

Japanese Next Generation Vehicle Strategy

A Successful Strategy to Achieve CO₂ Emission Reduction and Global
Green Vehicle Leadership

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Briefing Outline

- **History of Japanese Low Emission Vehicle Policy**
- **Outcome as of 2007—Marked Increase in Low Emission Gasoline Vehicles, but Few Non-Gasoline Low Emission Vehicles on the Road**
- **Post 2007: Lessons Learned Applied to Launch of Next Generation Vehicle Policy**
- **Outcome as of 2011 – Reasons for Optimism**
- **Factors Facilitating Progress and Outlook**

Japan's Low Emission Vehicle Policies

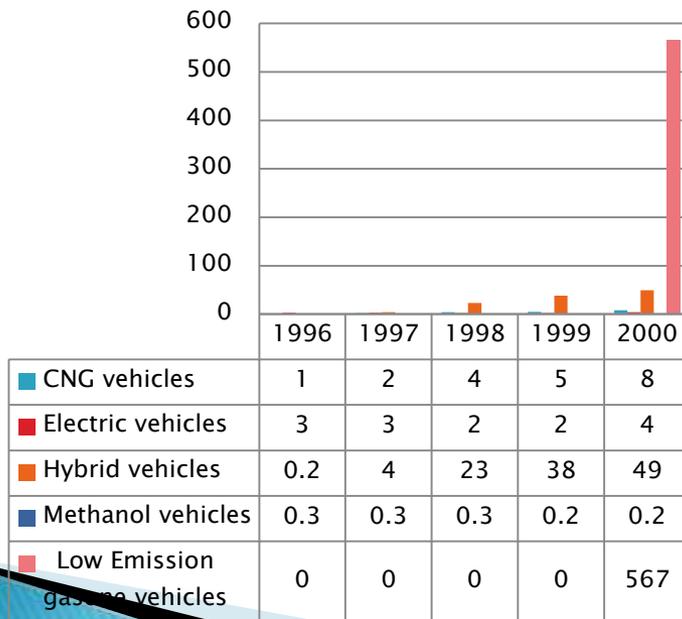
Japanese Low Emission Vehicle policy has evolved through a series of flexible action plans and policy measures

- ▶ **In July 2001**, Japan launched “**Prime Minister Koizumi’s Low Emission Vehicle Development and Diffusion Action Plan 低公害車開発普及アクションプラン**,” which called for 10 million low emission vehicles (**低公害車**) and 50,000 fuel cell vehicles on the road by the end of 2010
- ▶ **In 2004**, Japan launched the “**World’s Most Advanced Low Emission Vehicle Society Action Plan 世界最先端の低公害車社会の構築に関する政策**,” and introduced more aggressive policy measures

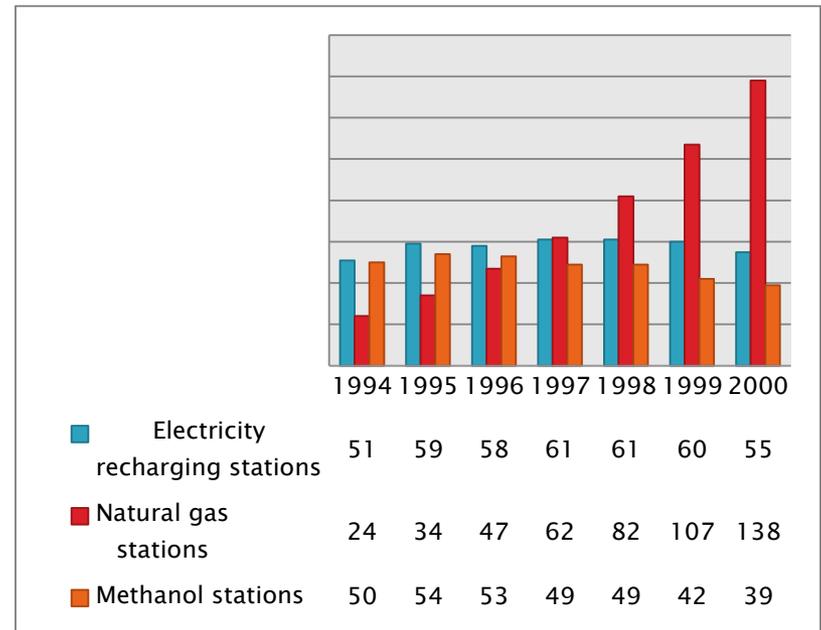
Japan's Requirement for Low Emission Vehicles

- ▶ **Need to lower greenhouse gas emissions** through expanded use of low emission vehicles. Few LEVs on the road in Japan prior to 2001.
- ▶ **The 2001 Prime Minister's Action Plan and the 2004 Low Carbon Society Construction Plan** called for 10 million low emission vehicles and 50,000 fuel cell vehicles on the road by the end of 2010.

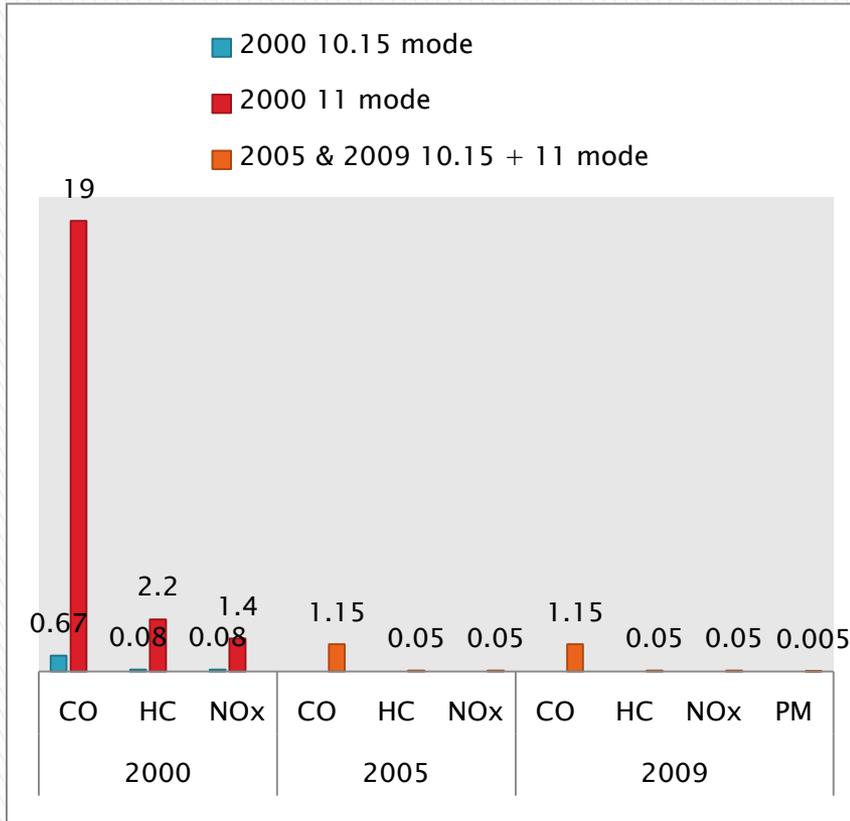
Number of LEVs in Use prior to 2001
(thousand units)



