



# **Fuel Efficiency Standard for Heavy-Duty Vehicles in Japan**

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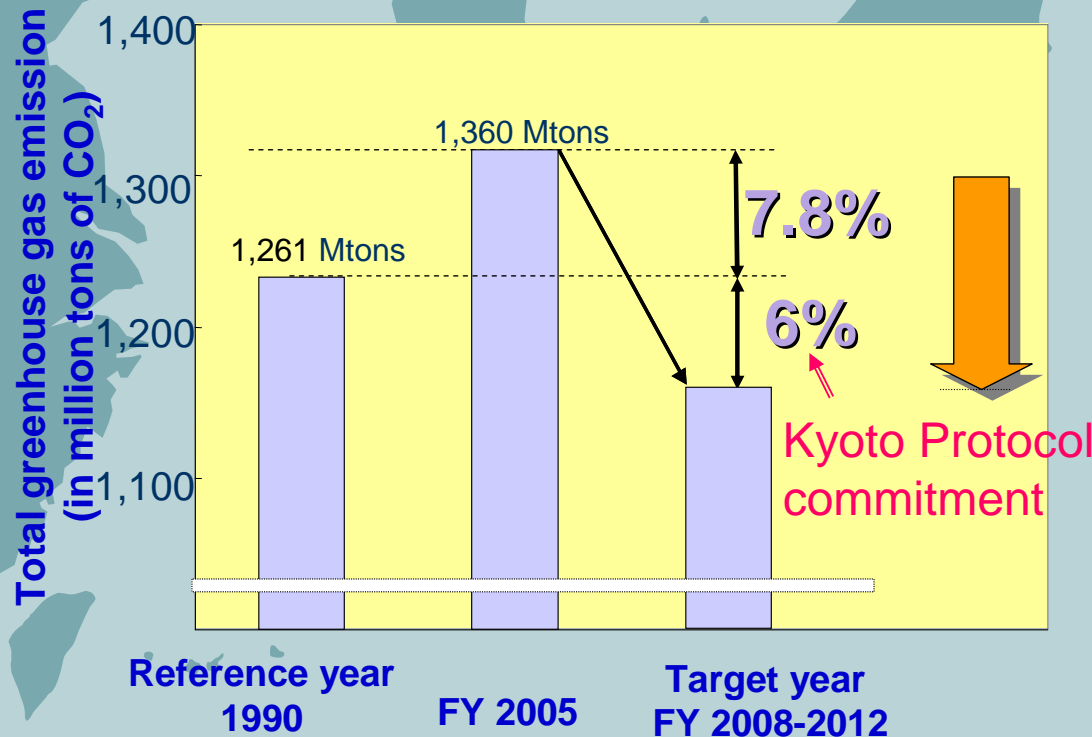


