

**Future Policy for  
Motor Vehicle Emission Reduction  
(Fourteenth Report)**

**August 20, 2020**

**Central Environment Council**

In case of any doubts, please refer to the original text written in Japanese.

Future Policy for  
Motor Vehicle Emission Reduction  
  
(Fourteenth Report)

August 20, 2020

Central Environment Council



To: His Excellency Shinjiro Koizumi  
Minister of the Environment

From : Kazuhiko Takeuchi  
Chairperson  
Central Environment Council

### Future Policy for Motor Vehicle Emission Reduction (Fourteenth Report)

In response to Inquiry No. 31 of May 21, 1996, on “Future Policy for Motor Vehicle Emission Reduction,” the Central Environment Council has successively made reports starting from the interim report (Chukanshin No. 83 of October 18, 1996) to the Thirteenth Report (Chukanshin No. 972 of May 31, 2017).

Among the above reports, the Thirteenth Report cited, regarding the regulations on particulate matter (hereinafter referred to as “PM”), that since there was a certain correlation between PM mass and PM particle number, it was possible to reduce PM emissions by introducing regulations to measure particle number in addition to the conventional regulations to measure particle mass, and thus that the council would discuss the introduction of regulations on PM particle number (hereinafter referred to as “PN”) for diesel vehicles and vehicles equipped with in-cylinder direct injection gasoline engines (hereinafter referred to as “gasoline direct injection vehicles”).

In addition, regarding special motor vehicles fueled by gasoline or liquefied petroleum gas (LPG) (hereinafter referred to as “gasoline/LPG special motor vehicles”), the report also considered the introduction of a transient cycle to properly evaluate measures to reduce emissions in accordance with the actual use of such vehicles, the strengthening of regulations on emissions in consideration of trends in the corresponding technological developments, and measures to reduce blow-by gas.

Moreover, to promote further international harmonization of emission test methods, it was necessary to study test cycles for low-powered passenger cars, etc.

For this purpose, the Expert Committee on Motor Vehicle Emissions under the Air, Noise, and Vibration Committee has discussed these issues. The results of the discussion were compiled in the Fourteen Report by the Expert Committee on Motor

Vehicle Emissions, as attached.

The Air, Noise, and Vibration Committee discussed this Fourteenth Report and concluded that it was appropriate to adopt the Fourteenth Report and continue its contribution to the protection of the air quality in Japan through prompt harmonization of motor vehicle emission test methods to reduce motor vehicle emissions.

The Council thus makes the following report:

## Details

### 1. Measures for Fine Particulate Matter, etc.

As the conventional measurement method under the PM regulations is based on the measurement of the mass of the particles trapped in the filter, the regulation values cannot be reduced significantly due to inadequate measurement accuracy. On the other hand, the PN measurement method, which removes the volatile components of PM and counts the number of particles, enables more accurate measurement.

According to the results of research conducted by the Ministry of the Environment, there is a certain degree of correlation between PM mass and PN. Therefore, it is appropriate to introduce PN regulations for diesel vehicles and vehicles equipped with in-cylinder direct injection gasoline engines, as the introduction of PN regulations can virtually reduce PM emissions.

For emission test methods including emission test cycles to introduce the PN regulations, it is appropriate to apply WHDC (Worldwide harmonized Heavy Duty Certification) including WHTC (Worldwide Harmonized Transient Cycle) and WHSC (Worldwide Harmonized Steady state Cycle), which were developed by the United Nations, to heavy-duty vehicles (excluding gasoline vehicles), WLTP (Worldwide harmonized Light vehicles Test Procedure) including WLTC (Worldwide Light-duty Test Cycle) to passenger cars, etc. and JE05 mode to gasoline heavy-duty vehicles.

It is appropriate to make the allowable maximum desired values as strict as feasible, based on the degree of the achievement of the environmental standards for PM<sub>2.5</sub> and technological developments trends at home and abroad, as shown in Attached Tables 1 and 2.

With regard to the application start time, it is appropriate to commence the application by the end of 2024 for gasoline vehicles and by the end of 2023 for diesel vehicles, in consideration of the period of time required for automobile manufacturers to develop technologies, etc.