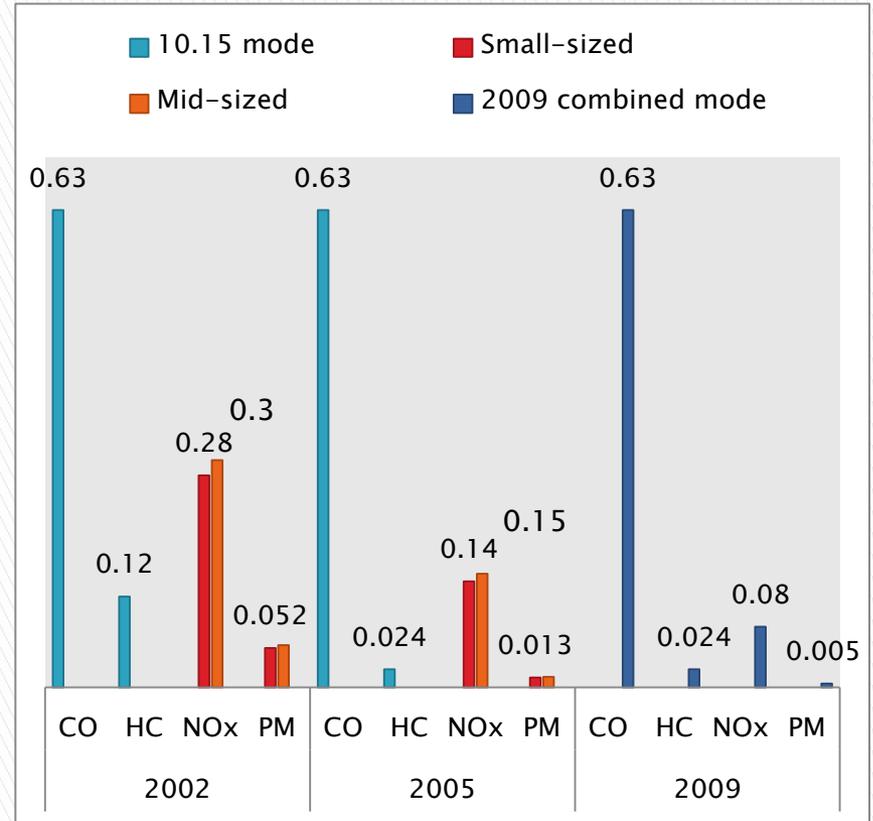
Number of Eco-Fueling stations prior to 2001
(Units)



Japan's Passenger Vehicle Emissions Standards: Historical Trends (g/km)