**1. Current Situation**  
**~ CO2 Emissions from Heavy-Duty**  
**Vehicles ~**

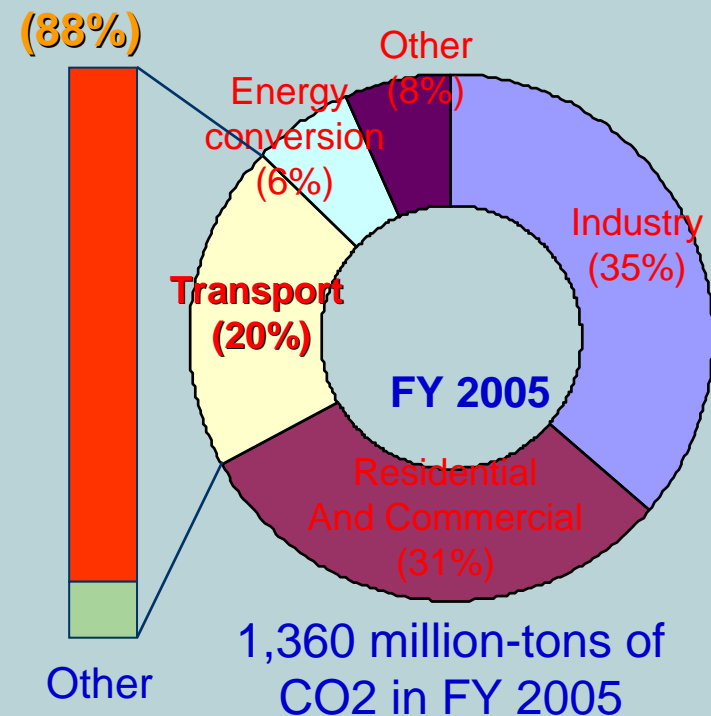
# Greenhouse Gas Emissions in Japan

○1,360 Million-tons of GHG Emitted in FY2005, up 7.8% Over 1990.  
 →To achieve the committed 6% GHG reduction, we must reduce about 14% of GHG between 2005 and 2008-2012.

○About 20% of CO<sub>2</sub> were emitted from Automobiles.

