depending on the combined FCR and emission factor.

A greenhouse star rating similar to the Green Vehicle Guide¹² could be considered as a possible alternative to the FCR approach if a more accurate greenhouse rating is desired. This rating scheme effectively considers both the FCR and CO₂ emissions per litre of fuel used by models in their ratings. The resulting ratings are likely to convey the greenhouse implications of vehicle choice better than a FCR based star rating and separate information on vehicle emissions and this option may be worth considering by the Ministry.

Emissions from vehicles which affect air quality may also be influenced by the selection of fuel type. Some indicative rates in g/km, indicate that particles from diesel passenger (Euro 1) vehicles are approximately 4 to 5 times greater than for the corresponding petrol and LPG vehicles, respectively. However, for these Japanese imports, new regulations introduced in Japan that apply from 2005 are increasingly stringent for particulates. For small passenger cars, maximum particulates of 0.013 g/km apply, which are approximately half the Euro 4 Standard of 0.025 g/km applying from 2005 in Europe. Previous Japanese particulate emission standards (post 2002 vehicles) are almost the same as the Euro 3 requirements. This increased stringency and the fact that only 1.7% of the vehicles shown in the database are diesel fuelled mean that particulate emissions from the current mix of Japanese imports is not a significant issue.

There needs to be consideration of the broader implication of emissions in general for the programme as this, could potentially, influence the consumer to choose vehicles with lower FCR but risk increasing some emissions. Consideration of fuel quality is particularly relevant for diesel, where low sulphur diesel will diminish (in part) the deleterious impact of diesel. This issue may require further investigation.

¹¹ Apelbaum Consulting Group Pty Ltd (2005), "Australian Transport Facts"

¹² See www.greenvehicleguide.gov.au

Comparison of fuel consumption rates for cost calculations

The website intended for the display of fuel consumption information does not enable comparisons of FCRs derived from new and Japanese used vehicles. However it is understood that the site will use FCRs derived from both the Japanese and European test methods to derive a fuel cost figures. It may be that the average fuel consumption rates obtained via one test method may be lower than those obtained through the other test method. This could lead consumers to believe that on average, Japanese used vehicles, or new vehicles, could cost less to fuel, than others.

A new study by the *Pew Center on Global Climate Change*¹³ in the USA in 2004 has compared the differences in international test cycles and found a 1st level approximation, however this has not been assessed in this review. It was found that the Japanese test cycle will generally produce a lower FCR compared to the European test cycle.

Without consideration of differing average FCRs under European and Japanese test methods, presentation of costs based on both sets of un-adjusted figures could incentivise the purchase of Japanese used vehicles over new vehicles. It would be worth considering a methodology that could adjust the fuel cost calculation for Japanese figures to ensure equity with costs derived from vehicles tested under European standards.

Deterioration of Vehicle Efficiency

Once a new vehicle enters the fleet, the actual FCR increases as the vehicle age increases. The rate of deterioration of vehicles imported into New Zealand will be influenced largely by the maintenance regime employed by the owner in Japan. Assuming that the FCR is not measured at the time of export, then the actual FCR on landing in NZ is not identified and will almost certainly be higher than the value detailed on the database. If the rate of deterioration was uniform across all vehicle types then this should not ostensibly influence the relativity of the star ratings across all vehicle types. However, the nature of the rate of deterioration can only be assessed by comparison of the FCR at time of landing with the original manufacturer supplied value, and this is not currently undertaken.

Another implication with the issue of fuel efficiency of vehicles deteriorating with age is that to improve the actual fleet average FCR it would be advantageous for the star rating scheme to encourage the selection of newer used vehicles – or even new vehicles if possible – as the lower average age of the fleet generally reduces fuel consumption. The Ministry reports that a comparison is not possible for most vehicles due to the impossibility of accurately comparing Japanese derived FCRs with other new vehicle FCRs derived from mostly European test results.

¹³ http://www.pewclimate.org/global-warming-in-depth/all_reports/fuel_economy/index.cfm

For the star rating scheme to recognise deterioration with age of used vehicle import, the scheme ideally should be applied to all Japanese used imports (currently only those manufactured after 1999 are included). Regardless of this being implemented, applying a deterioration factor to the year of manufacture would assist in creating a more direct comparison. There have been various studies and analysis of the rate of deterioration of vehicles of a particular vintage. The BTCE¹⁴ have assumed that FCR will increase by up to 3 per cent per annum until it becomes 20 per cent greater than when new at which point it remains at 20 per cent greater. However, this study was published in 1996 and is naturally based on older model vehicles, and may not be relevant to the characteristics of Japanese vehicles currently imported into NZ.

Deterioration is considered in the calculation of the annual Australian transport emissions.¹⁵ Velocity dependent emission factors (including those related to the deterioration of FCR) are applied to on-road emissions by vehicle type, fuel type and vintage. It may be worthwhile to investigate how best to incorporate a deterioration factor into the New Zealand scheme and which approach is the most appropriate based on the available data, sources of the deterioration factors and required level of confidence. This investigation needs to consider if the degree of improvement in representativeness of the data and is defensible and valid. As any adjustment of the Japanese manufacturer supplied FCR to represent the current vehicle FCR may not dramatically improve the accuracy of the result (i.e., the FCR may vary significantly more depending on how well the vehicle was serviced in Japan than any deterioration in FCR due to age). Ministry staff point out that very tight performance standards are in place for up to usually 120,000km, allowing for example that only some microns wear from the cylinder bore of these vehicles. The Ministry think it is extremely unlikely that Japanese vehicles manufactured since 1999 would deteriorate at the rate quoted by the BTCE.