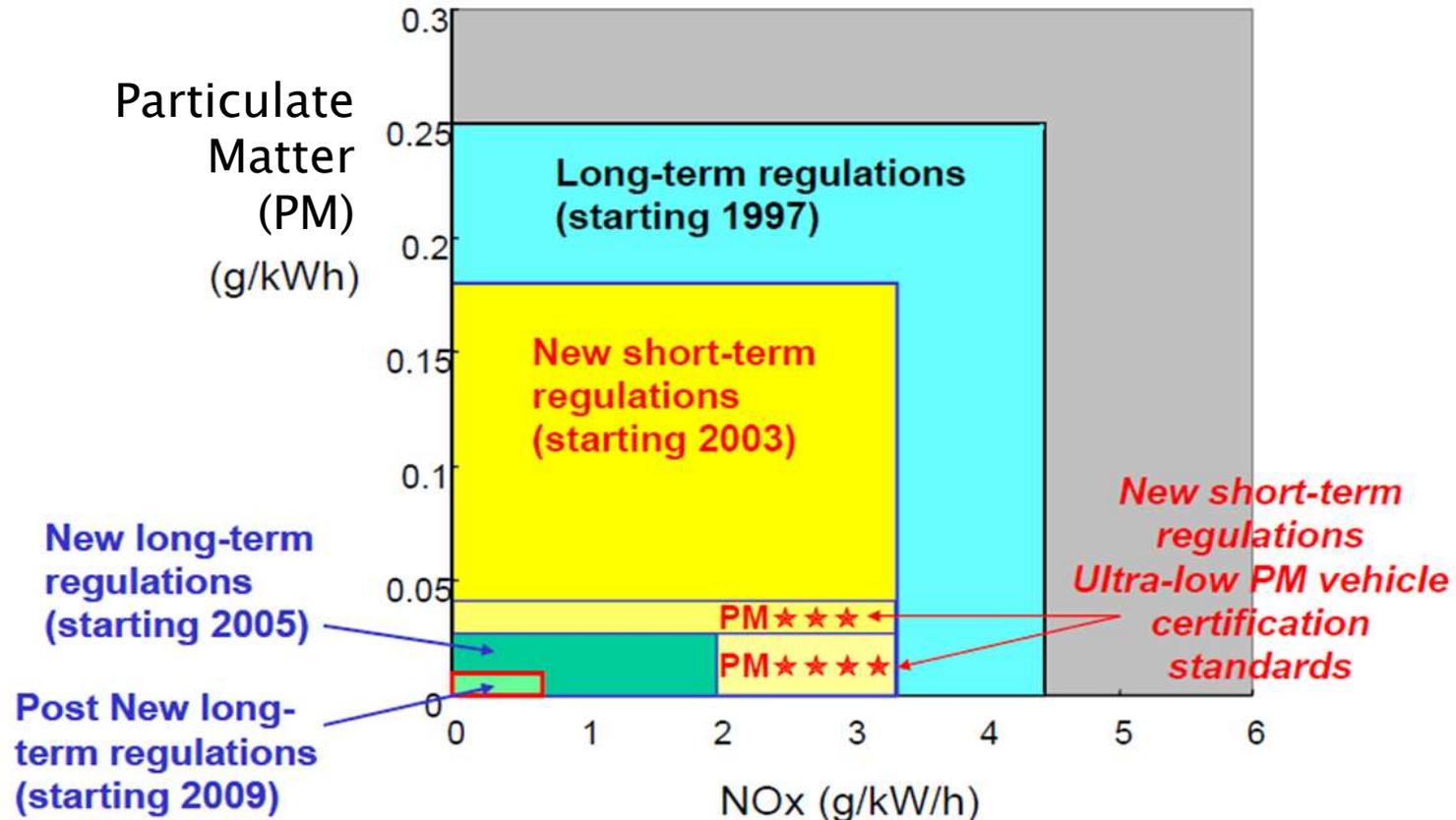
Gasoline Vehicles



Diesel Vehicles

Japan's Heavy-Duty Vehicle Exhaust Emissions Standards: Work in Progress

Heavy-duty Diesel Vehicles

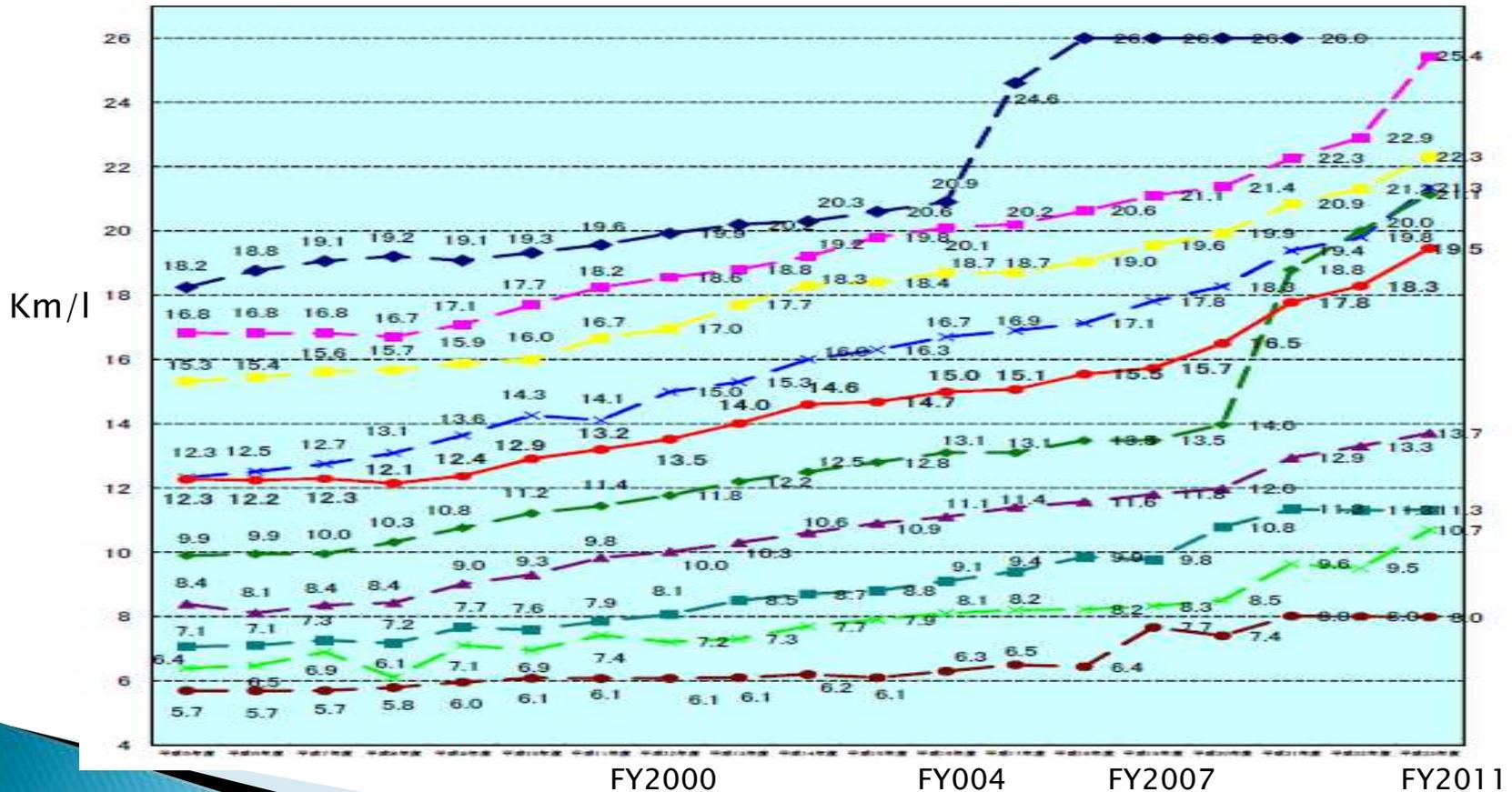
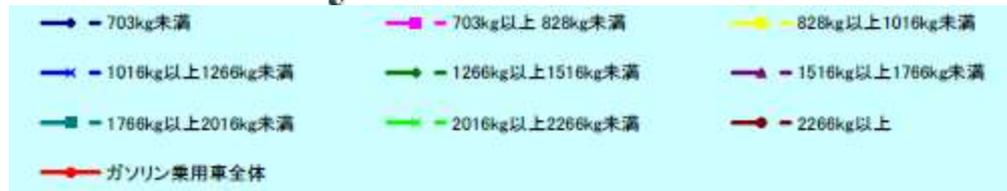


Sources: Ministry of the Environment; Ministry of Land, Infrastructure, Transport and Tourism

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Fuel Efficiency Standards: Historical Trend, a 44% Increase in 10 years

1 km/l = 2.35 mpg (US)
 2000 13.5km/l = 31.7 mpg
 2004 14.7km/l = 34.5 mpg
 2007 15.5km/l = 36.4 mpg
 2011 19.5km/l = 45.8 mpg



Vehicle Certification Keyed to Fuel Efficiency and Vehicle Emissions

● CERTIFICATION FOR VEHICLES WITH ADVANCED FUEL EFFICIENCY

For Gasoline and Diesel Vehicles Including Trucks and Buses with GVW ≤ 2.5t

Rating/Performance Level		Vehicle Sticker
Compliant +20% compared to standards	Performing at least 20% better compared to 2015 fuel efficiency standards	
Compliant +10% compared to standards	Performing at least 10% better compared to 2015 fuel efficiency standards	
Compliant with standards	Compliant with 2015 fuel efficiency standards	

Note: Fuel efficiency is JC08 test cycle-based.

