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Overview of Japan's HDV Fuel Efficiency

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Today's Topic

- The situation of the emission amount of CO2 in Japan
- Our approach to CO2 reduction
- The situation of fuel efficiency regulation
- Introducing other measures to reduce CO2 from automobile

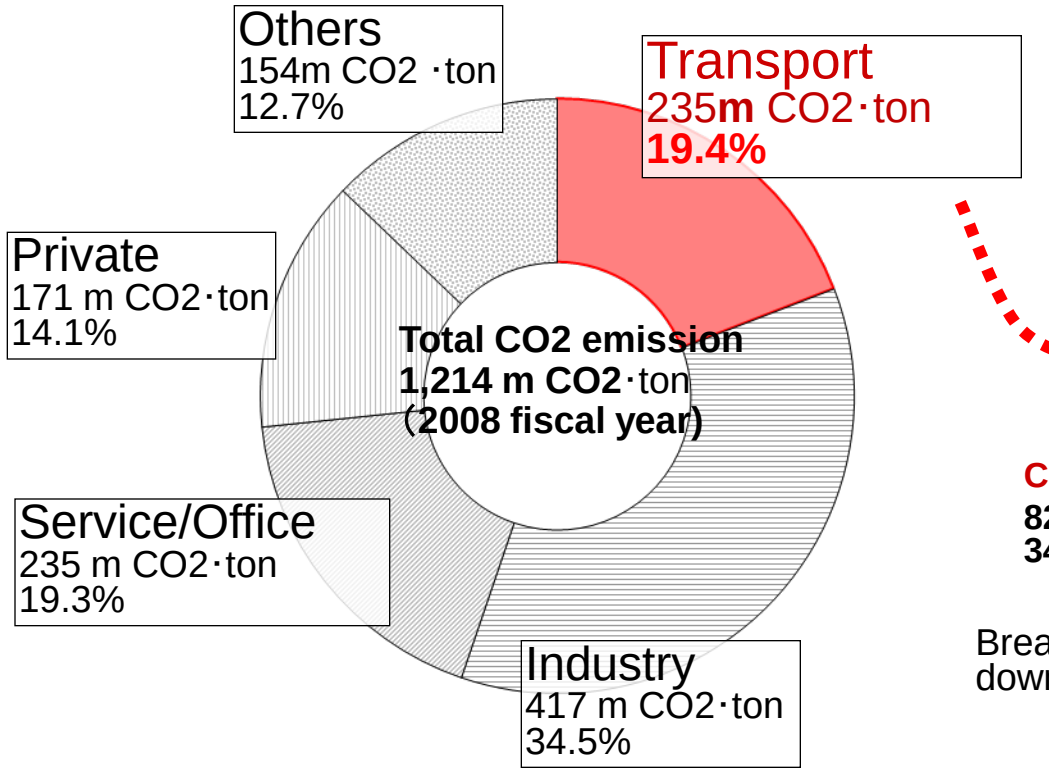
CO2 Emission in Japan

CO2 Emission from transport sector is 19% of total emission in Japan.

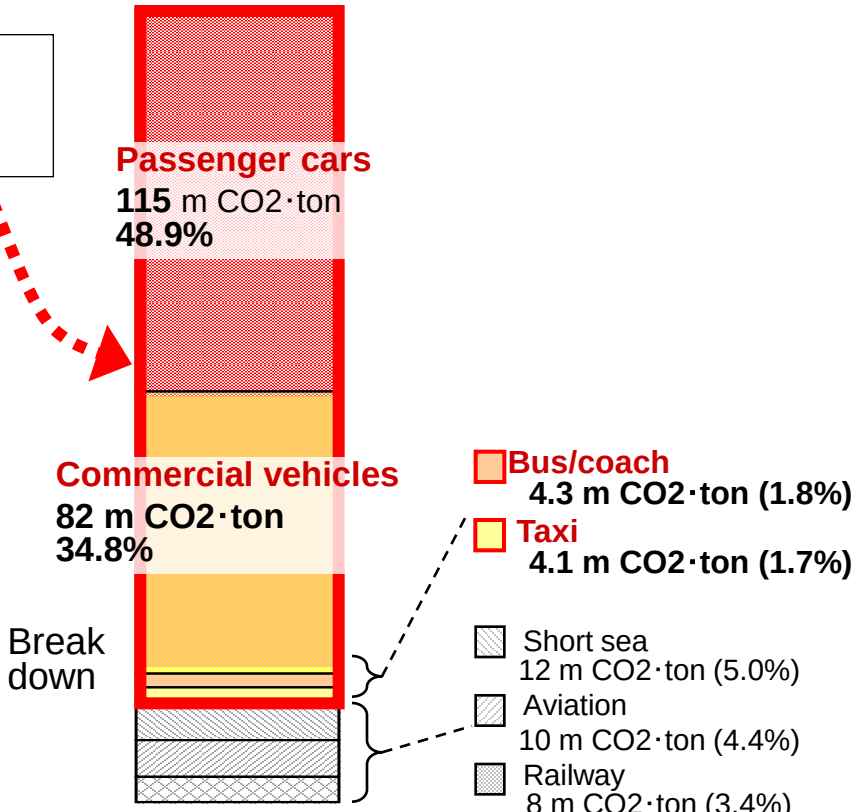
Road transport emits 87% of transport emission.

