Future Policy for
Motor Vehicle Exhaust Emission Reduction

(Sixth Report)

June 30, 2003

Central Environment Council

Chukanshin No. 126
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To: His Excellency Shunichi Suzuki
Minister of the Environment

From: Akio Morishima
Chairperson
Central Environment Council

Subject: "Future Policy for Motor Vehicle Exhaust Emission Reduction (Sixth Report)"

In response to an inquiry concerning "Future Policy for Motor Vehicle Exhaust Emission Reduction" (Inquiry No. 31, dated May 21, 1996), the Central Environment Council (Chukanshin) conducted studies and deliberations and submits the following report based on its conclusions.

Future Policy for Motor Vehicle Exhaust Emission Reduction (Sixth Report)

In response to an inquiry concerning "Future Policy for Motor Vehicle Exhaust Emission Reduction" (Inquiry No. 31, dated May 21, 1996), a total of five reports were completed: the Interim Report (October 1996); the Second Report (November 1997); the Third Report (December 1998); the Fourth Report (November 2000); and the Fifth Report (April 2002). These reports set new target levels for motor vehicles that use gasoline or liquefied petroleum gas (hereinafter called "gasoline/LPG motor vehicles") and motor vehicles that use diesel oil (hereinafter called "diesel motor vehicles") in a two-stage framework that includes new short-term and new long-term targets. The new long-term target levels for diesel motor vehicles in particular place priority on reducing emissions of particulate matter (PM) by 75 to 85% compared with the new short-term target levels and nitrogen oxides (NOx) by 41 to 50% by 2005, making them the strictest targets in the world. In order to achieve these new long-term targets, the permissible limit target level for sulfur content in gasoline and diesel oil has been set to 50 ppm or less, to be achieved by the end of 2004. With regard to two-wheeled motor vehicles (including motor-driven cycles, hereinafter collectively called "two-wheeled motor vehicles"), exhaust emission regulations were introduced in 1998 or 1999, depending on the vehicle category. Similarly, regulations were introduced for special vehicles that use diesel oil for fuel (hereinafter called "special diesel motor vehicles") beginning in 2003.

The Experts Committee on Motor Vehicle Exhaust Emissions conducted a comprehensive review of policies for reducing motor vehicle exhaust emissions and wrote up the results in the Sixth Report.

Acting on the basis of the Sixth Report cited above, the Air Environment Committee engaged in discussions and, with the aim of accurately pursuing future emission reduction policies for motor vehicles, decided it was appropriate to adopt the Sixth Report of the Experts Committee on Motor Vehicle Exhaust Emissions, establish new reduction targets for two-wheeled motor vehicles and special motor vehicles, and continue conducting reviews of overall motor vehicle exhaust emission policy.

With these considerations in mind, the Central Environment Council submits the following report.

1. Measures to Reduce Exhaust Emissions from Two-Wheeled Motor Vehicles

1.1. Target Levels for Reducing Exhaust Emissions

Regulations were introduced to control nitrogen oxides (NOx), hydrocarbons (HC) and carbon monoxide (CO) exhaust emissions from two-wheeled motor vehicles in 1998 or 1999, depending on the vehicle category. In view of the fact that two-wheeled motor vehicles account for a large portion of total HC emitted from all motor vehicles, however, priority should be placed on strengthening measures to reduce HC emissions. Therefore, in working to strengthen exhaust emission measures, it's appropriate to apply the permissible limit target levels cited in Appendix 2 by using the exhaust emission testing methods described in Appendix 1, which replace the current testing mode with a cold start testing mode.

Using the permissible limit target levels shown in Appendix 2, it's appropriate to achieve the targets for first-class motor-driven cycles and mini-sized two-wheeled motor vehicles by the end of 2006, and the targets for second-class motor-driven cycles and small-sized two-wheeled motor vehicles by the end of 2007.