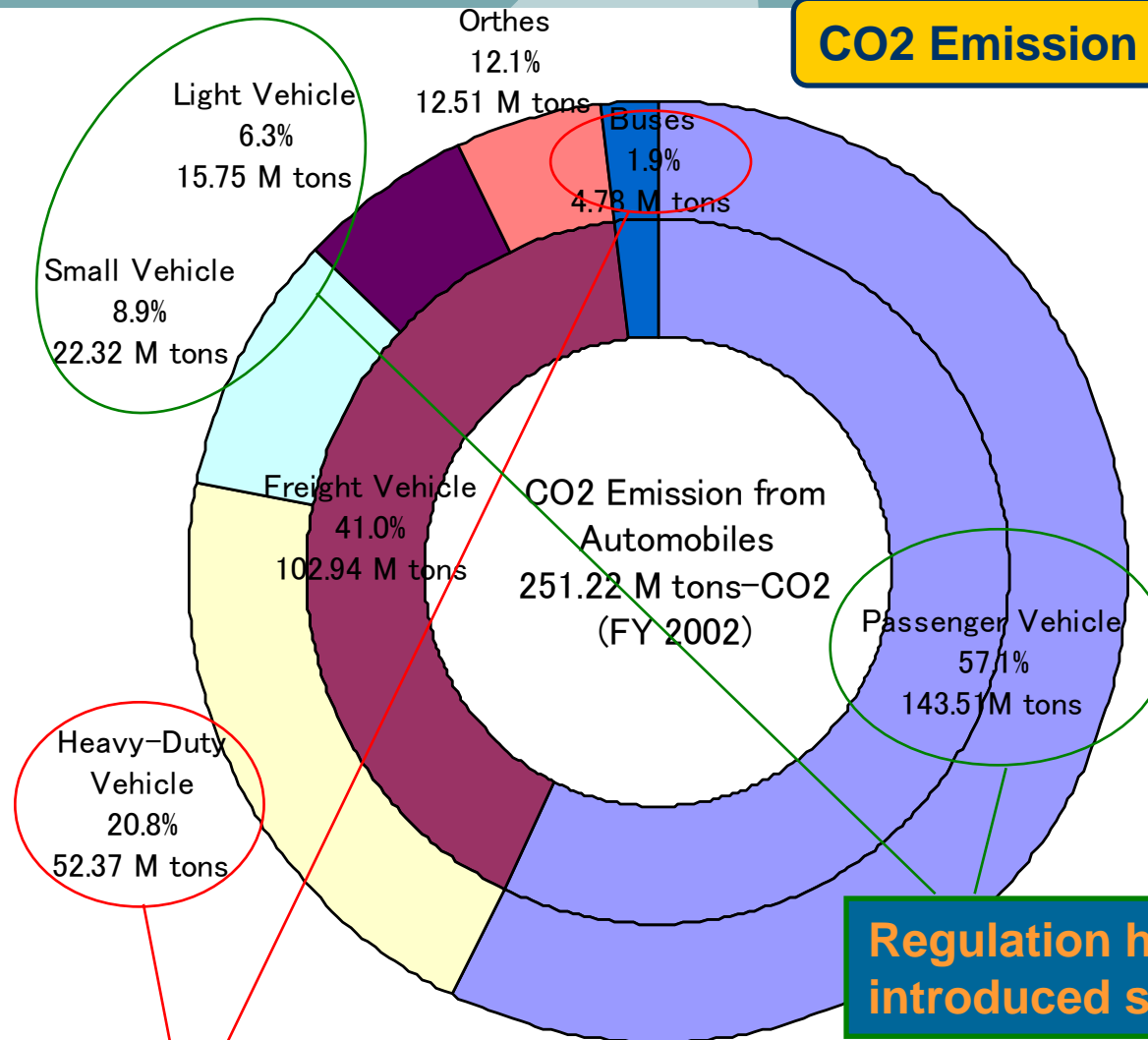


## Automobiles (88%)



# CO2 Emissions from Heavy-Duty Vehicles

CO2 Emission from Automobiles



Regulation had already been introduced since 1999

HDV Regulation was introduced in 2006



## **2. Fuel Economy Standard for Heavy-Duty Vehicles in Japan ~ Target Standard Values and Test Procedure ~**

# Fuel Economy Standard for Heavy-Duty Vehicles

## <Background>

About 1/4 of CO<sub>2</sub> from Automobiles were emitted from Heavy-Duty Vehicles.

→ “CO<sub>2</sub> Reduction = Fuel Economy Improvement” are needed.

Appropriate Measurement Method of Fuel Economy for Heavy-Duty Vehicles was developed.

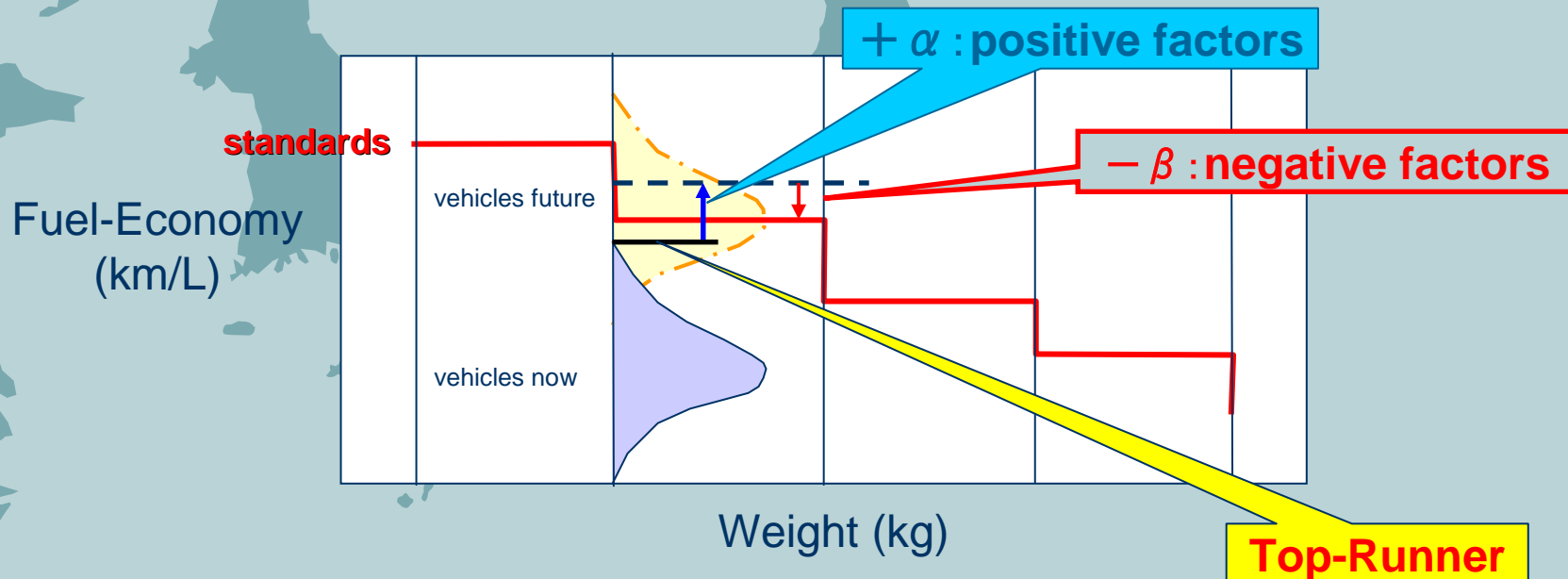
The world's first Fuel Economy Target Standard Values for Heavy-Duty Vehicles (diesel vehicles that weigh more than 3.5 ton), based on “Top-Runner Program”, promulgated in 2006.