34.8% in transport sector comes from commercial vehicles.

CO2 Emission in Japan



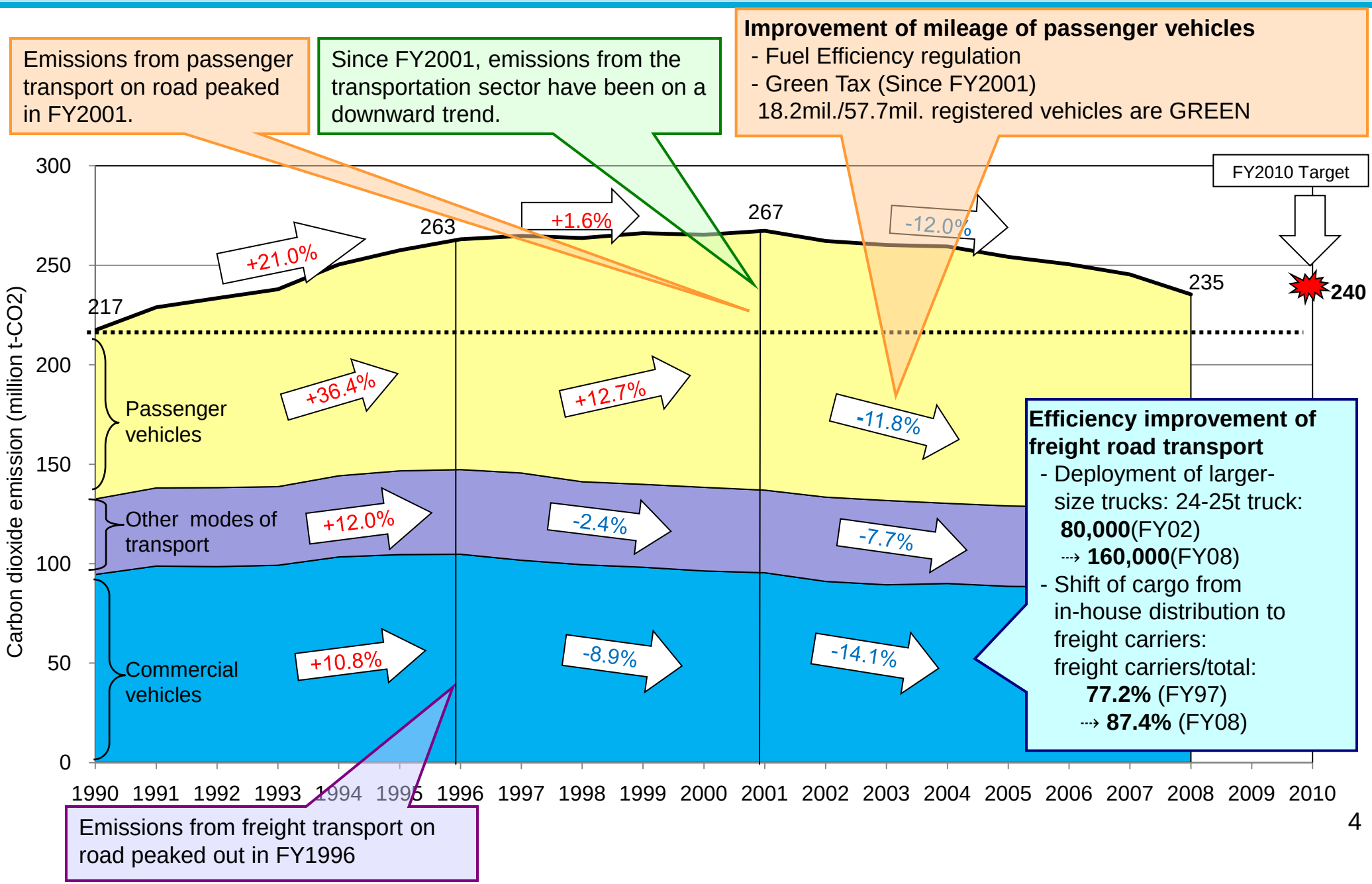
Breakdown in Transport sector



※ Emission from electric generation and thermal generation are distributed to final demand sectors according to amount of consumption of each sector.