In light of deterioration of fuel efficiency of aging vehicles, the critical issue is whether this deterioration will materially affect the star ratings of the vehicles concerned. Japan have such strict maintenance and emission requirements, it is unlikely that the FCR of imported vehicles will be deteriorating at the 3% p.a. assumed by the BTCE study. Also as the star rating system will only apply to vehicles manufactured since 1999, currently rated vehicles will have had a maximum of five years for their fuel efficiency to deteriorate. This implies that the maximum deterioration in FCR of imported vehicles will be 15% and it is highly likely to be much lower than that. Given a 10% deterioration on the FCR of an average vehicle will move its star rating less than ½ star, deterioration in fuel efficiency with age is unlikely to be substantially affecting the star ratings of the vehicles currently being imported. In another five years the deterioration may be significantly affect the actual fuel efficiency of a greater proportion of rated vehicles, and then it may be necessary to introduce a deterioration-through-age factor when calculating star ratings.

¹⁴ BTCE (1996), "Costs of Reducing Greenhouse Gas Emissions From Australian Cars: An Application of the BTCE CARMOD model"

¹⁵ Apelbaum Consulting Group (2005), "Australian Transport Facts"

Despite there being no need to include a deterioration factor in the calculation of the star rating of vehicles at present, it is recommended that consumers be advised of the impact of age on fuel efficiency and be encouraged to buy newer vehicles accordingly.

Issues and Recommendations

Summary of Issues

The following issues were considered in this review and may need to be further investigated:

1. As the website will show a fuel running cost for all new vehicles and used Japanese imports. For the purposes of fuel costs alone, the Ministry will be using new vehicle FCR and the FCR of used Japanese imports in direct comparison, where these FCRs are measured under different conditions.
2. Incorporation of greenhouse gas emissions in the rating scheme to ensure a fairer comparison between fuel types.
3. Consideration of deterioration factors to be applied to the used Japanese imports based on year of manufacture.
4. How to address non-CO₂ emissions (particulates, SO₂, NO_x, VOX) within the rating system to ensure that other environmental (i.e., air quality) factors are considered.

Recommendations

Considering the above issues respectively, the following recommendations are made:

1. Consider modifying the fuel cost calculation on the website to incorporate a normalisation factor that accounts for the different tests methods used to derive FCR for new and used vehicles. The Pew Center report may provide the appropriate conversion factors for this exercise, however further investigation of this study and the relevance of this methodology is required. It is not within the scope of this current study to undertake this investigation as it will apply to the later display of fuel running costs for both new and used vehicles.
2. The display - or relative rating - of greenhouse emissions based on FCR, fuel type and emission factors relevant to the test cycle (i.e., Japan, EU etc) should be incorporated into the consumer information on the web site.
3. Analysis of the potential improvements in predicting actual FCR based on an age related deterioration factor for used Japanese vehicles would be advised. As the majority of vehicles imported with FCR data were from the year 2000, the age based deterioration could increase the FCR by as much as 15%, however this is more likely to be under 10% for these used Japanese imports. Due to the small improvement to the representativeness of the scheme, the use of a deterioration factor for the current fleet coverage is not considered worthwhile.

4. Ideally, information should also be displayed on the other emissions; however this may not be possible if the data is not collected. If this is the case, the Ministry should investigate options to collect this information as soon as practical. At a minimum, the rating or display of information relating to the relevant emission standard that is required for registration should be provided. In this way, air quality performance can be assessed along with greenhouse emissions to allow for greater consumer choice and assist with promoting air quality policy goals.

Appendix I: Terms of reference for this report

The Terms of Reference for this report are:

To summarise the Ministry proposal for a Star Rating Scheme for Japanese used vehicles entering the New Zealand fleet;

To review the proposal for appropriateness and effectiveness including:

- the objectives and goals of the scheme;
- the test method for determining fuel consumption i.e. new vehicles, appropriateness of the supplied data for the rating scheme;
- the scope of vehicles included;
- the assumptions and data availability;
- information delivery methods;

To review the proposal for technical criteria and algorithms including:

- the spread of vehicles, by fuel consumption, category and sales;
- assumptions and calculations;
- potential for future efficiency improvements within the rating criteria;
- proposing any modifications (if required);

To draft a report on the matters above and provide a summary of how the rating scheme criteria are applied to the data in graphics and tables.