1.2. Measures to Maintain Performance Levels during Use, Etc.

To ensure that exhaust emission performance doesn't deteriorate during vehicle use, exhaust emission control systems must be appropriately durable, which makes it necessary to establish a required performance distance for these systems while taking into account actual conditions of use. Average travel distances are increasing for mini-sized two-wheeled motor vehicles and small-sized two-wheeled motor vehicles, making it appropriate to increase the required performance distance from the current 12,000 km to 24,000 km for these categories. It is also incumbent upon vehicle manufacturers to take steps in the production stage to help ensure that the systems they install continue to perform well in reducing exhaust emissions even after the required performance distance has been reached.

To ensure that exhaust emission control systems continue to function properly on vehicles in use, it is first of all important for the user to engage in appropriate maintenance activities through a strict regimen of inspections and repairs. In addition to this, however,

regulations should be implemented with regard to concentrations of CO and HC in exhaust emissions that are generated when the vehicle is idling (hereinafter called “idling regulations”) as part of mandated vehicle inspections required by the Road Vehicles Act and traffic checkpoints, with the aim of discovering and removing maladjusted or inappropriately renovated exhaust emission control systems. To that end, permissible limits for idling must be reviewed without delay, with consideration given to the exhaust emission control technologies that are being used.

Studies should be conducted without delay regarding the development of measures to reduce exhaust emissions under running conditions and test conditions that are outside the scope of established test modes (off-cycle measures). As part of that effort, measures should be evaluated from the perspective of practical execution.

2. Measures to Reduce Exhaust Emissions from Special Motor Vehicles

2.1. Methods for Reducing Exhaust Emissions from Special Motor Vehicles

Current regulations apply only to special vehicles on public roads (hereinafter called "on-road vehicles"). This is because a framework created by the Ministry of Land, Infrastructure and Transport is already in place to govern exhaust emissions from construction machinery, and because of the fact that the same type of all-purpose engine is often mounted on a wide variety of different machines.

As regulations are strengthened on the basis of exhaust emission target levels for special diesel motor vehicles cited in this report, however, there is concern that vehicles that do not travel on public roads (hereinafter called "off-road vehicles") might not meet the same standards for exhaust emissions that are in place for on-road vehicles. Similarly, there is concern that the use of fuels other than diesel oil in off-road vehicles that are fitted with new technologies to reduce exhaust emissions could greatly increase emission amounts and do damage to the vehicle itself. These concerns threaten to impede efforts to reduce emissions from off-road vehicles under the framework described above, and raise the possibility that no improvements will be manifested in the atmospheric environment. Therefore, when regulations are introduced on the basis of the exhaust emission reduction target levels cited in this report for diesel special motor vehicles, it is necessary to study the introduction of regulations for off-road vehicles in light of the exhaust emission measures cited above. In doing that, the framework should be studied with consideration given to the fact that off-road vehicles are manufactured in a "diverse product, small lot" production environment. Also, we cannot ignore the contribution to exhaust emissions that is made by engines used in portable electric power generators and other equipment, which are often the same engines that are used in special motor vehicles. Therefore, it is also necessary to conduct studies on applying exhaust emission regulations to these types of engines as well.

Advanced technologies designed to reduce exhaust emissions from diesel special motor vehicles are premised on the use of diesel oil for fuel. In view of the fact that, as mentioned above, fuels other than the diesel oil designated by manufacturers are reportedly widely used in off-road vehicles, it is important to conduct detailed surveys concerning actual fuel

use and to implement educational campaigns regarding the use of appropriate fuel. Once the results of these surveys, as well as the effects of both the educational campaigns and the regulations aimed at reducing exhaust emissions from off-road vehicles have been evaluated, consideration should be given to introducing further necessary regulations if it is found that the measures already taken are not adequate to achieve the desired reduction in exhaust emissions.

Also, to ensure that exhaust emission control devices installed in special motor vehicles are properly maintained during vehicle use, it is necessary to implement a user-targeted educational campaign regarding inspection and maintenance regimens. At the same time, technical development and appropriate measures must be pursued with engine manufacturers regarding such issues as ensuring durability, etc.