※Developed by MLIT referring to “Japanese GHG Inventory report “

CO2 Emission from transport sector in Japan



Integrated Approach

Japan has been succeeding in its environmental measures through an integrated approach that integrates a range of different but equally effective strategies.

(1) Developing and popularizing environmentally friendly vehicles

Establishing fuel efficiency standards

We are encouraging automakers to achieve globally leading levels of technological innovation by establishing new passenger vehicle fuel efficiency standards for up until 2020 (based on stringent technical analysis).

Supporting development

We are promoting the development and commercialization of next-generation vehicles with substantially improved environmental performance.

IPS（non-contact recharging）hybrid bus

Creating appropriate fiscal incentives for popularization

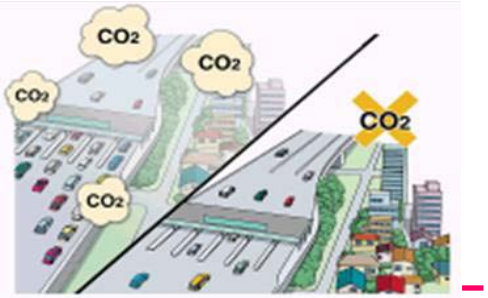
We are encouraging the popularization of environmentally friendly vehicles via tax breaks (green tax, etc.) and subsidies (measures to popularize low-emission vehicles).

(3) Implementing town planning considering the environment & traffic-flow measures

Progressing town planning that utilizes electric vehicles

- We are establishing technical standards for the optimum positioning and installation of recharging facilities
- We are supporting the establishment and maintenance of recharging facilities by local authorities

Traffic-flow measures using ITS



(2) Supporting improvements of usage

Supporting increased use of equipment that helps eco-driving (EMS)

Promoting use of public transport

(4) Improving fuel

Establishing and maintaining technological standards for E10-compliant vehicles

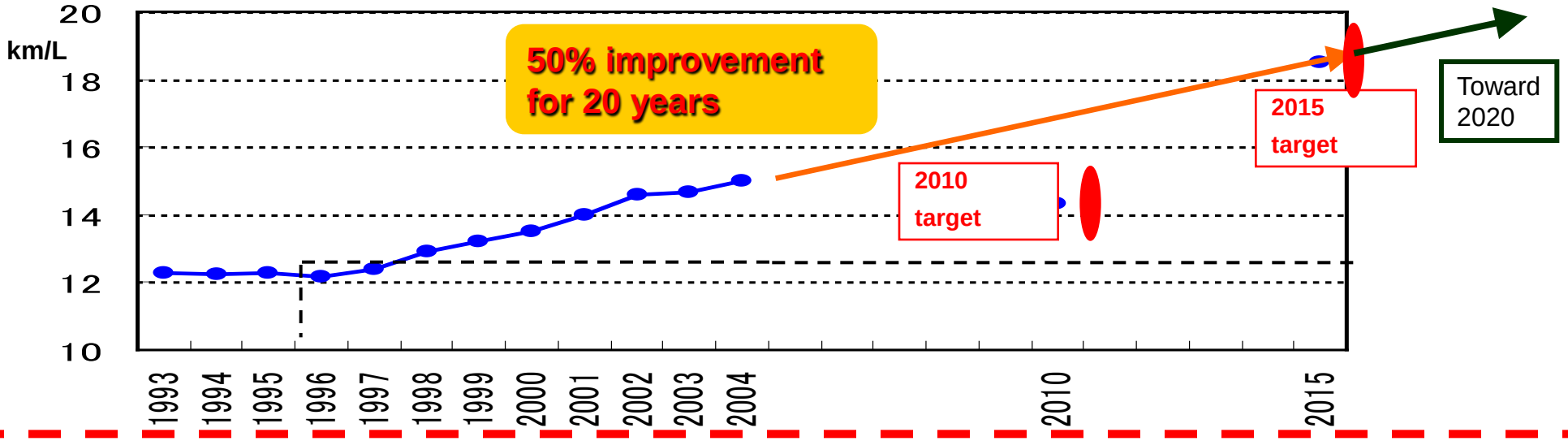
We are establishing and maintaining technological standards for E10-compliance, which relates to measures to prevent emissions and refueling errors.

Fuel efficiency standard (history)

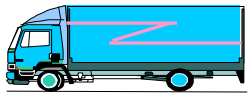
Japan has history to execute FE regulation.
Through this regulation, Japan's average FE of automobile has been improving steadily.