For Trucks and Buses with GVW > 2.5t

Rating/Performance Level		Vehicle Sticker
Compliant +10% compared to standards	Performing at least 10% better compared to 2015 fuel efficiency standards	
Compliant +5% compared to standards	Performing at least 5% better compared to 2015 fuel efficiency standards	
Compliant with standards	Compliant with 2015 fuel efficiency standards	

Note: Fuel efficiency is JC08 or JE05 test cycle-based.

For Gasoline and LPG Vehicles Including Gasoline Trucks with GVW ≤ 2.5t

Rating/Performance Level		Vehicle Sticker
Compliant +50% compared to standards	Performing at least 50% better compared to 2010 fuel efficiency standards	
Compliant +38% compared to standards	Performing at least 38% better compared to 2010 fuel efficiency standards	
Compliant +25% compared to standards	Performing at least 25% better compared to 2010 fuel efficiency standards	

Note: Fuel efficiency is 10-15-mode test cycle-based.

● CERTIFICATION FOR VEHICLES WITH LOW EMISSIONS

Rating/Performance Level		Vehicle Sticker
	Emissions down by 10% from 2009 standards	
	Emissions down by 75% from 2005 standards	
	Emissions down by 50% from 2005 standards	

● CERTIFICATION FOR TRUCKS AND BUSES WITH LOW NOx & PM EMISSIONS

Rating/Performance Level	Vehicle Sticker
Compliant with 2009 emission standards	
Compliant with 2005 emission standards	
Compliant with other certification criteria (see above)	

JAMA Data

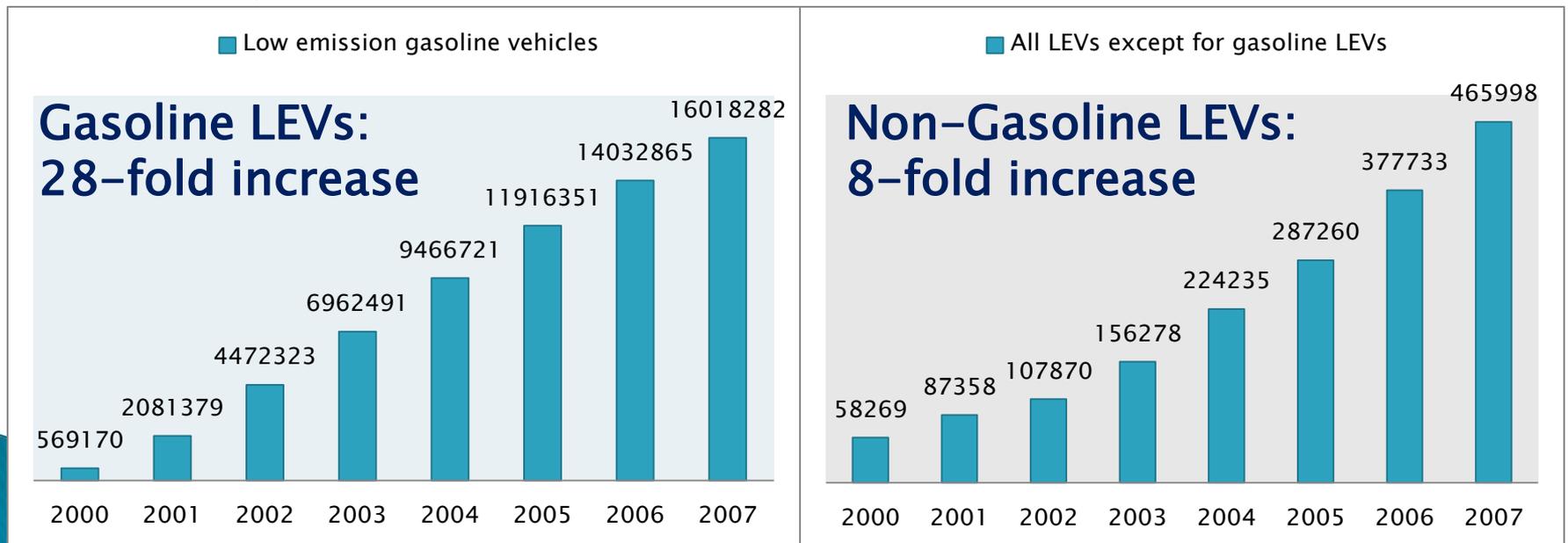
Tax Cuts, Subsidies, Loans, Government Procurement

- ▶ **Measures were specific for the period between 2001 to March 2003**
- ▶ **Have remained the same for subsequent low emission vehicle programs, with minor modifications**

Measures	Policy Target	Specific Measures
Automobile tax	Electric vehicles, CNG vehicles, methanol vehicles (all types) All low emission, fuel efficient gasoline vehicles	50% less tax 50, 25, 13% less tax based on the stickers (☆ ☆☆☆☆ ☆☆☆)
	Diesel vehicles of more than 11 years old and gasoline vehicles of more than 13 years old	10% more tax
Automobile acquisition tax	Electric vehicles, methanol, CNG vehicles (all types), hybrid buses and trucks Hybrid passenger vehicles Low emission, fuel efficient gasoline vehicles	2.7% less tax (out of 5% acquisition tax) 2.2% less tax 30万円 tax deductible
Subsidies for businesses	CNG and hybrid buses Diesel particle filter	½ of the difference with conventional counterparts Various provisions
Corporate tax, Property tax	Electric vehicle, CHG vehicle, and hybrid vehicles, CGS gas stations, methanol stations	30% depreciation for the first year; 7% tax deductible, etc.
Low interest loans	Electric vehicles, CNG vehicles, methanol, and hybrid vehicles	About 4% interest for 5–10 years
Government procurement	Cabinet Secretariat, Cabinet Office, Ministries, other government agencies, the Diet, the Court, and local governments to acquire LEVs	Replacement of all Central Government vehicles with LEVS in three years