2.2. Expanding the Range of Special Motor Vehicles to Which Exhaust Emission Regulations Apply

Because of the following considerations, it is appropriate to apply exhaust emission regulations to special motor vehicles that use gasoline or LPG for fuel (hereinafter called "special gasoline/LPG motor vehicles") with rated outputs ranging from 19 kW up to but not including 560 kW. First, despite being a rather small segment of the total special vehicle population in terms of absolute numbers, these vehicles account for a relatively high proportion of total exhaust emissions from special motor vehicles. Second, it is possible to reduce their exhaust emissions using the same technical measures that are applied to general gasoline/LPG motor vehicles.

In addition, it is desirable that the industry itself steadily implement autonomous measures for all engines that fall into output categories that are not subject to regulation.

2.3. Target Levels for Reducing Exhaust Emissions

2.3.1. Special Diesel Motor Vehicles

In light of the fact that special diesel motor vehicles are responsible for a relatively high proportion of the total exhaust emissions from all motor vehicles, measures should be strengthened with priority given to reducing PM and NOx emissions. Therefore, it is appropriate to work toward reducing PM, NOx, HC, and CO, and black smoke (a

component of PM) emissions in accordance with the permissible limit target levels shown in Appendix 3.

The permissible limit target levels shown in Appendix 3 are appropriate based on the assumption that design, development and production preparations will be accomplished efficiently, thus making it possible to achieve the targets for special motor vehicles with rated outputs from 130 kW up to but not including 560 kW by the end of 2006; the targets for special motor vehicles with rated outputs from 19 kW up to but not including 37 kW or from 75 kW up to but not including 130 kW by the end of 2007; and the targets for special motor vehicles with rated outputs from 37 kW up to but not including 75 kW by the end of 2008.

Because special motor vehicles are manufactured in a "diverse product, small lot" production environment, there is a great variety of vehicle categories and types that will come under regulation. Not only that, but the engines and car bodies of many machines are often made by different manufacturers, with car body manufacturers designing and developing their car bodies only after they receive the engine from the engine manufacturer. Because of this, manufacturers need development time in order to comply with the regulations. Particularly difficult challenges are posed by two ranges of engine size: engines ranging from 56 kW up to but not including 75 kW, which is the smallest range of engines that can accommodate exhaust emission control technologies adapted from those used in general diesel motor vehicles; and engines ranging from 130 kW up to but not including 560 kW, for which the least amount of development time is available before regulations take effect, which in turn makes it difficult to secure the labor hours required for production of these vehicles. For these two ranges in particular, measures must be taken to ensure conformity is smoothly achieved when the regulations come into effect.

After-treatment devices are indispensable for achieving substantial reductions in exhaust emissions from diesel engines. Regulations that are premised on the use of such after-treatment devices as diesel particulate filters (DPF) have been included in the new long-term targets for diesel motor vehicles which will come into effect in 2005. Looking to the future, similar regulations should also be introduced for special diesel motor vehicles.

Studies must also be conducted on the introduction of new exhaust emission testing methods that are designed to evaluate after-treatment devices. In view of the developmental period needed to apply after-treatment technology to special motor vehicles, as well as the probable evolution of a greater variety of vehicle types, it is estimated that DPG and other kinds of after-treatment devices will not be ready for practical applications before about 2010. It is appropriate to study regulatory details premised on after-treatment devices while monitoring progress in technical development. In view of these factors, we can expect the developmental period for coming into conformity with regulations to take longer than it would with ordinary motor vehicles, which means that a conclusion should be reached as early as possible.

Concerning HC emitted as blow-by gas, it is appropriate to quickly implement exhaust emission control measures at the stage in which some outlook of future technologies has been formed.

2.3.2. Special Gasoline/LPG Motor Vehicles

For special gasoline/LPG motor vehicles, measures should be strengthened with priority given to NOx and HC emissions. When strengthening measures to reduce exhaust emissions, the testing methods shown in Appendix 4 for measuring individual engines should be used to help reduce, by the end of 2007, exhaust emissions in accordance with the target levels for permissible limits for NOx, HC, and CO emissions as shown in Appendix 5.