< History of Top runner fuel efficiency regulation>

	Published	Target year
Passenger vehicle (Gasoline)	1999	2010
Passenger vehicle (Diesel)	1999	2005
Passenger vehicle (Gasoline and Diesel)	2007	2015
Passenger vehicle (Gasoline and Diesel)	*under consideration・・・*	*2020*



FE regulation for HDV

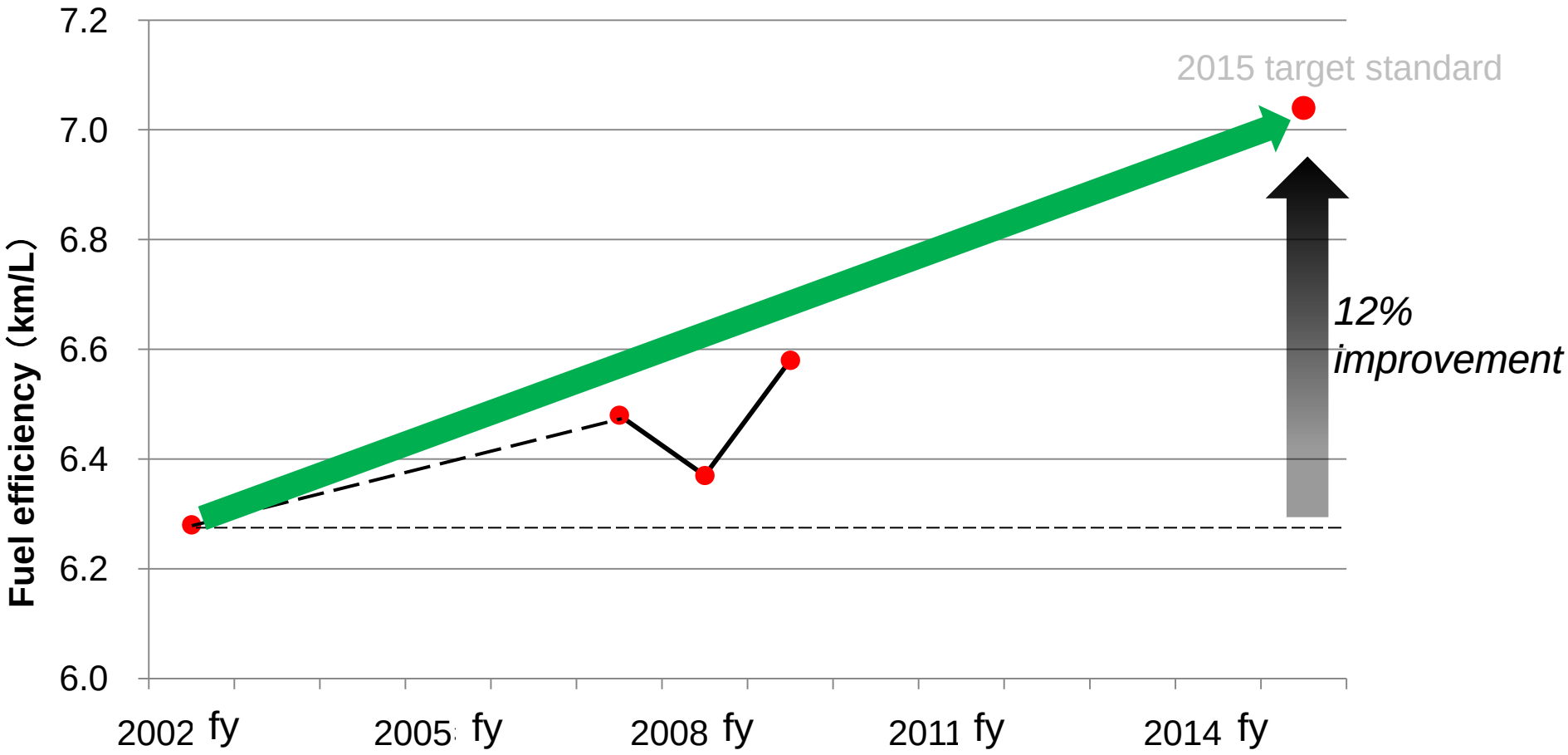


2006 — 2015

Trend of fuel efficiency of Heavy-duty vehicle

- In March 2006, Japan adopted fuel efficiency standard for heavy-duty vehicle. This is the first implementation in the world. This is targeted for FY 2015.
- It demands fuel efficiency improvement by 12% compared with 2020 average fuel efficiency.
- This standard is used in Tax basis.