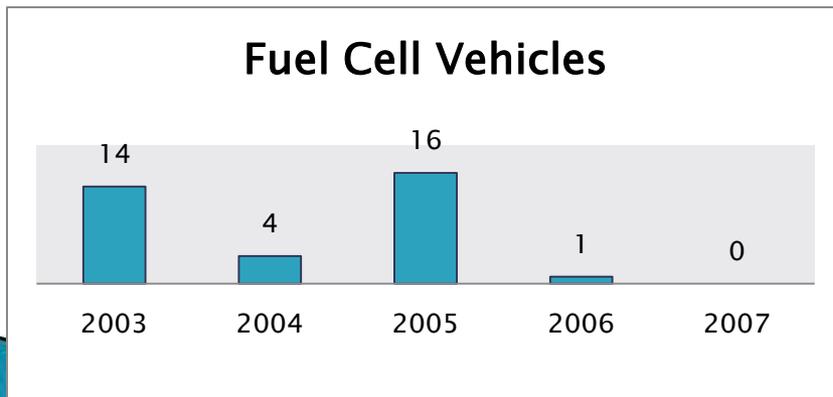
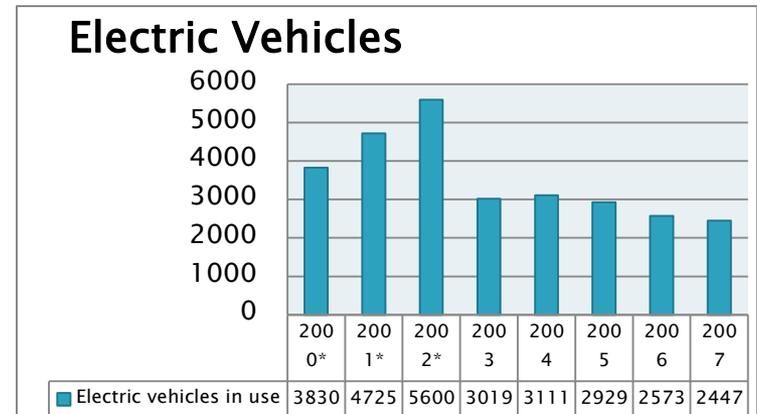
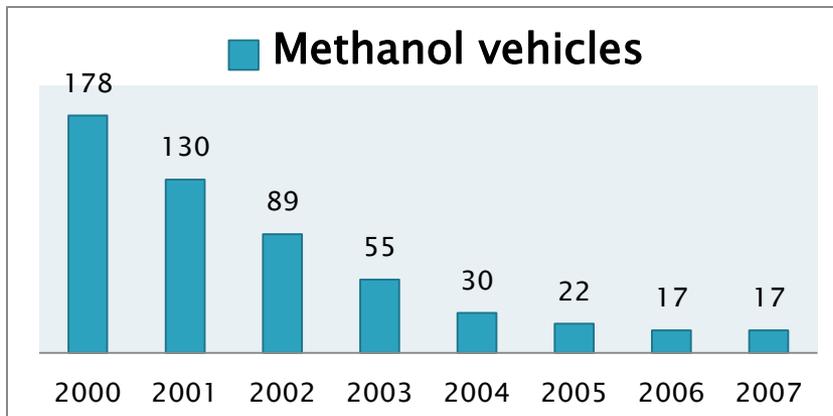
Outcome as of 2007—Marked increase in Low Emission Gasoline Vehicles, but not for other LEVs

- ▶ **Goal of 10 million LEVs met in 2004; total in 2007 was 16.5 million**
- ▶ **Low emission gasoline vehicles increased from about 600,000 to 16 million 2000 to 2007**
- ▶ **Non-gasoline low emission vehicles increased from 60,000 to 470,000**



Outcome As of 2007– Methanol Vehicles, Electric Vehicles, and Fuel Cell Vehicles Showed No Increase

- ▶ Methanol vehicles declined to near-zero. So did methanol stations.

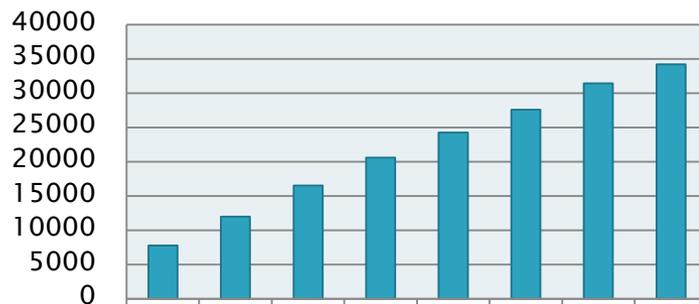


Reasons were high vehicle costs, insufficient vehicle performance, and lack of fuel infrastructure.

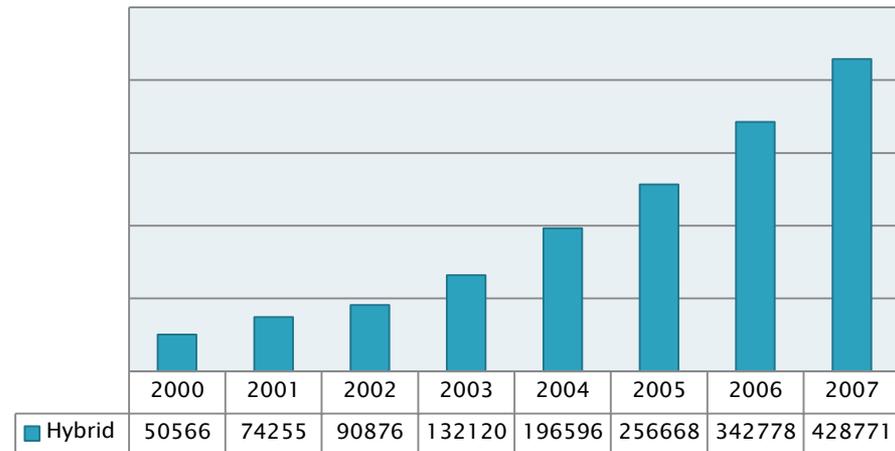
Outcome as of 2007–Modest Increase in CNG Vehicles

- ▶ CNG vehicles increased 3.7-fold
- ▶ Hybrid vehicles increased 8-fold
- ▶ Hybrid growth became robust starting 2004; Increase due to introduction of more technologically advanced and efficient 2nd generation Prius model