Regarding HC emitted as blow-by gas, it is appropriate to implement measures in tandem with reducing exhaust-pipe emissions.

2.4. Measures to Maintain Performance Levels during Use

To help ensure that exhaust emissions do not increase during vehicle use, and to ensure that exhaust emission control devices are appropriately durable, it is necessary to establish standards for the length of service life, taking into account actual conditions of use. It is appropriate to set those standards as follows: 5,000 hours for special diesel motor vehicles with rated outputs from 19 kW up to but not including 37 kW; 5,000 hours for special gasoline/LPG motor vehicles; and 8,000 hours for special diesel motor vehicles with

rated outputs from 37 kW up to but not including 560 kW. It is also incumbent upon vehicle manufacturers to take steps in the production stage to help ensure that the systems they install continue to perform well in reducing exhaust emissions even after the required performance hours have been exceeded.

To ensure that exhaust emission control systems continue to function properly during use, it is first of all important for the user to engage in appropriate maintenance activities through a strict regimen of inspections and repairs. In addition to this, however, it is necessary to discover and remove maladjusted or inappropriately renovated exhaust emission control systems as part of mandated vehicle inspections required by the Road Vehicles Act and traffic checkpoints. To that end, idling regulations for special gasoline/LPG motor vehicles must be implemented in the same way as they are for general gasoline/LPG motor vehicles. Permissible limits for idling should be established quickly, after taking into account the exhaust emission control technologies that are adopted in order to achieve the reduction targets cited in this report.

3. Future Measures to Reduce Exhaust Emissions from Motor Vehicles

3.1. Future Issues to Be Studied

This Council intends to continue studying the following issues, which include issues cited in Section 1 and 2 above.

(1) Concerning special diesel motor vehicles with rated outputs from 19 kW up to but not including 560 kW, studies will be conducted to thoroughly explore the possibility of adapting after-treatment devices (which will be applied in accordance with the new long-term regulations for general diesel motor vehicles), and to establish new reduction targets that should be achieved by around 2010. As part of that effort, consideration will also be given to introducing new exhaust emission testing methods.

(2) Concerning gasoline/LPG special motor vehicles with rated outputs from 19 kW up to but not including 560 kW, studies will be conducted on establishing new reduction targets as needed while monitoring how the regulations based on this report are faring, possibilities for further technical development, and the effects that various existing measures have had.

(3) No exhaust emissions reduction targets are currently set for special motor vehicles with rated outputs of less than 19 kW or 560 kW or more, or for general-purpose engines other than special motor vehicles. Studies will be conducted on introducing exhaust emission regulations for these machine categories, while monitoring such factors as the status of atmospheric pollution, changes in the proportion of total emissions accounted for by these machines, and progress in the development of exhaust emission control technologies.

(4) Concerning two-wheeled motor vehicles, studies will be conducted on establishing new reduction targets as needed while monitoring how the regulations based on this report are faring, possibilities for further technical development, and the effects that various existing measures have had. The introduction of regulations for evaporative emissions will be studied at the same time.

(5) Concerning diesel motor vehicles, studies will be conducted on new reduction targets, including the further reduction of sulfur content in diesel oil, while monitoring possibilities for further exhaust emission reductions. Concerning the establishment of specific permissible limit target levels for sulfur content in diesel oil, these levels are closely related to new exhaust emission target levels after the new long-term regulations come into effect. Therefore, while conducting studies and reaching conclusions as quickly as possible, studies will also be conducted on the quality of other fuels and lubricants. Although the quality of lubricants is currently not regulated, there is concern that the ash, sulfur, and other substances contained in lubricants could affect DPF and other after-treatment devices. Therefore, working in cooperation with vehicle manufacturers, fuel producers and others, it is desirable to conduct a review of standards related to lubricants as quickly as possible.