Manufacturers are required to improve Fuel Economy of Heavy-Duty Vehicles until target year 2015.

# Top-Runner Standard for Fuel Economy

## Target Standard Values based on Top-Runner Program

Based on the fuel economy of the most fuel efficient vehicle which is on sale (Energy Conservation Law)



\*Vehicles are divided into some categories by Vehicle Weight which strongly influence their fuel economy

Positive Factors: Technological Improvement  
Negative Factors: Exhaust Emission Regulations, etc.  
(trade-off relation with fuel economy)

# Fuel Economy Targets for Heavy-Duty Vehicles (In Detail)

Target Year FY2015

<Target Standard Values for Trucks>

Class by GVW (t)	3.5 -7.5				7.5 -8	8 -10	10 -12	12 -14	14 -16	16 -20	20-
Payload (t)	-1.5	1.5-2	2-3	3-							
Target (km/L)	10.83	10.35	9.51	8.12	7.24	6.52	6.00	5.69	4.97	4.15	4.04

<Target Standard Values for City Buses>


Class by GVW (t)	-8	8-10	10-12	12-14	14-
Target (km/L)	6.97	6.30	5.77	5.14	4.23

# Fuel Economy Targets for Heavy-Duty Vehicles (On Average)

	Target year	Base year (2002) Fuel Economy	Target standard value (average)
Trucks	2015	6.32 km/L (415 g-CO <sub>2</sub> /km)	7.09 km/L (370 g-CO <sub>2</sub> /km) <b>(12.2% improvement)</b>
Buses	2015	5.62 km/L (466 g-CO <sub>2</sub> /km)	6.30 km/L (416 g-CO <sub>2</sub> /km) <b>(12.1% improvement)</b>

\*Target standard values are set by categories of GVW.

# Tax Reduction Incentive for Fuel Efficient Heavy-Duty Vehicles

<p style="text-align: center;"><b>Term</b> Apr. 2006 - Mar. 2008</p>	<p>NOx and (or) PM 10% Low-Emission Vehicle from 2005 Emission Regulation</p>	<p>Low-Emission Vehicle applied to 2005 Emission Regulation</p>
<p>Fuel economy target compliance</p> 	<p>(Automobile acquisition tax) 2% reduction</p>	<p>(Automobile acquisition tax) 1% reduction</p>

**Tax Reduction Incentive was introduced simultaneously with Fuel Economy Target Standard Values for Heavy-Duty Vehicle**

# Fuel Economy Test Procedure for Heavy-Duty Vehicles (Background)

**Character of Heavy-Duty Vehicle**  
Wide variety of types



**Challenges for Fuel Economy Test**

- testing facility
- testing time
- evaluation of factors affecting fuel economy



**Solution: Simulation Method**

A computer program that converts a vehicle-based driving cycle into an engine-based operation cycle using vehicle specification data, and thereby calculates fuel economy using the data from engine-based tests.

# Fuel Economy Test Procedure for Heavy-Duty Vehicles (Test Cycle)

## Simulation method

A computer program that converts a vehicle-based driving cycle into an engine-based operation cycle using vehicle specification data, and thereby calculates fuel economy using the data from engine-based tests.

( Advantage of simulation method : testing facility, testing time, measuring accuracy and evaluation of factors affecting fuel economy )