### 2. Measures to Reduce Emissions from Special Motor Vehicles

Regarding gasoline/LPG special motor vehicles, the regulations are implemented for those with an engine rated output of 19 kW or more but less than 560 kW, and C2

mode (7-mode), which is a steady-state mode, is adopted for these vehicles. However, as the steady-state cycle alone cannot take into consideration time delay in catalyst temperature caused by transient use and the deterioration of the performance of the three-way catalyst due to unsteady nature of emissions flowing into the catalyst, it may not properly evaluate emission reduction measures commensurate with the actual use of the vehicles.

In addition, regulations to ban the release of blow-by gas into the atmosphere are not currently introduced for gasoline/LPG special motor vehicles.

Consequently, it is appropriate to set the allowable maximum desired values for gasoline/LPG special motor vehicles for the next term as follows:

## 2.1. Test cycles, etc. for special motor vehicles and allowable maximum desired values

In light of the comparison between emissions measured in the transient test cycles adopted in the U.S. and Europe (hereinafter referred to as “LSI-NRTC”) and those measured in the test cycles based on the actual use of vehicles in Japan (JTC), air quality is expected to be improved and worldwide harmonization of emission test cycles will be promoted when LSI-NRTC is used as an emission test cycle in Japan. Therefore, it is appropriate to introduce LSI-NRTC, shown in Attached Figure 1, as a transient cycle of the test method in the emission regulation for special motor vehicles in the next term.

As some engines generated more emissions when tested in steady-state cycles than in LSI-NRTC, it is appropriate to continue to use C2 mode (7-mode). In addition, it is also appropriate, from the perspective of international harmonization of technical standards, to introduce 7M-RMC as shown in Attached Figure 1 to allow the selection of either the C2 mode (7-mode) or 7M-RMC, as the amount of emissions in 7M-RMC, which can be selected instead of C2 mode (7-mode) in the U.S., is the same as that in C2 mode (7-mode).

The allowable maximum desired values when introducing LSI-NRTC and 7M-RMC are shown in Attached Table 3, and it is appropriate to adopt them by the end of 2024.

## 2.2. Measures to reduce blow-by gas

A survey of the technologies introduced in recent gasoline special motor vehicles showed that it was technologically possible to prohibit the release of blow-by gas into the atmosphere. Therefore, it is appropriate to prohibit the release into the atmosphere of blow-by gas emitted from gasoline/LPG special motor vehicles with a rated output of 19 kW or more but less than 560 kW.

With regard to the application start time, it is appropriate to adopt the prohibition by the end of 2024, in conjunction with the application of the allowable maximum desired values for emissions.

### 3. International Harmonization of Emission Test Methods for Passenger Cars, etc.

Vehicles to which WLTC is applied are divided into three categories based on the value of the maximum power output of a vehicle divided by the vehicle mass in an unladen state (running order) (Power to Mass Ratio, hereinafter referred to as "PMR"). They are classified as Class 1, Class 2 and Class 3 in ascending order of PMR, with 22 W/kg and 34 W/kg as the borderlines.

In developing the test cycles for Class 1 and Class 2 vehicles, there is no actual vehicle driving data as there are no Class 1 or Class 2 vehicles in Japan. Japan has not introduced the relevant test cycles until now, as the actual vehicle driving data in other countries where most vehicles are low-powered and travel at low speed is taken into account. However, the United Nations is considering the development of the UN Regulation on WLTP as a new international standard, and when this UN Regulation is adopted by Japan and is subject to mutual recognition, it is necessary to also introduce the test cycles.

Class 1 and Class 2 vehicles are not sold in Japan and have a very limited impact on the environment. On the other hand, the adoption of the UN Regulation will reduce the burden on automobile manufacturers and allow them to implement more efficient environmental measures. Therefore, the test cycles applied to WLTC Class 1 and Class 2 vehicles as specified in Attached Figure 2 should be introduced in Japan, and the test cycles by vehicle type as in the UN Regulation should be applied as well. The test cycle applied to Class 1 vehicles includes the low-speed phase, medium-speed phase, and additional low-speed phase, and the test cycle applied to Class 2 vehicles includes the low-speed phase, medium-speed phase, and high-speed phase, as with the test cycle applied to Class 3 vehicles.