(6) Concerning gasoline/LPG motor vehicles, studies will be conducted on establishing new reduction targets as needed while monitoring how the regulations based on the new long-term targets for gasoline motor vehicles are faring, possibilities for further technical development, and the effects that various existing measures have had. Concerning the quality of fuel and lubricants (including the sulfur content of gasoline), cooperative research on the part of the Japanese government, vehicle manufacturers, fuel producers and other concerned parties will be promoted, focusing on reducing exhaust emissions through various combinations of improvements in vehicle technologies and fuel quality. On the basis of research results, studies will be conducted on measures related to fuel and lubricant quality.

(7) Research will be conducted on ultrafine particles emitted from diesel motor vehicles to: determine their number and other characteristics, establish measuring methods, and ascertain their effect on human health. On the basis of the results, consideration will be given to whether or not it is necessary to introduce appropriate regulations.

(8) To ensure the improvement or maintenance of the exhaust emission performance of motor vehicles, it's important to improve or maintain fuel quality. Recently, bio-derived fuels, dimethyl ether (DME), and a wide variety of other alternative fuels have gained attention, of which bio-derived fuels in particular have raised hopes with regard to

preventing global warming, etc. The Japanese government is conducting surveys and research on how the use of these fuels, or their mixture with conventional fuels, would affect exhaust emissions. Based on the results of those efforts, consideration will be given as needed to measures designed to prevent air pollution.

When conducting studies or implementing measures related to the issues cited above, it must be remembered that motor vehicles are products that are distributed internationally, and that measures to reduce exhaust emissions contain many elements that are commonly dealt with both within Japan and abroad. In view of this, it is important to harmonize Japanese regulations with international norms to the greatest extent possible whenever it can be done without adversely affecting Japan's own environmental protection efforts. Therefore, it is desirable for Japan to make active contributions to the harmonization of international standards related to such concerns as: methods for testing exhaust emissions from large-sized motor vehicles; onboard diagnostic systems (OBD); off-cycle measures; methods for testing exhaust emissions from two-wheeled motor vehicles; and methods for testing exhaust emissions from special motor vehicles, including general-purpose engines.

International harmonization will bring the following advantages:

- Promotion of technical development through more efficient R&D on the part of vehicle manufacturers, and reduction of development and production costs through the common use of parts
- Lower purchase prices for vehicle users

3.2. Related Measures

To supplement the measures indicated in this report, it is desirable to pursue comprehensive exhaust emission measures for motor vehicles and other related measures such as the following.

(Pursuing Comprehensive Exhaust Emission Measures)

On the basis of the Law concerning Special Measures for Total Emission Reduction of Nitrogen Oxides and Particulate Matter from Automobiles in Specified Areas (Automobile NOx/PM Law, promulgated on June 27, 2001) it is necessary to pursue comprehensive exhaust emission measures such as the following: strengthening regulations by vehicle

category; enhancing control measures for exhaust emissions from motor vehicles used for business purposes; promoting the dissemination of low-pollution vehicles.

(Promoting the Dissemination of Low-Pollution Vehicles, Etc.)
In accordance with the "Action Plan for Developing and Disseminating Low-Pollution Vehicles" that was completed on July 11, 2001, it is desirable for all ministries and agencies concerned to work together to further disseminate low-pollution vehicles.

(Measures to Reduce Exhaust Emissions from Vehicles in Use)
As indicated in the Fifth Report, etc., it will continue to be important to ensure that exhaust emission control systems function well on all gasoline/LPG and diesel motor vehicles that are in use. This is to be achieved by encouraging users to engage in appropriate maintenance activities through a strict regimen of inspections and repairs, and through checking exhaust emission control systems as part of mandated vehicle inspections required by the Road Vehicles Act and traffic checkpoints.

Also, with regard to diesel motor vehicles that are in use, it is necessary to pursue such measures as promoting the dissemination of DPF and other devices.

In addition, in an effort to maintain the performance level of exhaust emission control systems during normal vehicle use, thought should be given to whether or not it is necessary to establish exhaust emission standards for vehicles in use, introduce surveillance systems, etc.

(Cost Burden, Etc.)
The process of implementing the exhaust emission reduction measures included in this report can be expected to have an effect on such costs as vehicle price, costs associated with ensuring engine durability, fuel costs, and maintenance costs. It will be necessary to have vehicles manufacturers and users bear these costs as part of the general environmental costs associated with using a motor vehicle.