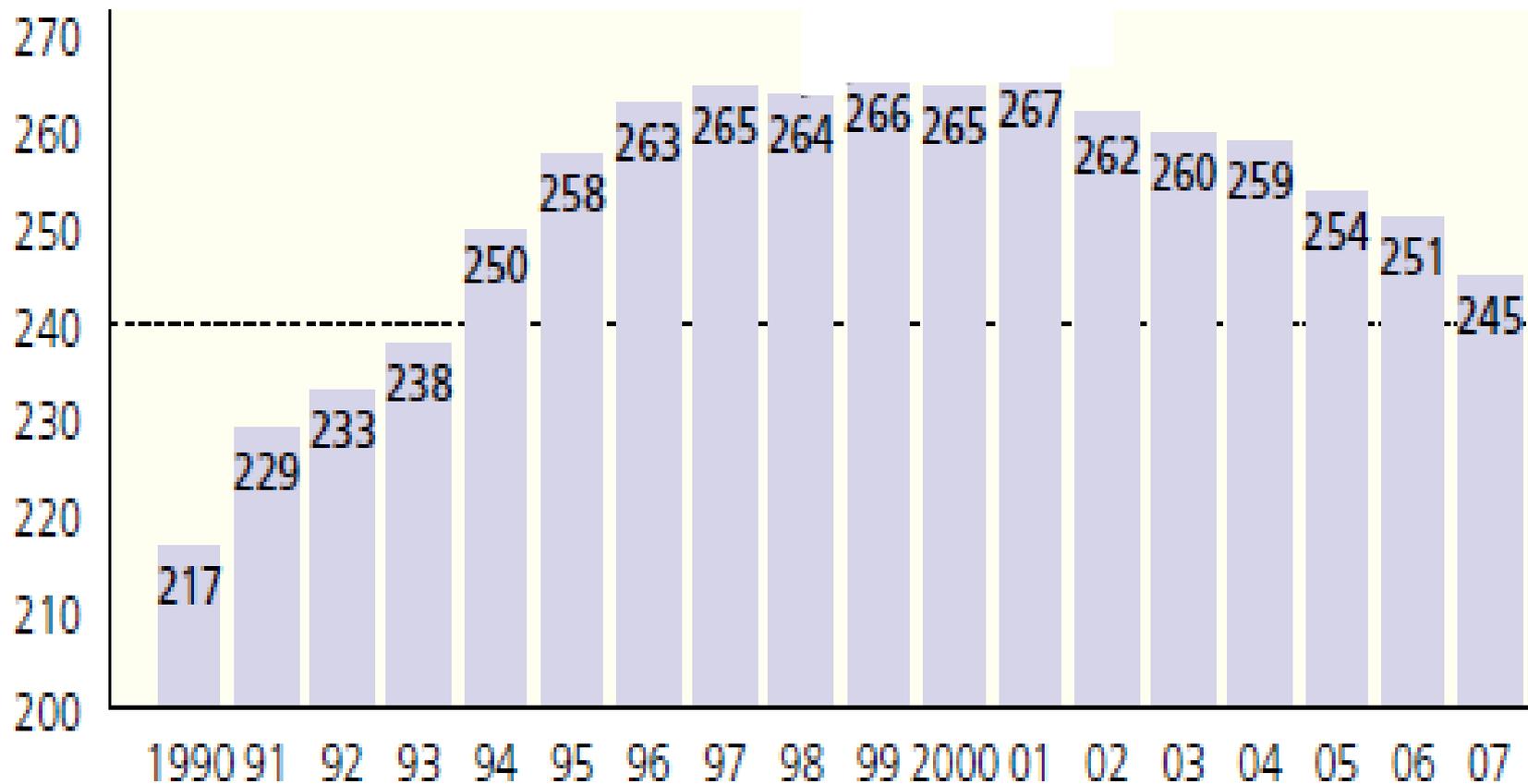
CNG Vehicles



Hybrid Vehicles

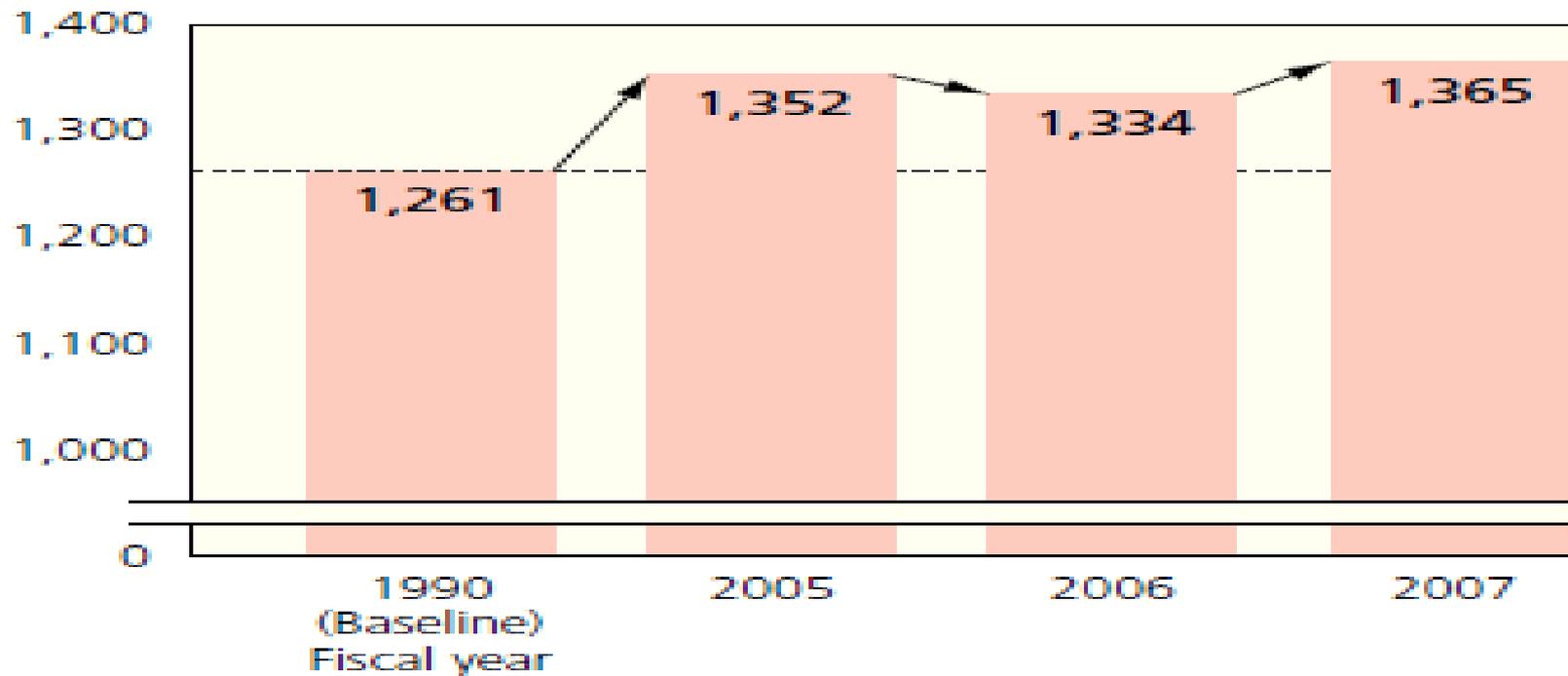


Outcome As of 2007 –CO₂ Gas Emissions In Japan's Transport Sector



JAMA data

Outcome As of 2007 – CO₂ Gas Emissions In Japan's Entire Economy



JAMA data

Lessons Learned from 2007 Outcome

1. Japan realized that gasoline LEVs alone would not sufficiently lower the entire Japanese greenhouse gas emissions
2. Japan hence decided to implement Next Generation Vehicles **次世代自動車** action plans.