With regard to the application start time, it is appropriate to adopt the test cycles by vehicle type as in the UN Regulation in conjunction with the adoption of the UN Regulation on WLTP.

### 4. Issues to be Considered in the Future, etc.

The Expert Committee on Motor Vehicle Emissions will continue studying issues to be considered in the future as listed in the Fourteenth Report. Among others, the Committee will place special importance on discussing the issues below. Furthermore, the Japanese Government should promote the measures proposed in the report, including those related to the comprehensive policy for motor vehicle emission reduction.

#### 4.1 Measures for fine particulate matter, etc.

Currently, discussions are being held in the United Nations on whether to reduce the lower limit of detection range of the PN measurement method from the current value



of 23 nm to 10 nm in particulate diameter. In addition, the revision of the test method is being discussed based on the results of round-robin tests to improve the accuracy of the measurement method including a diameter of 23 nm. Japan should continue to participate in and contribute to the activities of the United Nations by sharing its knowledge on the actual status of emissions in Japan, etc. with the United Nations, and discuss revisions to the test method, etc. considering Japan's environment and impact of vehicle emissions

#### 4.2 Measures for brake dust and tire dust

In addition to the emissions from exhaust pipes, PM emissions from motor vehicles also include fine particles caused by the wear of brakes and tires, and the relative ratios of brake dust and tire dust to the overall PM emissions are on the rise. In particular, test methods for brake dust are studied in detail at various research institutes. The United Nations has agreed to develop test methods for that by 2021. As round-robin tests using the test methods are scheduled to be conducted in the future, Japan should also actively participate in and contribute to the development of international standards by cooperating in the round-robin tests and sharing the findings gained through surveys, etc. in Japan with the United Nations.

#### 4.3 Measures to reduce emissions from special motor vehicles

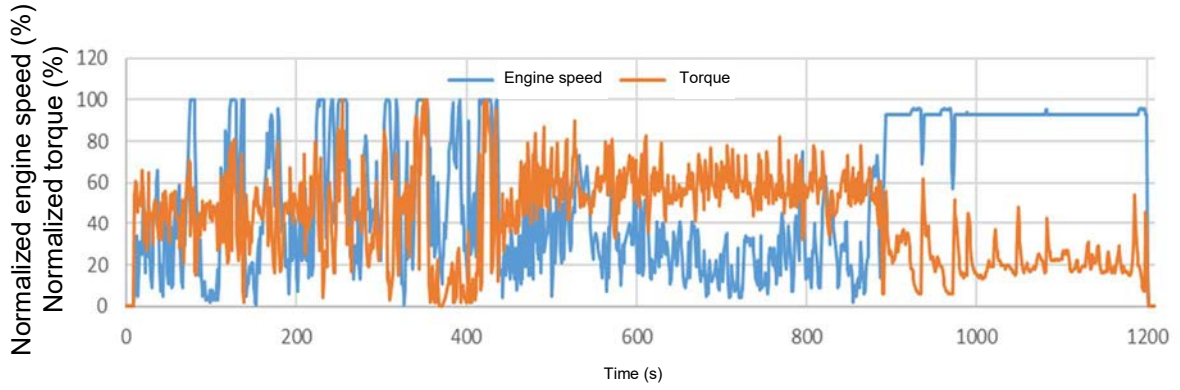
For special motor vehicles with a rated output of 19 kW or more but less than 560 kW, it is necessary to consider strengthening the emission regulation for them as necessary, taking into account the state of air pollution, contribution of their emissions, technological developments trends, and international trends.

Particularly with regard to measures to reduce fine particulate matter, it is necessary to consider the required measures, including the PN regulations introduced for vehicles other than special motor vehicles, as the contribution of special motor vehicles to PM emissions is expected to increase.