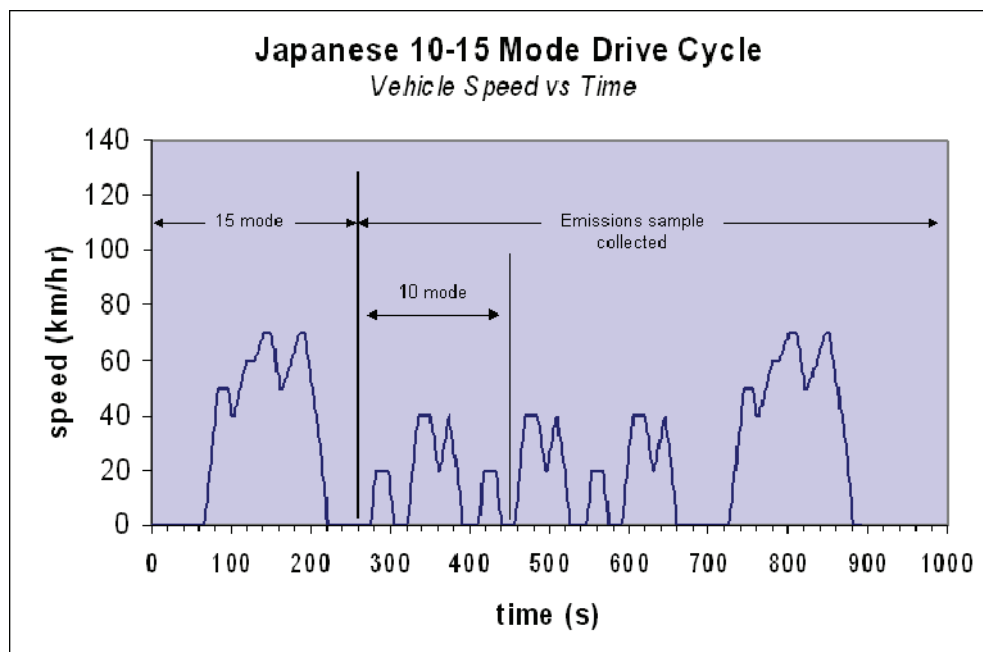
Appendix II: Test Method Summary

The Japanese “10-15 Light Duty Test Cycle” is the test method used to determine the FCR that is entered on the importers certificate. Data is entered that represents the vehicle as was manufactured, rather than the actual FCR of the vehicle when it arrives in New Zealand. Hence the FCR is based on the manufacturer supplied data for the year of manufacture. Importers of new vehicles are also required to enter FCR, however this data is not directly comparable to those of the Japanese used imports as the FCR can be measured under different test conditions and will represent the current FCR of the vehicle being imported. The scheme will not include new vehicles and therefore will not compare the FCR of new vehicles with used Japanese imports.

The FCR data for the scheme is contained in a database of Japanese vehicles and their variants. The database is based on the data provided by the Society of Automotive Engineers of Japan (JSAE) and contains vehicle information from 2000 onwards. The importer must enter an Industry model code and variant (optionally) from the vehicle de-registration or export certificate.

Japanese 10-15 Light Duty Test Cycle

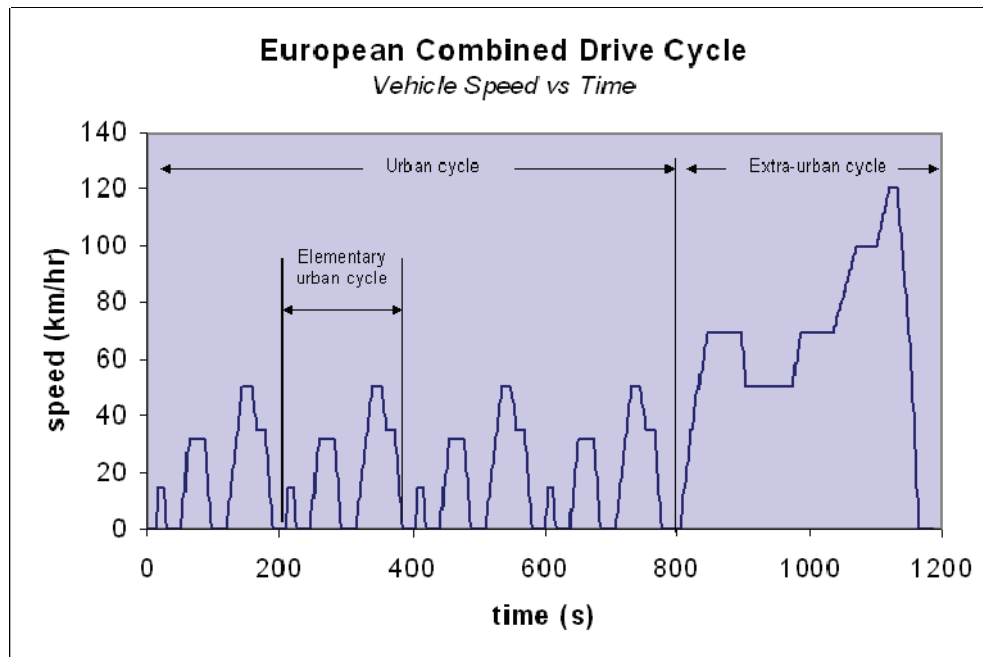
The Driving schedules are specified in Japanese Technical Standards - Official guidance is found in the Japanese Automobile Standards Internationalization Centre (JASIC). The drive schedule for the Japanese 10-15 light duty test cycle is presented below.



Drive cycle contained in the Japanese Automotive Type Approval Handbook, published by the Japan Automobile Standards Internationalization Centre (JASIC)

UN ECE Test Cycle

The UN Economic Commission for Europe Dynamometer Operating Cycles - Official guidance is found in the United Nations Economic Commission for Europe (UN/ECE) WP.29 1958 Agreement and its Addenda (specifically found in Regulation 101 of the Regulations for the Construction of Vehicles). The urban and extra-urban drive cycles for the UN ECE test cycle is presented below.