Change in Strategy		
2001-2007	低公害車	Low Emission, High Fuel Efficiency Vehicle Strategy
2008-2030	次世代自動車	Next Generation Vehicle Strategy

Next Generation Vehicle Action Plans

- ▶ In 2008, Japan launched “The Low Carbon Society Construction Action Plan 低炭素社会づくり行動計画”; called for 1 out of 2 new vehicles sold in 2020 to be **次世代自動車 (Next Generation Vehicles)**.
- ▶ In 2010, Prime Minister’s Office announced “Next Generation Vehicle 2010 次世代自動車戦略2010,” which calls for 20-50% of vehicles on the road by 2020 to be **次世代自動車** and 50-70% by 2030.

	2020	2030
Conventional vehicles	50-80%	30-50%
Next generation vehicles	20-50%	50-70%
Hybrid vehicles	20-30%	30-40%
Electric vehicles/Plug-in hybrid vehicles	15-20%	20-30%
Fuel cell vehicles	~1%	~3%
Clean diesel vehicles	~5%	5-10%

Next Generation Vehicles

Next Generation Vehicles 次世代自動車 would achieve fuel efficiency and energy conservation and lower CO₂ emissions all at once



バイオ燃料車



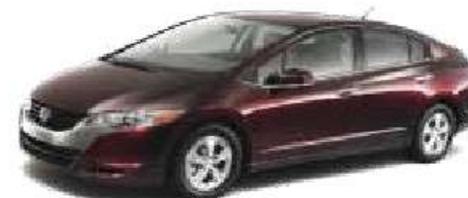
電気自動車



ハイブリッド車



天然ガス車



燃料電池自動車



プラグインハイブリッド車



クリーンディーゼル車



水素自動車

26

Vehicle Certification Keyed to Financial Incentives

Vehicle Type		Reductions/Exemptions	
Requirements	Certification Sticker(s)	Acquisition Tax (a)	Tonnage Tax
Passenger Cars and Small Trucks and Buses (GVW ≤ 2.5t)			
Electric Vehicles (including fuel cell vehicles), Plug-In Hybrid Vehicles, Clean Diesel Vehicles (1), Natural Gas Vehicles (2)		Exempt	Exempt at time of 1st vehicle inspection; 50% reduction at 2nd inspection
Gasoline Vehicles (including hybrid vehicles)	Compliant +20% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (3)		Exempt
	Compliant +10% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (3)		75% reduction
	Compliant with 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (3)		50% reduction
Mid-Sized Trucks and Buses (2.5t < GVW ≤ 3.5t)			
Electric Vehicles (including fuel cell vehicles), Plug-In Hybrid Vehicles, Natural Gas Vehicles (2)		Exempt	Exempt at time of 1st vehicle inspection; 50% reduction at 2nd inspection
Diesel Vehicles (including hybrid vehicles)	Compliant +10% compared to 2015 fuel efficiency standards, with NOx and PM emissions down by 10% from 2009 standards		Exempt
	Compliant +5% compared to 2015 fuel efficiency standards, with NOx and PM emissions down by 10% from 2009 standards		75% reduction
	Compliant +10% compared to 2015 fuel efficiency standards, and compliant with 2009 emission standards		75% reduction
	Compliant with 2015 fuel efficiency standards, with NOx and PM emissions down by 10% from 2009 standards		50% reduction
	Compliant +5% compared to 2015 fuel efficiency standards, and compliant with 2009 emission standards		50% reduction
Gasoline Vehicles (including hybrid vehicles)	Compliant +10% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards		Exempt
	Compliant +5% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards		75% reduction
	Compliant +10% compared to 2015 fuel efficiency standards, with emissions down by 50% from 2005 standards		75% reduction
	Compliant with 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards		50% reduction
	Compliant +5% compared to 2015 fuel efficiency standards, with emissions down by 50% from 2005 standards		50% reduction

Vehicle Certification Keyed to Financial Incentives

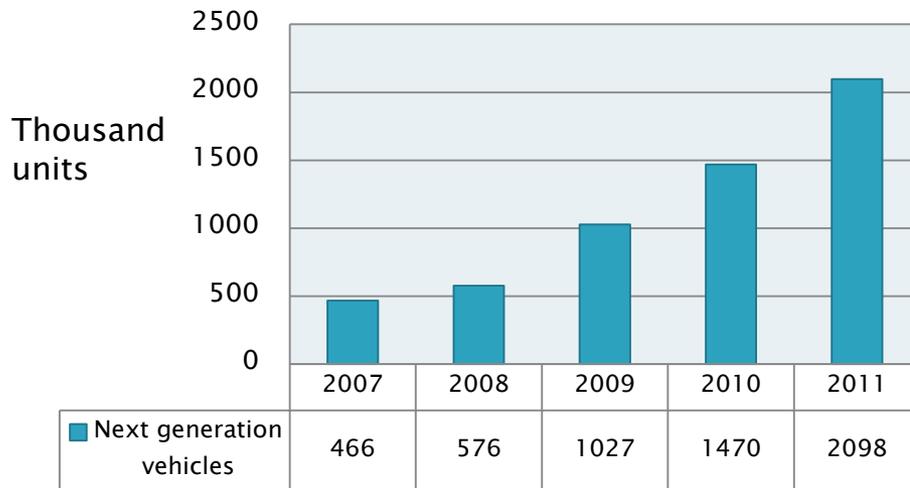
Vehicle Type			Reductions/Exemptions	
	Requirements	Certification Sticker(s)	Acquisition Tax	Tonnage Tax
Passenger Cars and Small Trucks and Buses (GVW ≤ 2.5t)				
	Electric Vehicles (including fuel cell vehicles), Plug-In Hybrid Vehicles, Clean Diesel Vehicles (1), Natural Gas Vehicles (2)		Exempt	Exempt (3 years) of 1st vehicle inspection; 50% reduction at 2nd inspection
Gasoline Vehicles (including hybrid vehicles)	Compliant +20% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (a)		Exempt	Exempt (3 years) of 1st vehicle inspection; 50% reduction at 2nd inspection
	Compliant +10% compared to 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (a)		75% reduction	75% reduction
	Compliant with 2015 fuel efficiency standards, with emissions down by 75% from 2005 standards (a)		50% reduction	50% reduction
Mid-Sized Trucks and Buses (2.5t < GVW ≤ 3.5t)				
	Electric Vehicles (including fuel cell vehicles), Plug-In Hybrid Vehicles, Natural Gas Vehicles			

Next Generation Vehicles (electric Vehicles, fuel cell vehicles, plug-in hybrid, clean diesel vehicles, natural gas vehicles) exempted from the automobile acquisition tax and from annual tonnage tax at the 1st vehicle inspection (3 years) and 50% reduction in the 2nd inspection (5 years).