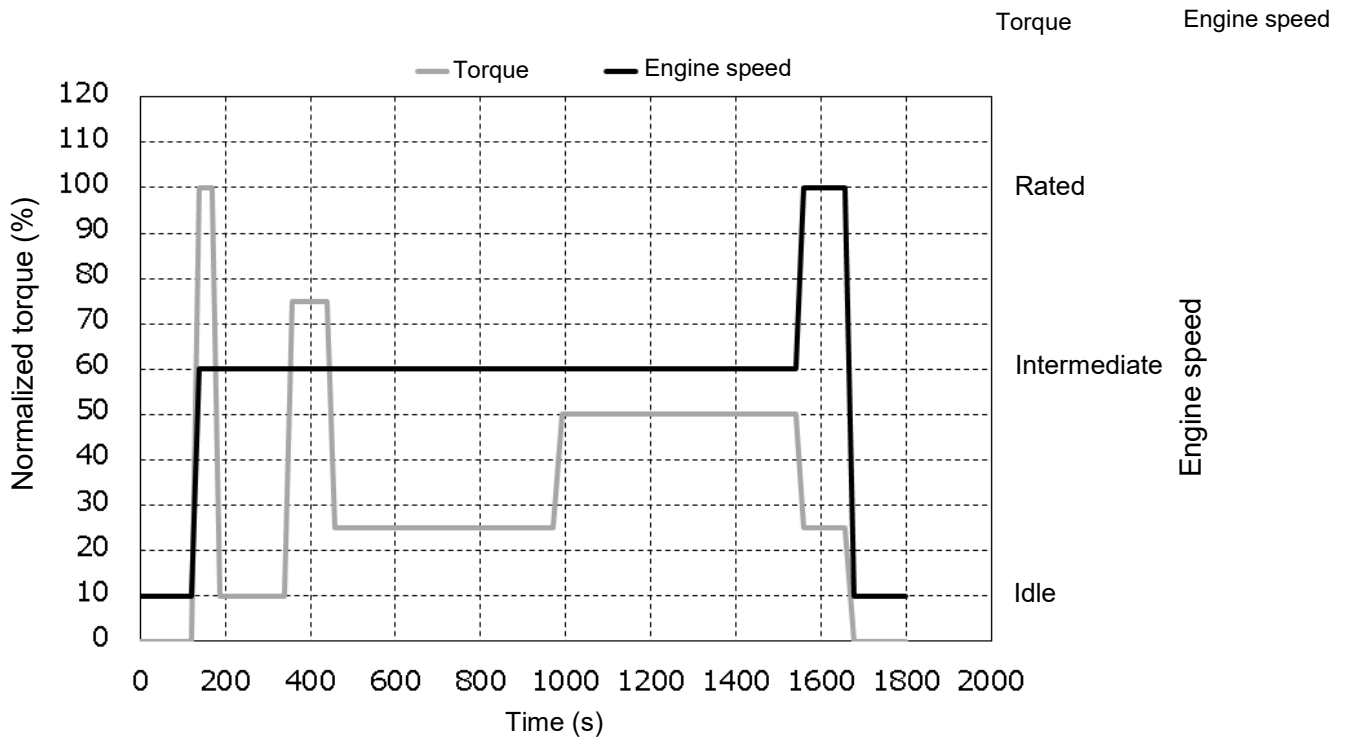
End

Attached Figure 1

### Exhaust pipe emission test cycle for gasoline/LPG special motor vehicles



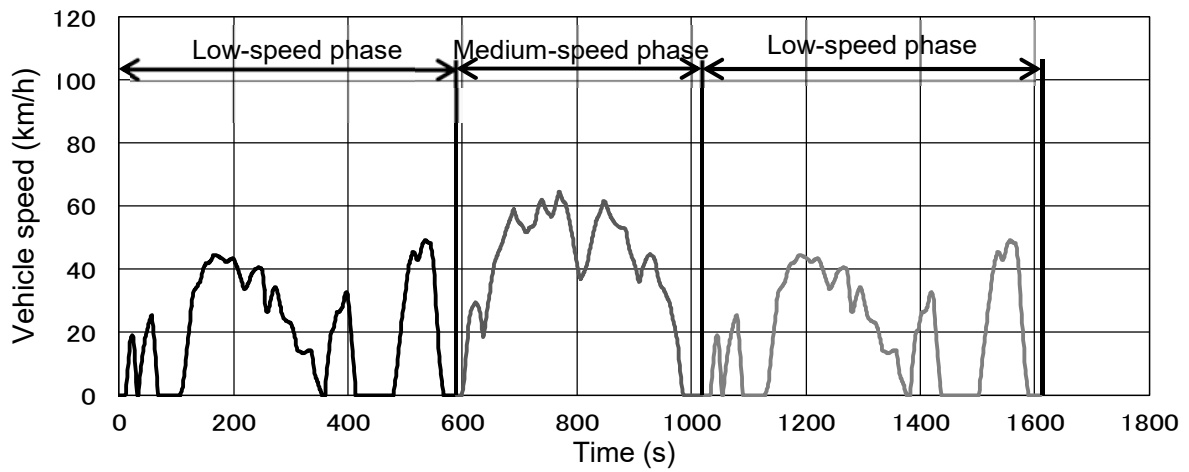