Trend of fuel efficiency of Heavy-duty vehicle (average)



Fuel efficiency standard (Legal system)

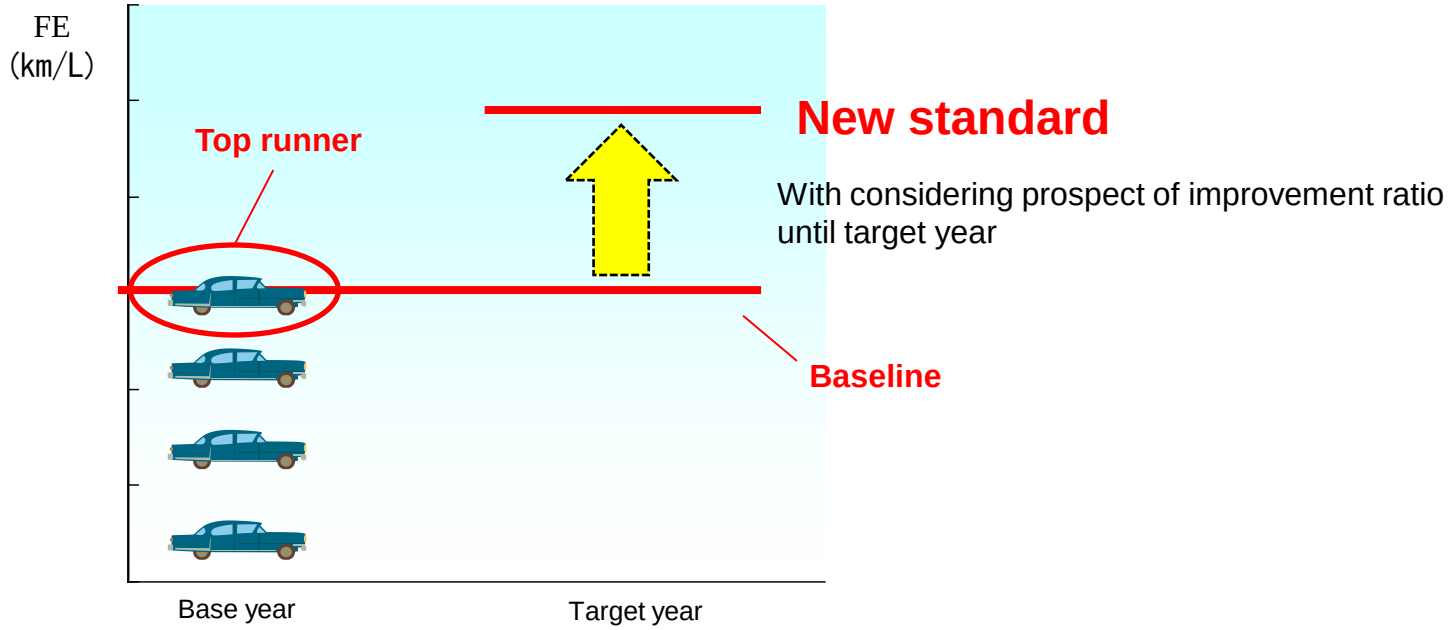
- Japanese automobile FE standard regulation system is provided by “Law Concerning the Rational Use of Energy”(so called “Sho Ene Ho” means Energy conservation law) .
- Energy Conservation Law targets some products which are mass produced and energy-consuming. The manufacturers or importers of these products are required to improve efficiency to meet target standard requested by the Law.
- This law targets 23 products, including passenger vehicles and freight vehicles.

<Target Products>

1. Passenger Vehicles
2. **Freight Vehicles**
3. Electric Refrigerators
4. Electric Freezers
5. Electric Rice Cookers
6. Microwave Ovens
7. Ligting Equipment
8. Air Conditioners
9. Electric Toilet Seats
10. TV sets
11. Video Cassette Recorders
12. DVD Recorders
13. Computers
14. Magnetic Disk Units
15. Copying Machines
16. Space Heaters
17. Gas Cooking Appliances
18. Gas Water Heaters
19. Oil Water Heaters
20. Vending Machines
21. Transformers
22. Routers
23. Switching Units

Fuel Efficiency standards (Top Runner Approach)

- ”Top Runner Approach” means the method of making FE standard. New standard is made by considering the most efficient product at the base year as a baseline level.
- Standard should be high but reachable, because target standard is almost achieved by actual products at the time of base year.
- In the automobile standard, this “Top Runner Approach” is used from “2010 FE standard”



Fuel efficiency standard (Driving mode)

・Japan adapts original driving mode to reproduce actual traffic situation in our country.