It will also be necessary to make appropriate financial and tax arrangements to encourage people to exchange their vehicles for new ones that conform to the latest regulations, and to promote smooth improvement in fuel quality.

(Status Surveys and Measures for Unregulated Exhaust Emission Sources)
As stated in the Fifth Report, etc., it is necessary to continue to conduct surveys on the current status of various emission sources that are not yet regulated and to determine whether or not further measures are required. At the same time, studies must be conducted on what kinds of systems should be devised in order to implement those measures.

(Measures against Harmful Atmospheric Pollutants)
As stated in the Fifth Report, etc., it is desirable to establish the basis for an understanding of the amounts of harmful atmospheric pollutants being emitted by vehicles by developing measurement methods and improving measurement precision, and to formulate necessary policies on the basis of the information thus obtained.

In addition, efforts must be made to understand the effects that such factors as engine combustion technology, after-treatment devices (catalytic converters, etc.), and the quality of fuel and lubricants have on the amounts of harmful atmospheric pollutants that are emitted.

(Making Measurements of Exhaust Emissions from Vehicles More Precise)
As stated in the Fifth Report, regulations on gasoline/LPG motor vehicles and diesel motor vehicles will be greatly strengthened and target levels for exhaust emissions will be lowered. As this occurs, it is important for measurements to be reliable and to accurately understand the standards of quality that must be maintained during the manufacturing process. For this reason, it is necessary to pursue research aimed at improving measurement precision.

(Enhancing the Ability to Predict and Measure Effects)
As stated in the Fifth Report, as progress is made on vehicle measures and comprehensive vehicular exhaust emission measures, it will become increasingly important to plan and

execute policies based on accurate predictions of what effect a given measure will have, and on the measurement of that effect through precise monitoring. To that end, it is necessary to compile an inventory of PM, HC, and other substances generated by all mobile emission sources (including motor vehicles), fixed emission sources (such as factories and offices), and natural emission sources. It is also necessary to get an understanding of contributions to the secondary formation of such substances as suspended particulate matter (SPM) and photochemical oxidants. Therefore, it is desirable to develop methods for predicting and measuring the effects of various policies adopted to improve the quality of the atmosphere, and to establish systems that will help us to grasp the effects on the roadside and at other onsite locations.

Appendix 1

Exhaust Emission Measurement Modes Applied to Two-Wheeled Motor Vehicles

For two-wheeled motor vehicles, the mass of exhaust emissions is measured using in the following manner. Fifty-five kilograms are added to the weight of the vehicle, the engine is started, and the substances contained in the exhaust generated and emitted from the exhaust pipe into the atmosphere are measured under each set of conditions cited on the left side of the table. Six measurements are made under each set of conditions, with each measurement lasting the duration specified on the right side of the table.

Operating Conditions	Time (Seconds)
Engine running without load	11
Engine accelerating from zero to 15 km/h	4
Engine running steadily at 15 km/h	8
Engine decelerating from 15 km/h to zero	5
Engine running without load	21
Engine accelerating from zero to 32 km/h	12
Engine running steadily at 32 km/h	24
Engine decelerating from 32 km/h to zero	11
Engine running without load	21
Engine accelerating from zero to 50 km/h	26
Engine running steadily at 50 km/h	12
Engine decelerating from 50 km/h to 35 km/h	8
Engine running steadily at 35 km/h	13
Engine decelerating from 35 km/h to zero	12
Engine running without load	7

Appendix 2

Target Levels for Permissible Limits for Two-Wheeled Motor Vehicles

Category	Target Levels for Permissible Limits (Average Values)			Measurement Method
	Nitrogen Oxides	Hydrocarbons	Carbon Monoxide	
First-class motor-driven cycles	0.15 g/km	0.5 g/km	2.0 g/km	Measurement modes cited in Appendix 1
Second-class motor-driven cycles	0.15 g/km	0.5 g/km	2.0 g/km	Measurement modes cited in Appendix 1
Mini-sized two-wheeled motor vehicles	0.15 g/km	0.3 g/km	2.0 g/km	Measurement modes cited in Appendix 1
Small-sized two-wheeled motor vehicles	0.15 g/km	0.3 g/km	2.0 g/km	Measurement modes cited in Appendix 1