Drive Cycle Contained In UNECE Regulation 101

Appendix III: LTNZ InfoSheet 2.15

Information on the process for recording information in the Ministry of Transport's Motor Vehicle Register is presented in LTNZ Information Sheet 2.15 following

Disclaimer: This information summarises certain legal requirements. **It is not legal advice and may be altered without notice.** Before acting on this information, you are advised to refer directly to the appropriate legislation and/or take professional advice. Note that the Land Transport New Zealand doesn't endorse or guarantee, or accept liability for reliance upon, any other organisations or individuals linked or referred to or the accuracy of their information. Please check our website to confirm you're reading the latest version of this document.

Infosheet 2.15

Date: February 2005

From: Vehicle Certification Unit

No. of pages: 12

Fuel consumption data capture

This infosheet explains the requirements and processes for recording the fuel consumption data of a vehicle entering the New Zealand fleet, under *section 7 (1) (e)* of the *Transport (Vehicle & Driver Registration Licensing) Act 1986*.

Situation

The vast majority of motor vehicles are powered through the use of non-renewable fossil fuels. A major by-product of burning these fuels is carbon dioxide, which is a greenhouse gas that contributes to global warming.

The New Zealand government has signed the *Kyoto Protocol*, which is an international agreement that addresses global warming and aims to reduce climate change by reducing total greenhouse gas emissions.

New Zealand's Kyoto Protocol target is to reduce greenhouse gas emissions to the level they were in 1990, or take responsibility for excess emissions.

The New Zealand government is establishing initiatives to reduce fuel consumption and associated greenhouse gas emissions. The first step is to establish a record of the fuel consumption data of light vehicles entering the fleet.

Land Transport Rule: Vehicle Exhaust Emissions 2003 (the Emissions Rule) requires that vehicles manufactured on or after 1990 meet a recognised emissions standard, current at the time of manufacture. The exhaust emissions 'test regime' that the vehicle was manufactured to must be recorded. This demonstrates compliance with the Emissions Rule and identifies the test regime used to determine the vehicle's fuel consumption.

Please refer to Infosheet 2.08 for further details on providing emissions data.

Clarification

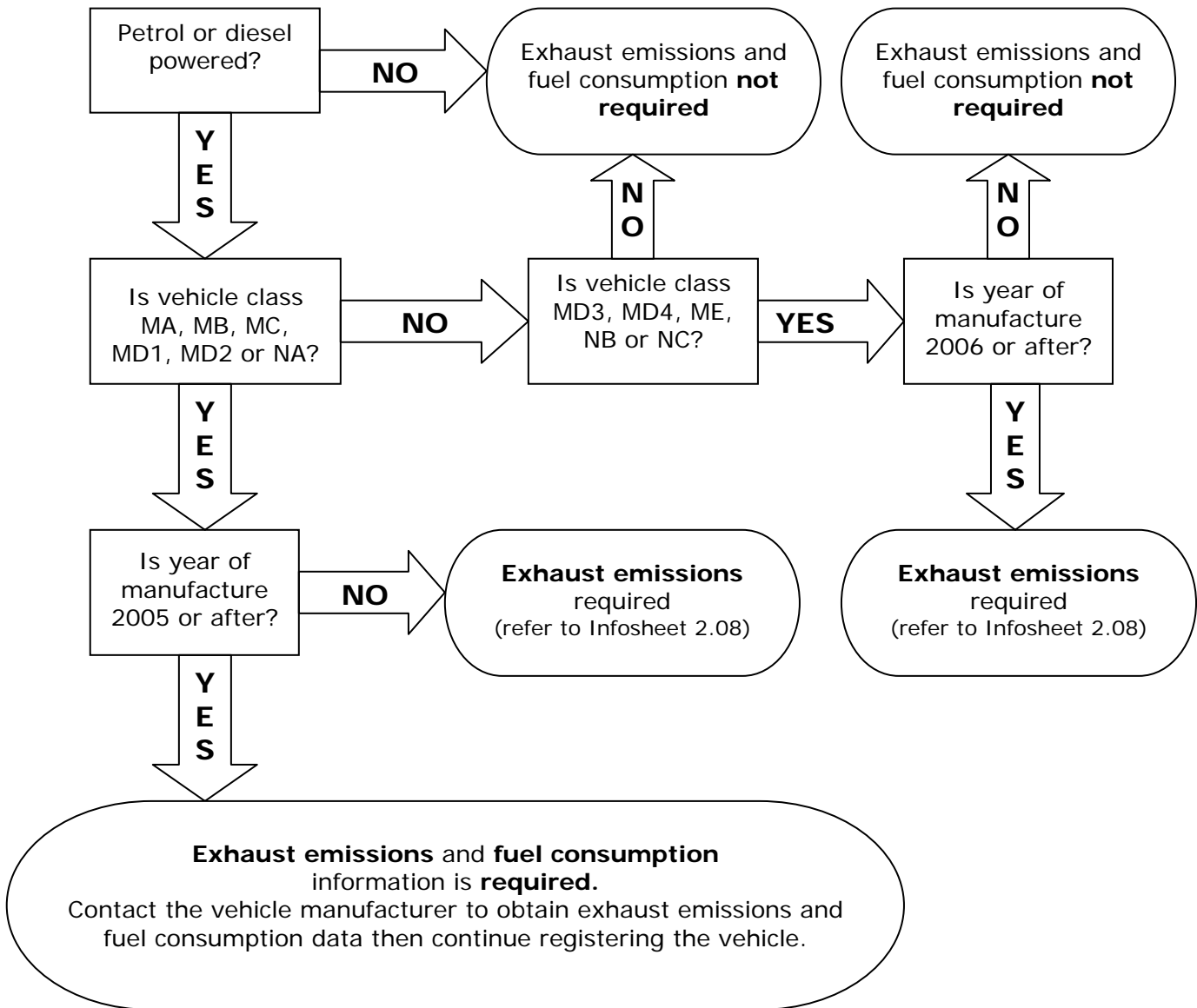
From 28 February 2005, as part of the certification process, the following information must be recorded in the Ministry of Transport's Motor Vehicle Register:

- exhaust emissions data for motor vehicles manufactured after 1989 (except Classes AA, AB, and LA-LE), and
- fuel consumption data for used light vehicles imported from Japan that were manufactured after 1999 and new light vehicles manufactured after 2004.
- exhaust emissions and fuel consumption information is required only for petrol and diesel vehicles (including hybrid petrol and diesel powered vehicles).

The following flowchart illustrates which vehicles must record exhaust emissions and/or fuel consumption data (provided by the vehicle importer), when they enter the New Zealand vehicle fleet. Different decision paths are provided for new and used vehicles. You must determine what vehicle class your vehicle is in to use the flowchart. See Appendix 1 for descriptions of the vehicle classes.

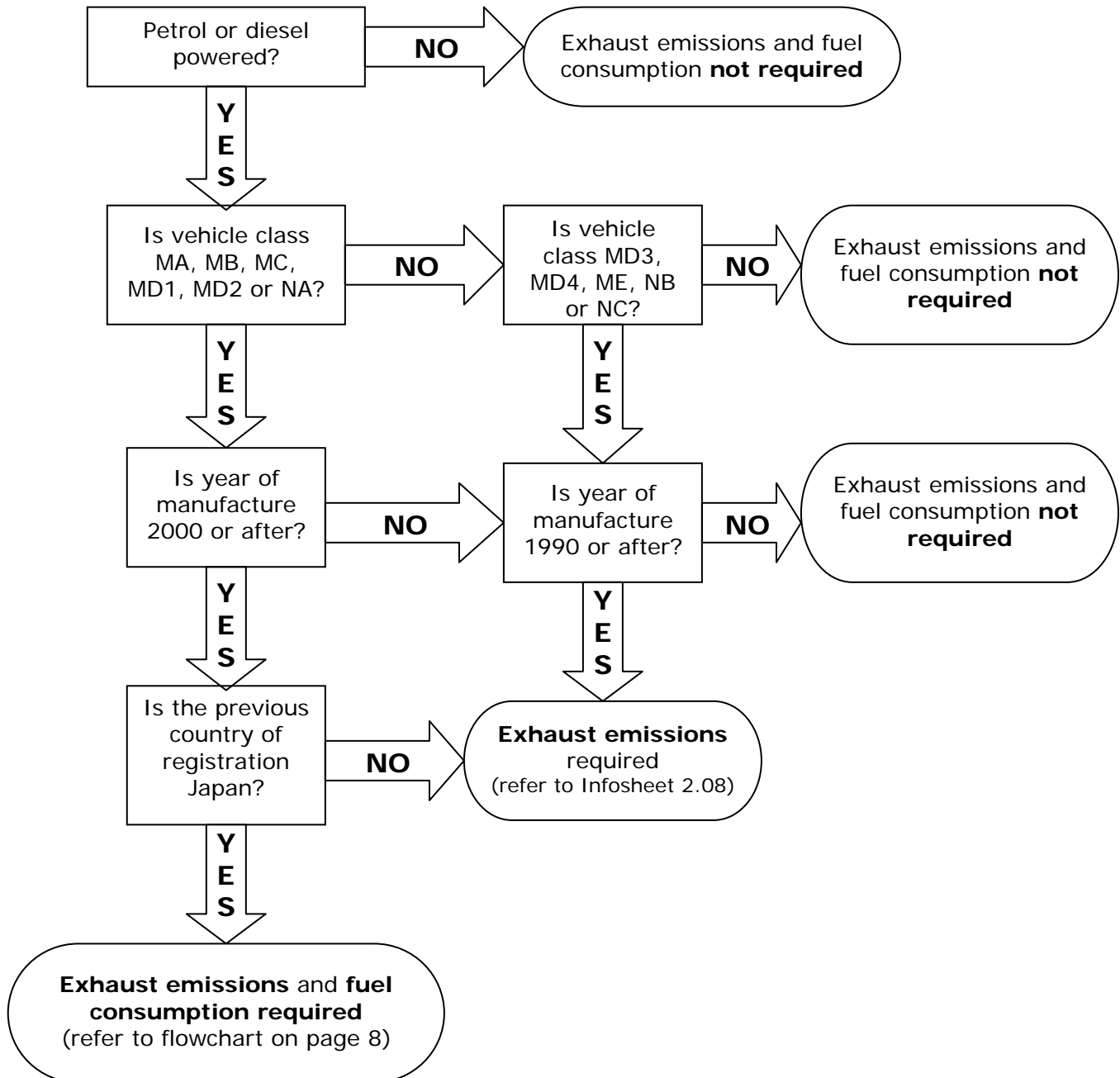
Is exhaust emissions and/or fuel consumption required?