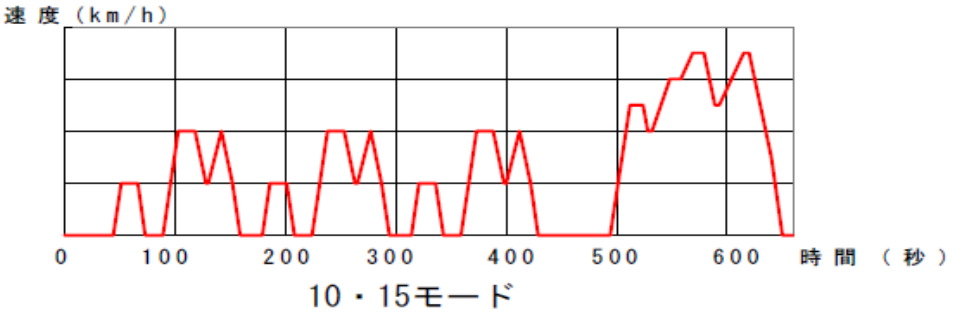
・PV uses ”10・15mode” and “JC08mode” ; Heavy duty vehicles use “JE05mode ” and “Interurban mode”.

・For PV, “10・15mode ” is adopted in “2010 standard”, and “JC08mode” is adopted in “2015 standard”

【PV】

10・15mode:

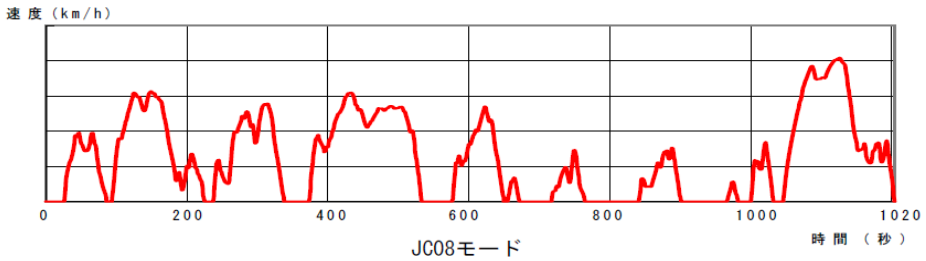
A driving mode which combines 10mode and 15mode. 10mode reflects urban and 15mode reflects suburb.



10・15モード

JC08mode:

JC08mode reflects actual traffic situation more adequately than 10・15mode. JC08 is longer and more high speed.

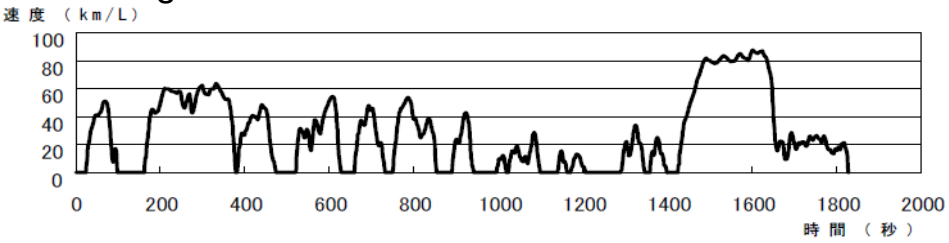


JC08モード

【HDV】

JE05mode:

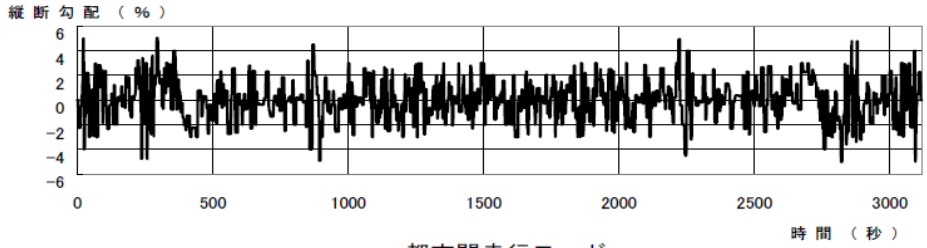
A driving mode which reflects traffic situation in urban areas



都市内走行モード

Interurban mode:

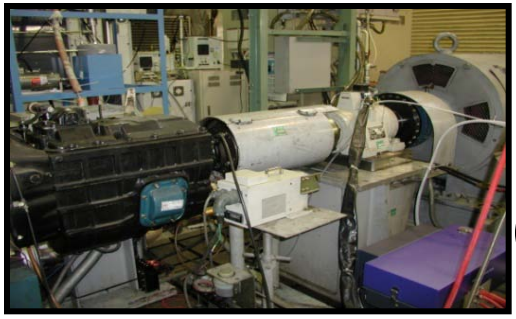
A driving mode which is reflects highway. Average speed is 80 km/h, which takes into consideration the below speed variation.



都市間走行モード

Fuel efficiency standard (Test procedure of HDV)

- FE of HDV is measured by engine dynamometer, not using whole vehicle. FE map of a engine is measured by this instrument.
- By using computer simulation with FE map and vehicle specification data, FE of HDV is calculated.
- With computer simulation, we can save cost and time, because FE map data of a engine can be used for various vehicle with that engine.