### LSI-NRTC (Large Spark Ignition engines Non-Road Transient Cycle)



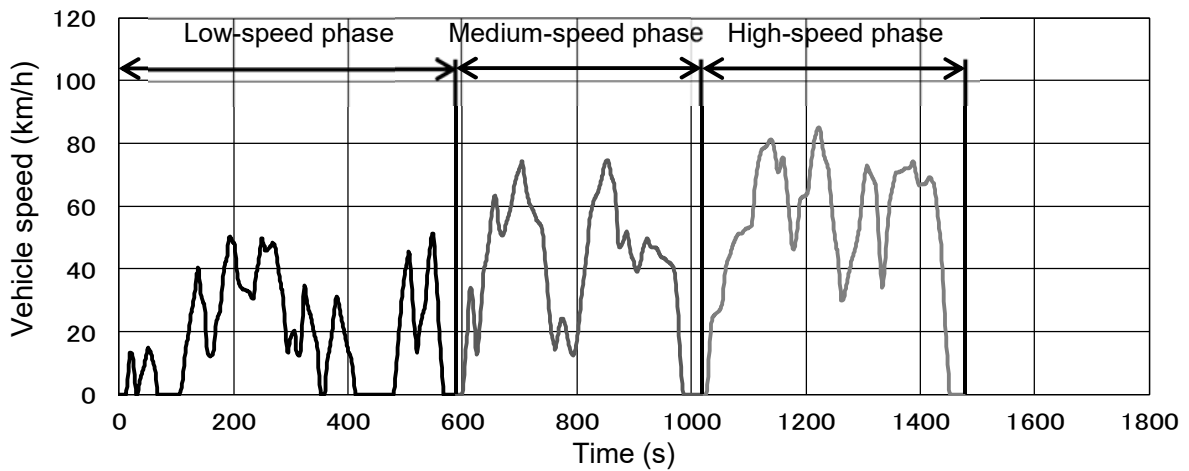
### 7M- RMC (7M Ramped-Modal Cycle)

Exhaust pipe emission test cycle for passenger cars, etc.