Appendix 3

Target Levels for Permissible Limits for Special Diesel Motor Vehicles (Average Values)

<table>
<tr><th colspan="3" rowspan="2">Category</th><th colspan="5">Target Levels for Permissible Limits (Average Values)</th></tr>
<tr><th>Nitrogen Oxides</th><th>Hydro-carbons</th><th>Carbon Monoxide</th><th>Particulate Matter</th><th>Black Smoke</th></tr>
<tr><td rowspan="5">Special Vehicles That Use Diesel Oil for Fuel</td><td colspan="2">Rated output: 19 kW up to but not including 37 kW</td><td>6.0 g/kWh</td><td>1.0 g/kWh</td><td>5.0 g/kWh</td><td>0.4 g/kWh</td><td>40%</td></tr>
<tr><td rowspan="2">Rated output: 37 kW up to but not including 75 kW</td><td>Rated output: 37 kW up to but not including 56 kW</td><td rowspan="2">4.0 g/kWh</td><td rowspan="2">0.7 g/kWh</td><td rowspan="2">5.0 g/kWh</td><td>0.3 g/kWh</td><td>35%</td></tr>
<tr><td>Rated output: 56 kW up to but not including 75 kW</td><td>0.25 g/kWh</td><td>30%</td></tr>
<tr><td colspan="2">Rated output: 75 kW up to but not including 130 kW</td><td>3.6 g/kWh</td><td>0.4 g/kWh</td><td>5.0 g/kWh</td><td>0.2 g/kWh</td><td>25%</td></tr>
<tr><td colspan="2">Rated output: 130 kW up to but not including 560 kW</td><td>3.6 g/kWh</td><td>0.4 g/kWh</td><td>3.5 g/kWh</td><td>0.17 g/kWh</td><td>25%</td></tr>
</table>

Appendix 4

Exhaust Emission Measurement Modes Applied to Special Gasoline/LPG Motor Vehicles

For special gasoline/LPG motor vehicles, measurements are made in the following manner. The mass of substances contained in emissions from the exhaust pipe of the vehicle are measured per unit time while the vehicle is running under each condition cited on the left side of the table. Values are obtained by multiplying the results by the appropriate weighting factor shown on the right side of the table. Then the respective amounts of power generated under each of the conditions cited on the left side of the table are again multiplied by the appropriate weighting factor on the right side of the table to obtain a second set of values. The sum of the first set of values is divided by the sum of the second set of values to determine the mass of exhaust emissions per unit time and unit power.

Operating Conditions	Weighting Factor
Engine running at the speed of rated output with a full load	0.06
Engine running at intermediate speed (1) with a full load	0.02
Engine running at intermediate speed (1) with a 75% load	0.05
Engine running at intermediate speed (1) with a 50% load	0.32
Engine running at intermediate speed (1) with a 25% load	0.30
Engine running at intermediate speed (1) with a 10% load	0.10
Engine running without load	0.15

(1) When the speed at which maximum torque is generated falls 60% and 75% of the rated speed, that speed is defined as "intermediate speed." When the speed at which maximum torque is generated is 60% of the rated speed or below, "intermediate speed" is defined as 60% of the rated speed. When the speed at which maximum torque is generated is 75% or above, "intermediate speed" is defined as 75% of the rated speed.

Appendix 5

Target Levels for Permissible Limits for Special Gasoline/LPG Motor Vehicles

Category		Target Levels for Permissible Limits (Average Values)			Measurement Method
		Nitrogen Oxides	Hydrocarbons	Carbon Monoxide	
Special motor vehicles that use gasoline or liquefied petroleum gas for fuel	Rated output: 19 kW up to but not including 560 kW	0.6 g/kWh	0.6 g/kWh	20.0 g/kWh	Measurement modes cited in Appendix 4