## Test Cycle

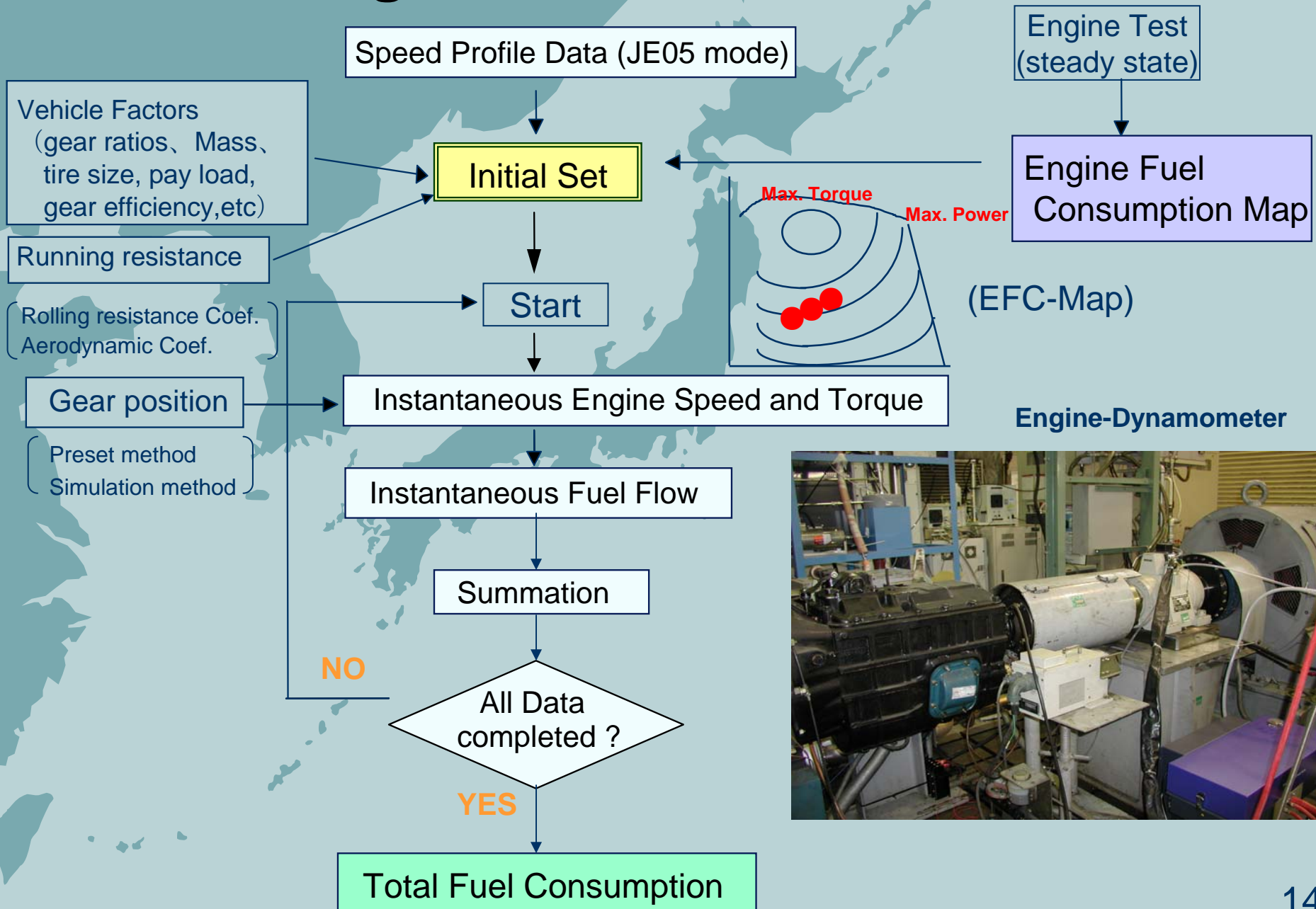
- 1) Intra-urban driving cycle (JE05 mode)
- 2) Inter-urban driving cycle (constant speed at 80 km/h with grades)

**Same mode as Exhaust Emission**



Combined at a predetermined ratio which is specific to the vehicle category  
(ex. trucks (GVW exceeds 20t) - intra-urban driving cycle 0.7 : inter-urban driving cycle 0.3)