NEW VEHICLES:



Is exhaust emissions and/or fuel consumption required?

USED VEHICLES



Responsibility of importer

The vehicle importer is responsible for providing exhaust emissions and fuel consumption data. There are several ways the data can be obtained.

Providing fuel consumption data to your entry certifier

For used light vehicles from Japan manufactured after 1999, a fuel consumption statement must be provided to the entry certifier.

Fuel consumption information is optional for used Japanese vehicles manufactured before 2000 and for used vehicles from other countries. If fuel consumption information is available, it would be beneficial to record for statistical purposes.

Note: If you have fuel consumption data which is not in litres per 100 kilometres, eg a brand new vehicle from the USA, you may need to convert the values to the correct units. A conversion calculator is available at

<http://www.landtransport.govt.nz/importing/fuel-consumption/calculator.html>

Process 1.1:

Requirements for new light vehicles requiring exhaust emissions and fuel consumption information

If the vehicle is a new light vehicle, exhaust emissions and fuel consumption data can be obtained from the manufacturer. In most cases, the data will be supplied and recorded on LANDATA directly by the manufacturer. The data must be provided as litres per 100 kilometres. If not, the vehicle importer must convert the fuel consumption data to the correct format using the calculation tables provided at

<http://www.landtransport.govt.nz/importing/fuel-consumption/calculator.html>

Process 1.2:

Requirements for new heavy vehicles requiring only exhaust emissions information

For new **heavy** vehicles (ie vehicle classes MD3, MD4, ME, NB and NC), the emissions test regime information will be required for vehicles manufactured after 1 January 2006. This information should be available from the vehicle manufacturer (see Infosheet 2.08).

Process 2.1:

Requirements for used light vehicles from Japan requiring exhaust emissions and fuel consumption information

If the vehicle is a used light vehicle previously from Japan manufactured after 1999, exhaust emissions and fuel consumption data can be obtained from an importers' database website, found at <http://www.landtransport.govt.nz/importing/fuel-consumption/>. The database contains fuel consumption information for the majority of used ex-Japan vehicles. However, there may be some cases where fuel consumption information cannot be found, eg, the vehicle was manufactured in the 12 months preceding importation into New Zealand, the year of manufacture is uncertain, or the vehicle has been modified (see process 2.2).

WARNING: It is advisable to obtain the vehicle details, (de-registration or export certificate) and start the process of obtaining the fuel consumption information well before the vehicle arrives in New Zealand. It may take some time to locate and verify fuel consumption information that is not available on the importer's database.

To obtain a fuel consumption statement from the importer's database:

A. Input:

- the **industry model code** and **variant code** from the de-registration or export certificate into the importers' database
- if the variant is not available, you will be prompted for other details such as the engine model code, weight (both available on the de-registration or export certificate), and transmission type
- the chassis number or vehicle identification number (VIN).

B. If your vehicle is found, compare the make, model and submodel and vehicle details listed to check the information is correct.

C. Print the fuel consumption statement from the website, which will show:

- the chassis number or VIN
- the date the statement was produced
- the make, model and submodel of the vehicle
- the industry model code and the variant
- the engine model code
- a vehicle description if available
- the exhaust emissions (test regime) and fuel consumption information.

The fuel consumption information from the importer's database will be supplied in the correct format of litres per 100 kilometres.

Note: For certain vehicles, such as vehicles not manufactured in Japan, the fuel consumption information may not be available, and will not be shown on the fuel consumption statement. You still need the fuel consumption statement to provide the correct exhaust emissions code.

D. Attach the 'fuel consumption statement' to the de-registration or export certificate and submit to the entry certifier.

E. The entry certifier records the information on LANDATA.

Process 2.2:

Requirements for used light vehicles from Japan (fuel consumption information not found on the importer website)

If the vehicle is a used light vehicle previously registered in Japan but fuel consumption data is not available on the importers' database:

A. First, check that the vehicle is:

- manufactured on or after 1 January 2000, and
- a light vehicle (ie vehicle class MA, MB, MC, MD1, MD2 or NA), and

- a petrol or diesel vehicle.
- B. If it is, you must obtain the fuel consumption information. Contact the Land Transport New Zealand Helpdesk to find out more about the correct procedures.
- The Independent Motor Vehicle Dealer's Association, Inc (IMVDA) and the Motor Trade Association (MTA) are offering assistance to vehicle importers, for a fee.
 - If you have access to Japan Society of Automotive Engineers (JSAE) vehicle information books, you may be able to locate the vehicle (eg vans that may be listed in the commercial section). If you do locate the fuel consumption information, you must provide Land Transport New Zealand with verification of the data. This should be a year, page and line reference to the JSAE books and a copy of the vehicle de-registration or export certificate.
- C. Land Transport New Zealand will verify the data and update the importers' website.
- D. Repeat process 2.1.