Driving mode (time and speed)

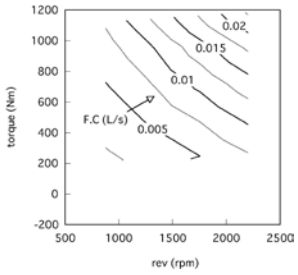
- combine with JE05 mode and Interurban driving mode

Conversion program
- determine gear-shift positions
- calculate engine speed and torque

Vehicle specifications
（vehicle weight, tire resistance, transmission etc.）

Engine operating mode

Fuel efficiency map

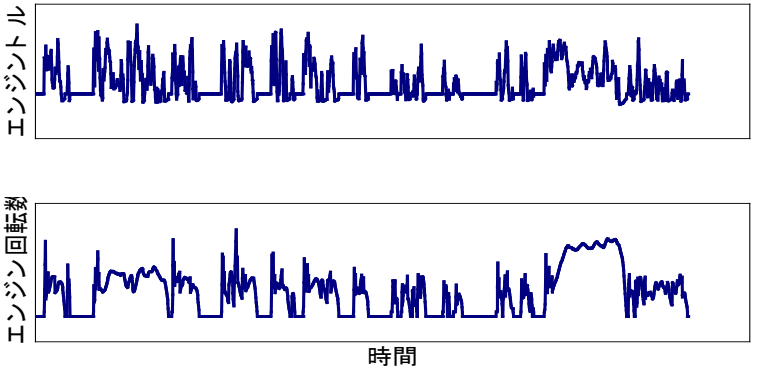


computing

Fuel consumption

□ □ □ $= \sum_{i=start}^{end} F.C(i)$

Fuel efficiency



Fiscal Incentives

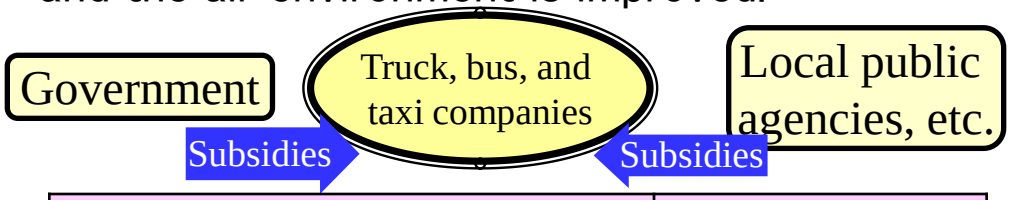
➢**Fiscal incentives is significantly essential to accelerate dissemination of EFVs.**

Fiscal Incentives（example）

Tax incentive Apr.2008 – Apr. 2011	Acquisition tax Weight based tax
EV, PHEV, HV, CNG, Clean Diesels	**Exempted**
Gasoline and Diesel ▪ 燃費基準+25%達成車 and 低排出ガス車 +25% 2010 FE reg +75% JP05 ▪ 2015 FE reg For HDV and JP09 level Etc.	**-75%**
▪ 燃費基準+15%達成車 and 低排出ガス車 +15% 2010 FE reg +75% JP05 ▪ 2015 FE reg For HDV and +10% JP05 Etc.	**-50%**

Subsidies for introduction of low-pollution vehicles, etc.

With subsidies for bus and truck companies, the use of low-pollution vehicles is promoted and the air environment is improved.



Subsidiary(*1)		Subsidiary rate
New vehicles	CNG truck and bus	1/4 of vehicle main body price or 1/2 of difference with normal vehicle price
	Hybrid truck and bus (*2)	
	Electric vehicle	
	Hybrid taxi	
Remodeling of in-use vehicles to CNG vehicles		1/3 of remodeling cost

(*1) Minimum requirement : 2 buses and 3 trucks in principle
(*2) Vehicles reducing NOx by 10% and PM by 50% compared to JP09 level

Support for inovation

Intercity - Long distance

Suburb - Middle distance

Urban areas

Community

Clean diesel vehicle

Ultra fuel economy gasoline vehicles

Fuel cell vehicles

Hybrid vehicles

CNG/LNG Trucks

Alternate fuel trucks and buses

Super clean diesel trucks and buses

Hybrid trucks

Fuel cell buses

Plug-in hybrid vehicles

Hybrid buses

Electric vehicles

Ultra small-sized mobility

Inductive Power Transfer (IPT) hybrid buses

Inductive Power Transfer (IPT) hybrid community buses

★ : infrastructure for Electric power supply is required.