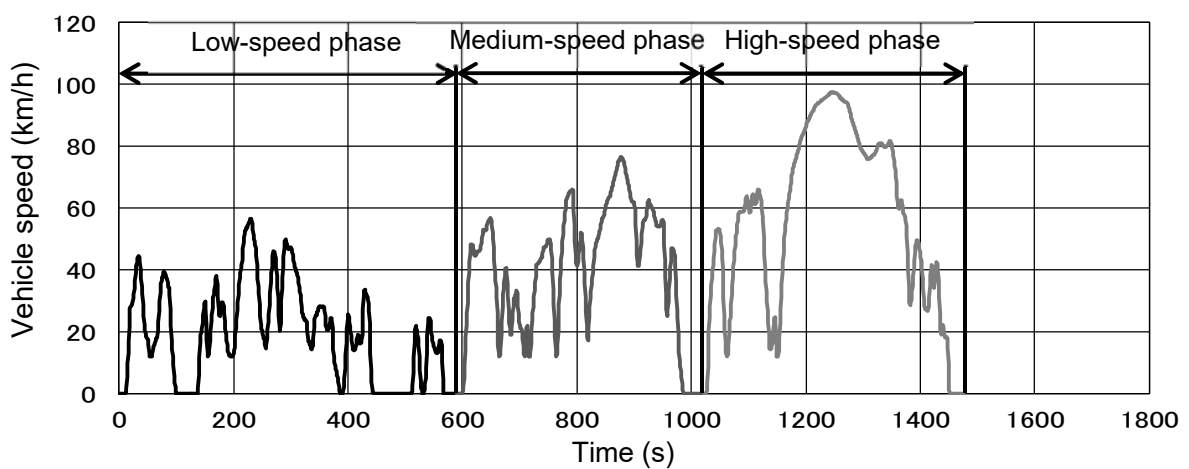
● Test cycle (i)



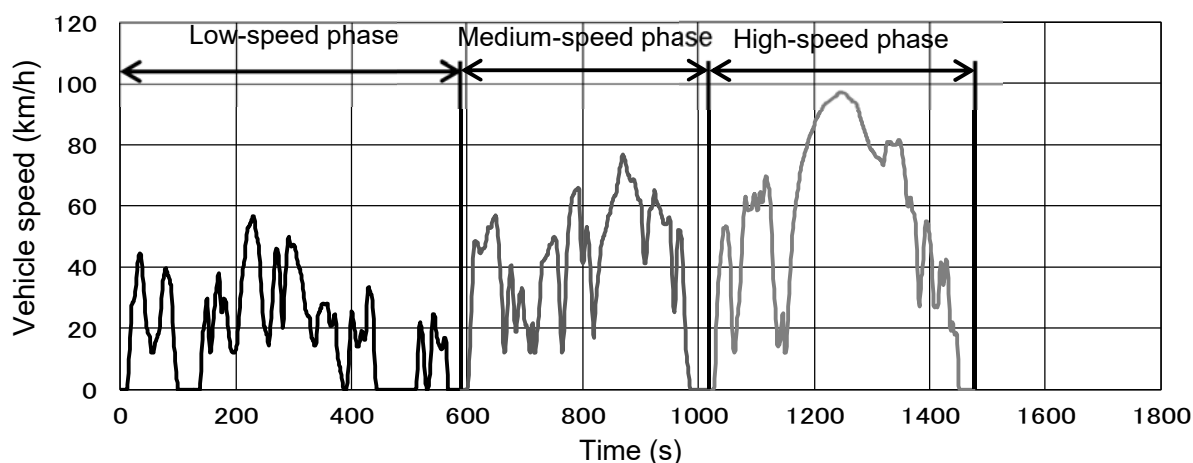
● Test cycle (ii)



● Test cycle (iii)



● Test cycle (iv)



\*Note: The test cycle is determined for each type of vehicle as follows:

Vehicle type		Test cycle	
Gasoline/LPG passenger cars	Vehicles with a PMR not exceeding 22 W/kg	Test cycle (i)	
Gasoline/LPG light-freight vehicles	Vehicles with a PMR exceeding 22 W/kg but not exceeding 34 W/kg	Test cycle (ii)	
Gasoline/LPG light-weight vehicles			
Gasoline/LPG medium-weight vehicles	Vehicles with a PMR exceeding 34 W/kg	Vehicles with a maximum speed of less than 120 km/h	Test cycle (iii)
Diesel passenger cars		Vehicles with a maximum speed of 120 km/h or more	Test cycle (iv)
Diesel light-weight vehicles			
Diesel medium-weight vehicles			

Test cycle (i): a test cycle applied to Class 1 vehicles in WTLP-gtr

Test cycle (ii): a test cycle applied to Class 2 vehicles in WTLP-gtr (excluding the extra-high-speed phase)