Process 3.1: Used vehicles from Japan requiring exhaust emissions information only

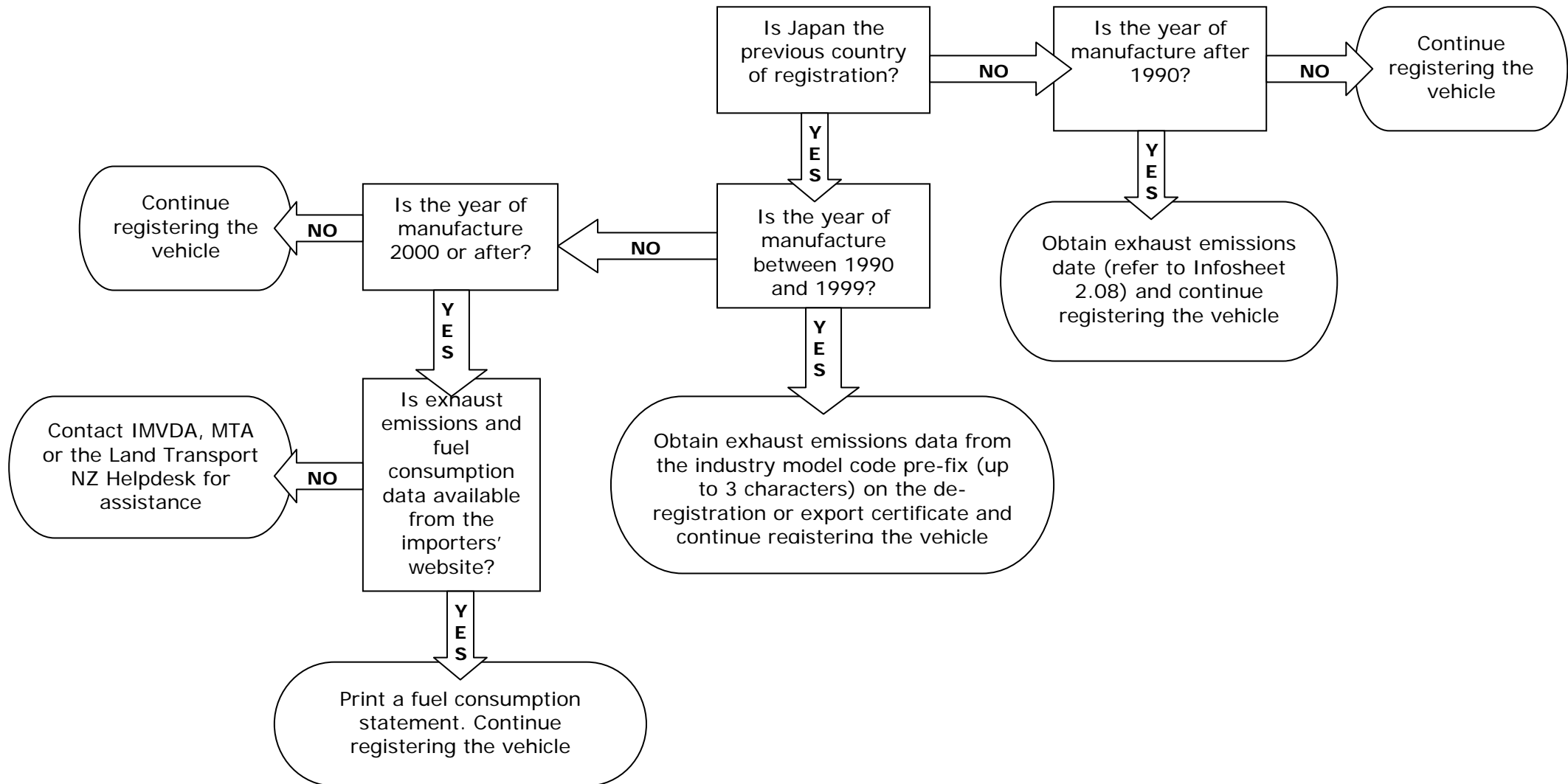
If the vehicle is a used vehicle from Japan requiring exhaust emissions information, but not fuel consumption information (eg the vehicle is a class MD3, MD4, ME, NB or NC, OR has a year of manufacture of 1990-1999):

- A) The exhaust emissions data is the letter 'J', followed by the pre-fix of the 'industry model code' (up to 3 characters before the hyphen) on the de-registration or export certificate.

Process 3-2: Used vehicles not from Japan requiring exhaust emissions information only

If the vehicle is a used vehicle from a country other than Japan and manufactured after 1989, fuel consumption data is not required, but **exhaust emissions data must be provided**. Refer to Infosheet 2.08 for further details on providing emissions data.