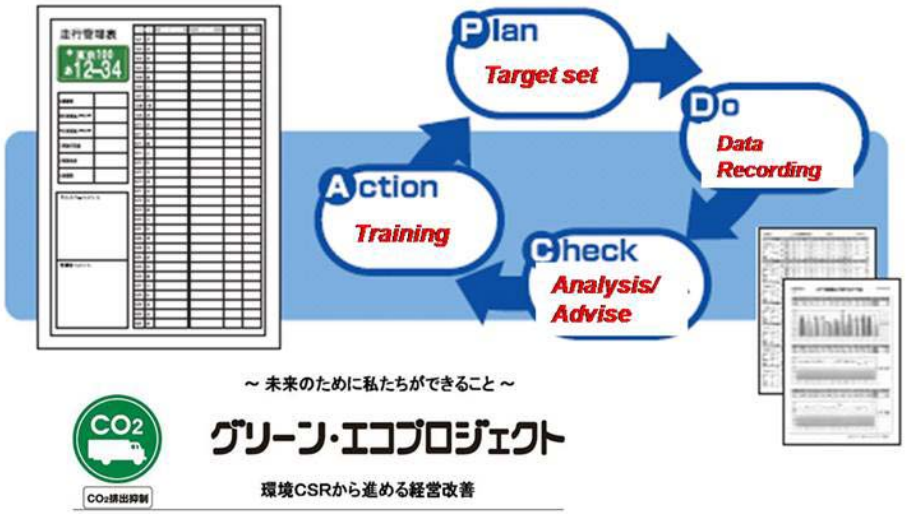
★ : Infrastructure for hydrogen and natural gas supply is required.

Eco-driving

Eco-driving contributes to fuel efficiency and CO2 reduction by 10% on average.
We have national eco-drive campaigns to affect driver behavior showing actual HOW-TO. These kinds of campaigns, training programs should play an important role, as well as in-car equipment to assist eco-driving.

Eco-driving assist system/ Fuel consumption meter

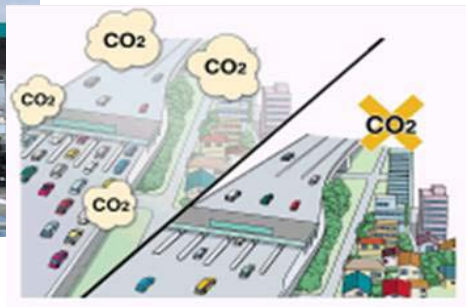
Education and monitoring program



National campaign material ”10 tips for Eco-Driving”

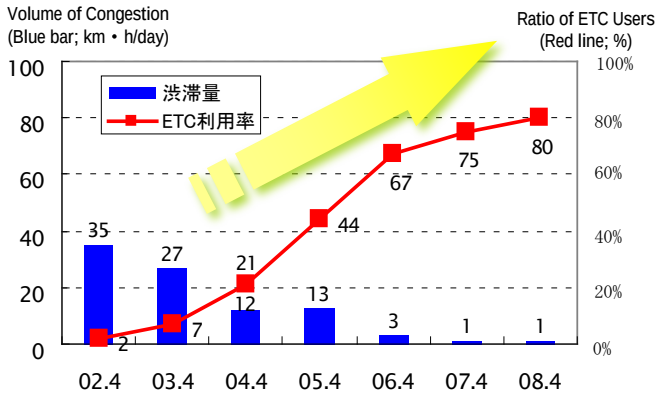
Infrastructure Improvement(ITS)

ETC
Electronic Toll Collection System



■ ETC: Enables non-stop, cashless toll collection at expressway tollbooths, whose capacity shortage causes about a third of traffic jams on expressways:

ETC Decreases Volume of Congestion:
(18 Tollbooths of the Metropolitan Expressways)

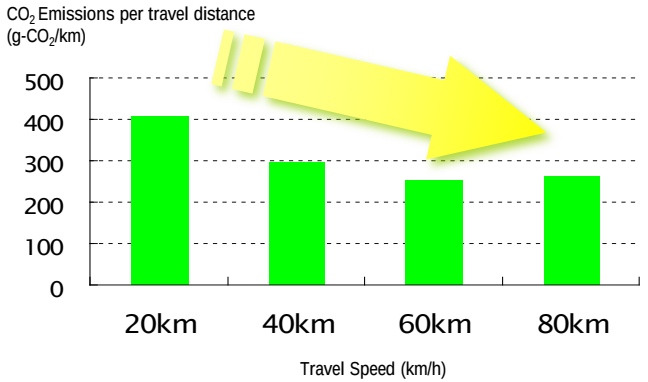


In 2010

Reducing 0.2Mt-CO_2

VICS
Vehicle Information and Communication System

■ VICS: Provides road traffic information in real time, realizing smooth traffic & higher travel speed, resulting in the improvement of actual fuel efficiency:



Improvement ratio per unit × number of units × transport volume

In 2010

Reducing 2.4Mt-CO_2

Thank you for your attention

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