Test cycle (iii): a test cycle applied to Class 3a vehicles in WTLP-gtr (excluding the extra-high-speed phase)

Test cycle (iv): a test cycle applied to Class 3b vehicles in WTLP-gtr (excluding the extra-high-speed phase)

## Allowable Maximum Desired Values for Emissions from Gasoline Direct Injection Vehicles

Vehicle type (Note 1)	Allowable maximum desired value (average)
	PN
Gasoline/LPG passenger cars (Note 2) Gasoline/LPG light-freight vehicles (Note 3) Gasoline/LPG light-weight vehicles (Note 4) Gasoline/LPG medium-weight vehicles (Note 5)	$6.0 \times 10^{11}$ [particles/km]
Gasoline/LPG heavy-duty vehicles (Note 6)	$6.0 \times 10^{11}$ [particles/kWh]

(Note 1) Limited to vehicles equipped with in-cylinder direct injection gasoline engines

(Note 2) Gasoline- or LPG-fueled ordinary-sized, small-sized, and light motor vehicles exclusively used for carrying passengers and having a riding capacity of 10 people or less (excluding those with a riding capacity of 10 people and a gross vehicle weight exceeding 3.5 tons, as well as two-wheeled vehicles).

(Note 3) Gasoline- or LPG-fueled light motor vehicles (excluding those exclusively used for carrying passengers as well as two-wheeled vehicles)

(Note 4) Gasoline- or LPG-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight of 1.7 tons or less (excluding those exclusively used for carrying passengers and having a riding capacity of 10 people or less, as well as two-wheeled vehicles)

(Note 5) Gasoline- or LPG-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight exceeding 1.7 tons but not exceeding 3.5 tons (excluding those exclusively used for carrying passengers and having a riding capacity of 10 people or less, as well as two-wheeled vehicles)

(Note 6) Gasoline- or LPG-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight exceeding 3.5 tons (excluding those exclusively used for carrying passengers and having a riding capacity of 9 people or less, as well as two-wheeled vehicles)

Attached Table 2

## Allowable Maximum Desired Values for Emissions from Diesel Vehicles

Vehicle type	Allowable maximum desired value (average)
	PN
Diesel passenger cars <sup>(Note 1)</sup> Diesel light-weight vehicles <sup>(Note 2)</sup> Diesel medium- weight vehicles <sup>(Note 3)</sup>	6.0×10 <sup>11</sup> [particles/km]
Diesel heavy-duty vehicles <sup>(Note 4)</sup>	6.0×10 <sup>11</sup> [particles/kWh] (limited to WHTC)
	8.0×10 <sup>11</sup> [particles/kWh] (limited to WHSC)

(Note 1) Diesel-fueled ordinary-sized and small-sized motor vehicles exclusively used for carrying passengers and having a riding capacity of 10 people or less (excluding those with a riding capacity of 10 people and a gross vehicle weight exceeding 3.5 tons, as well as two-wheeled vehicles)

(Note 2) Diesel-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight of 1.7 tons or less (excluding those exclusively used for carrying passengers and having a riding capacity of 10 people or less, as well as two-wheeled vehicles)

(Note 3) Diesel-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight exceeding 1.7 tons but not exceeding 3.5 tons (excluding those exclusively used for carrying passengers and having a riding capacity of 10 people or less, as well as two-wheeled vehicles)

(Note 4) Diesel-fueled ordinary-sized and small-sized motor vehicles with a gross vehicle weight exceeding 3.5 tons (excluding those exclusively used for carrying passengers and having a riding capacity of 10 people or less, as well as two-wheeled vehicles)

Attached Table 3

Allowable maximum desired values for exhaust pipe emissions  
from gasoline/LPG special motor vehicles

Vehicle type	Allowable maximum desired value (average)		
	CO	HC	NOx
Gasoline/LPG special motor vehicles (Note 1)	15.0 g/kWh	0.6 g/kWh	0.3 g/kWh

(Note 1) Limited to gasoline- or LPG-fueled special motor vehicles with a rated output of 19 kW or more but less than 560 kW