Obtaining exhaust emissions and fuel consumption data: USED LIGHT VEHICLES (including parallel imports)



Appendix I: Vehicle Classes

Class	Description
AA (Pedal cycle)	A vehicle designed to be propelled through a mechanism solely by human power.
AB (Power-assisted pedal cycle)	A pedal cycle to which is attached one or more auxiliary propulsion motors having a combined maximum power output not exceeding 200 watts.
LA (Moped with two wheels)	A motor vehicle (other than a power-assisted pedal cycle) that: <ul style="list-style-type: none"> a) has two wheels; and b) either: <ul style="list-style-type: none"> i. has an engine cylinder capacity not exceeding 50 cc and a maximum speed not exceeding 50 km/h; or ii. has a power source other than a piston engine and a maximum speed not exceeding 50 km/h.
LB (Moped with three wheels)	A motor vehicle (other than a power-assisted pedal cycle) that: <ul style="list-style-type: none"> a) has three wheels; and b) either: <ul style="list-style-type: none"> i. has an engine cylinder capacity not exceeding 50 cc and a maximum speed not exceeding 50 km/h; or ii. has a power source other than a piston engine and a maximum speed not exceeding 50 km/h.
LB 1	A class LB motor vehicle that has one wheel at the front and two wheels at the rear.
LB 2	A class LB motor vehicle that has two wheels at the front one wheel at the rear.
LC (Motor cycle)	A motor vehicle that: <ul style="list-style-type: none"> a) has two wheels; and b) either: <ul style="list-style-type: none"> i. has an engine cylinder capacity exceeding 50 cc; or ii. has a maximum speed exceeding 50 km/h.
LD (Motor cycle and side-car)	A motor vehicle that: <ul style="list-style-type: none"> a) has three wheels asymmetrically arranged in relation to the longitudinal median axis; and b) either: <ul style="list-style-type: none"> i. has an engine cylinder capacity exceeding 50 cc; or ii. has a maximum speed exceeding 50 km/h.
Side Car	A car, box, or other receptacle attached to the side of a motor cycle and supported by a wheel.

Class	Description
LE (Motor tri-cycle)	<p>A motor vehicle that:</p> <ul style="list-style-type: none"> a) has three wheels symmetrically arranged in relation to the longitudinal median axis; and b) has a gross vehicle mass not exceeding one tonne; and c) either: <ul style="list-style-type: none"> i. has an engine cylinder capacity exceeding 50 cc; or ii. has a maximum speed exceeding 50 km/h.
LE 1	A Class LE motor vehicle that has one wheel at the front and two wheels at the rear.
LE 2	A Class LE motor vehicle that has two wheels at the front and one wheel at the rear.
Passenger vehicle	<p>A motor vehicle that:</p> <ul style="list-style-type: none"> a) is constructed primarily for the carriage of passengers; and b) either: <ul style="list-style-type: none"> i. has at least four wheels; or ii. has three wheels and a gross vehicle mass exceeding one tonne.
MA (Passenger car)	A passenger vehicle (other than a Class MB or Class MC vehicle) that has not more than nine seating positions including the driver's seating position).
MB (Forward control passenger vehicle)	<p>A passenger vehicle (other than a Class MC vehicle):</p> <ul style="list-style-type: none"> a) that has not more than nine seating positions (including the driver's seating position); and b) in which the centre of the steering wheel is in the forward quarter of the vehicle's total length.
MC (Off-road passenger vehicle)	<p>A passenger vehicle, designed with special features for off-road operation, that has not more than nine seating positions (including the driver's seating position), and that:</p> <ul style="list-style-type: none"> a) has four-wheel drive; and b) has at least four of the following characteristics when the vehicle is unladen on a level surface and the front wheels are parallel to the vehicle's longitudinal centre-line and the tyres are inflated to the vehicle manufacturer's recommended pressure: <ul style="list-style-type: none"> i. an approach angle of not less than 28 degrees; ii. a breakover angle of not less than 14 degrees; iii. a departure angle of not less than 20 degrees; iv. a running clearance of not less than 200mm; v. a front-axle clearance, rear-axle clearance, or suspension clearance of not less than 175mm.

Class	Description
Omnibus	A passenger vehicle that has more than nine seating positions (including the driver's seating position). An omnibus comprising two or more non-separable but articulated units shall be considered as a single vehicle.
MD 1	An omnibus that has a gross vehicle mass not exceeding 3.5 tonnes and not more than 12 seats.
MD 2	An omnibus that has a gross vehicle mass not exceeding 3.5 tonnes and more than 12 seats.
MD 3	An omnibus that has a gross vehicle mass exceeding 3.5 tonnes but not exceeding 4.5 tonnes.
MD 4	An omnibus that has a gross vehicle mass exceeding 4.5 tonnes but not exceeding 5 tonnes.
ME (Heavy omnibus)	An omnibus that has a gross vehicle mass exceeding 5 tonnes.
Goods vehicle	<p>A motor vehicle that:</p> <ul style="list-style-type: none"> a) is constructed primarily for the carriage of goods; and b) either: <ul style="list-style-type: none"> i. has at least four wheels; or ii. has three wheels and a gross vehicle mass exceeding one tonne. <p>For the purpose of this description:</p> <ul style="list-style-type: none"> a) a vehicle that is constructed for both the carriage of goods and passengers shall be considered primarily for the carriage of goods if the number of seating positions multiplied by 68 kg is less than 50% of the difference between the gross vehicle mass and the unladen mass; b) the equipment and installations carried on special purpose vehicles not designed for the carriage of passengers shall be considered to be goods; c) a goods vehicle that has two or more non-separable but articulated units shall be considered to be a single vehicle.
NA (Light goods vehicle)	A goods vehicle that has a gross vehicle mass not exceeding 3.5 tonnes.
NB (Medium goods vehicle)	A goods vehicle that has a gross vehicle mass exceeding 3.5 tonnes but not exceeding 12 tonnes.