# Block Diagram of Simulation Procedure

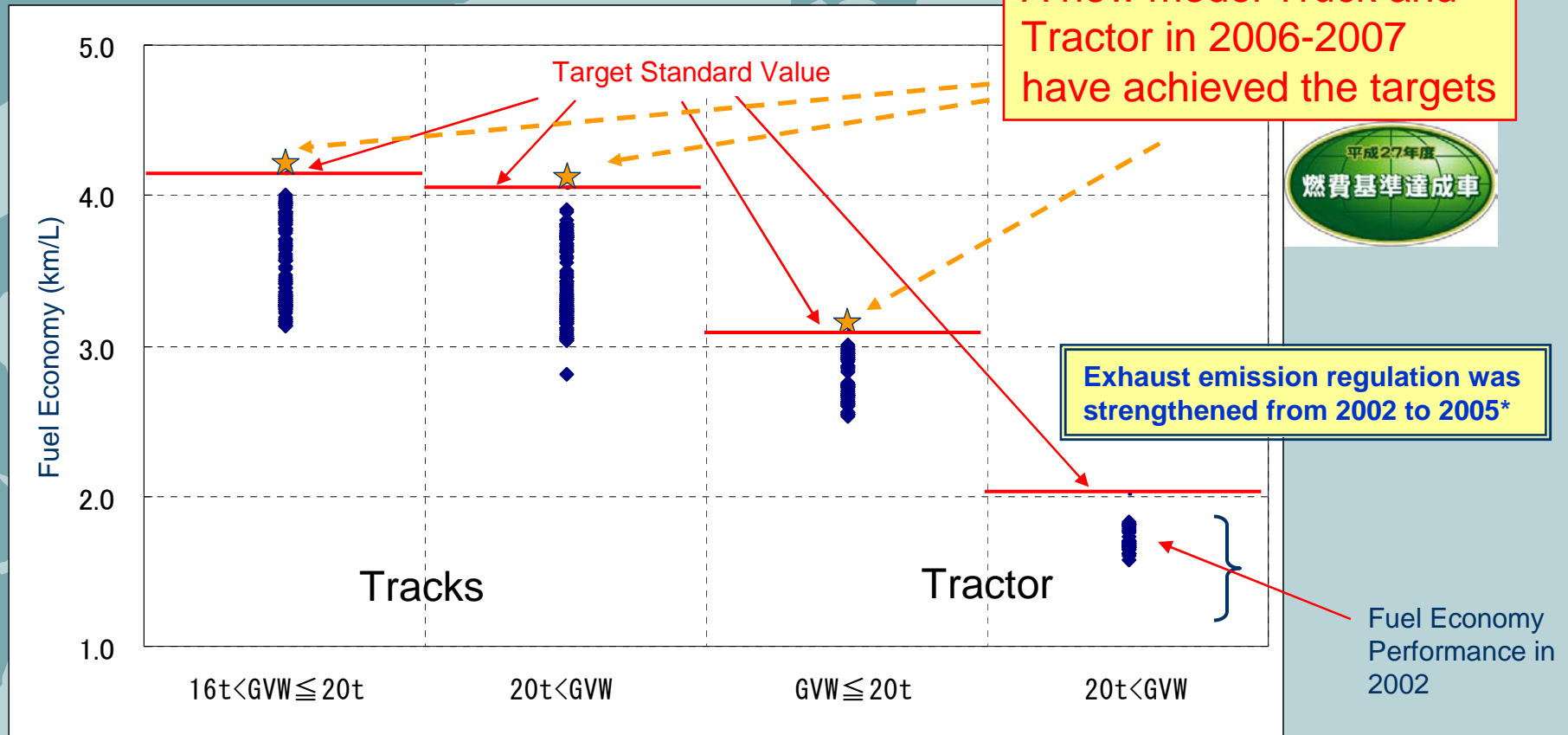




### **3. Outcomes of the Fuel Economy Standard for Heavy-Duty Vehicles at the Present Time**

# Latest Outcomes of Target Standard Values for Heavy-Duty Vehicle (Trucks)

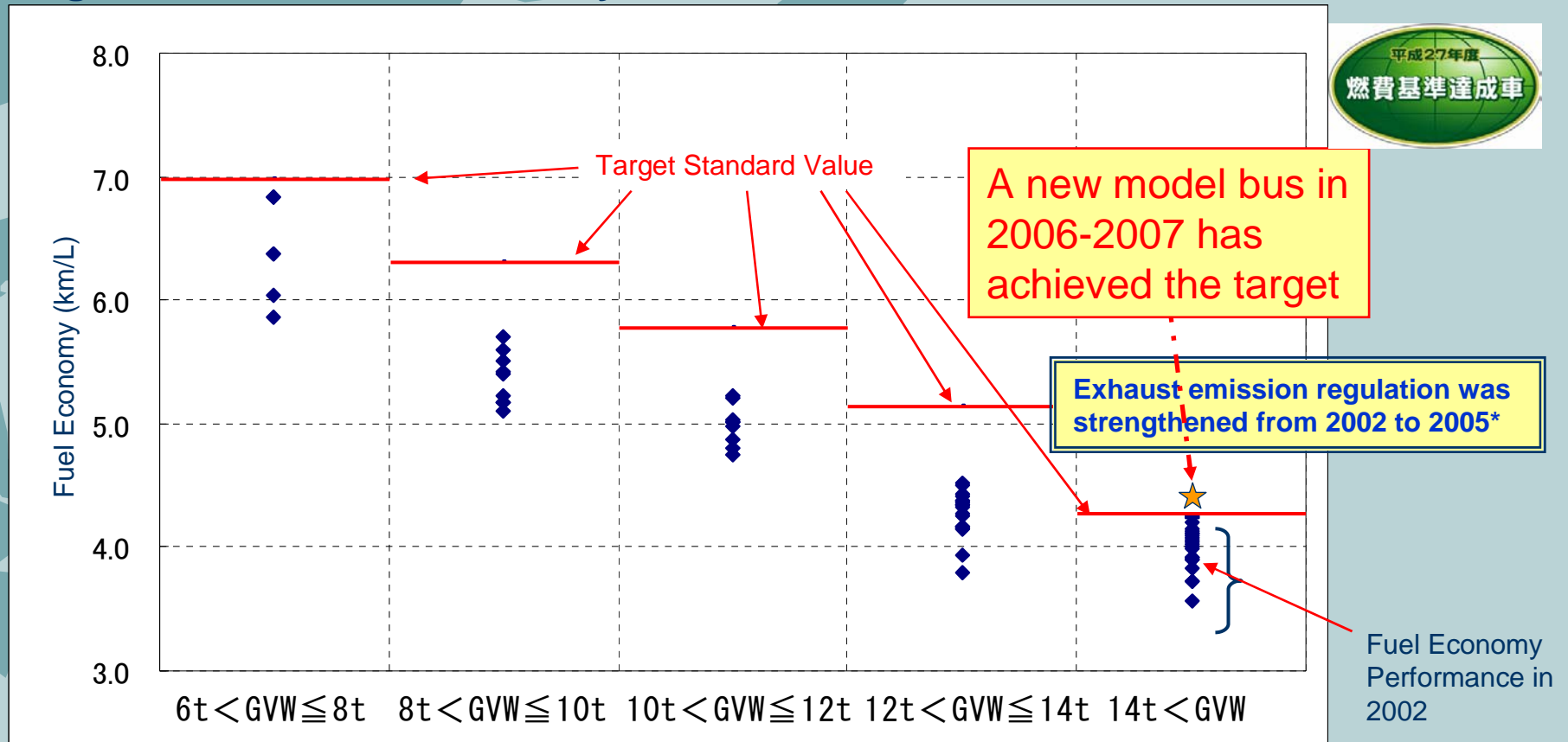
Target Standard Values for Truck and Tractor



\* The Truck or Tractor in 2006 should meet 85% more stringent PM regulation and 40% more stringent NOx regulation, which generally lowers fuel efficiency.

# Latest Outcomes of Target Standard Values for Heavy-Duty Vehicle (Buses)

## Target Standard Values for City Bus



\* The Bus in 2006 should meet 85% more stringent PM regulation and 40% more stringent NOx regulation, which generally lowers fuel efficiency.

## **Summary**

- 1. Fuel Economy Target Standard Values for Heavy-Duty Vehicles were set in Japan for the first time in the world.**
- 2. Tax Reduction Incentive for Fuel Efficient Heavy-Duty Vehicles was introduced simultaneously.**
- 3. Fuel Economy for Heavy-Duty Vehicles could be remarkably improved by the Target Standard Values.**