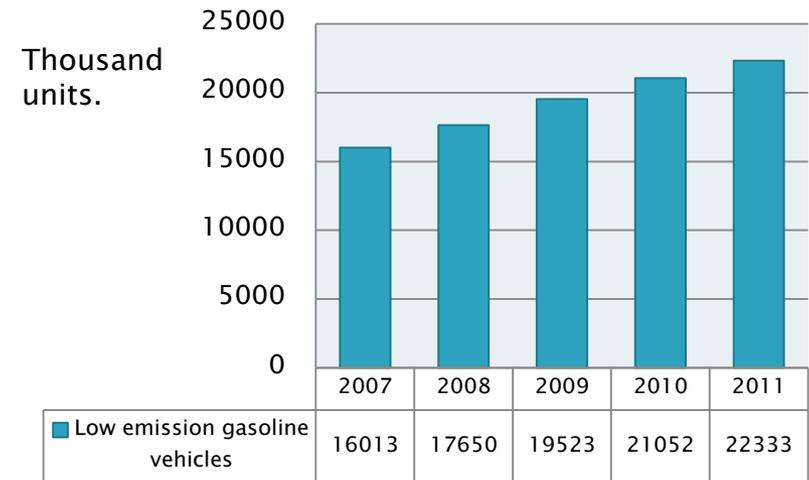
Outcome as of 2011 – Outstanding Results

- ▶ **Rate of increase for Next Generation Vehicles greater than for low emission gasoline vehicles**

Next Generation Vehicles (5-fold increase)



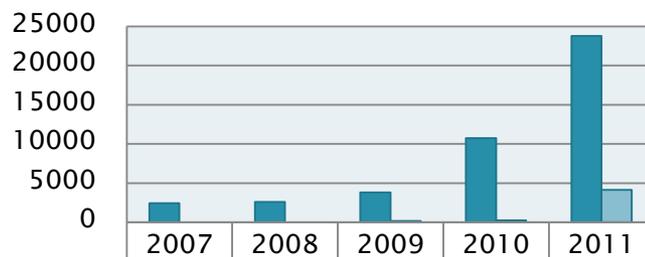
Low Emission Gasoline Vehicles (40% increase)



Outcome As of 2011 – Electric Vehicles and Hybrid Vehicles Substantially Increased

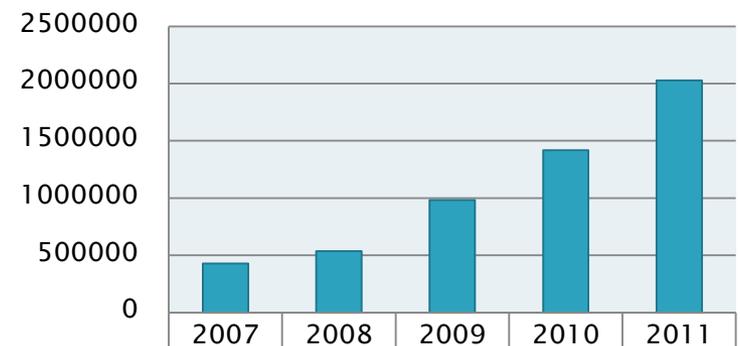
- ▶ **Electric vehicles increased 11-fold, due to two new plug-in electric vehicles, Mitsubishi i-MiEV in 2009 and Nissan Leaf in 2010**
- ▶ **Hybrid vehicles increased 5-fold, due to introduction of the 3rd generation Prius in 2009**

**Electric Vehicles
(11-fold increase)**



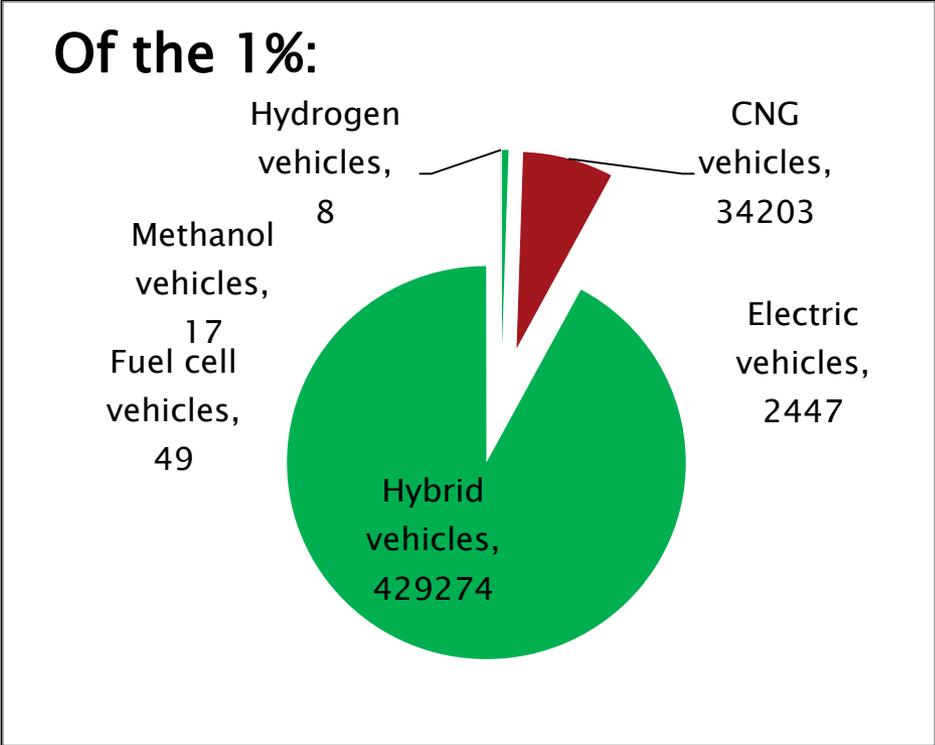
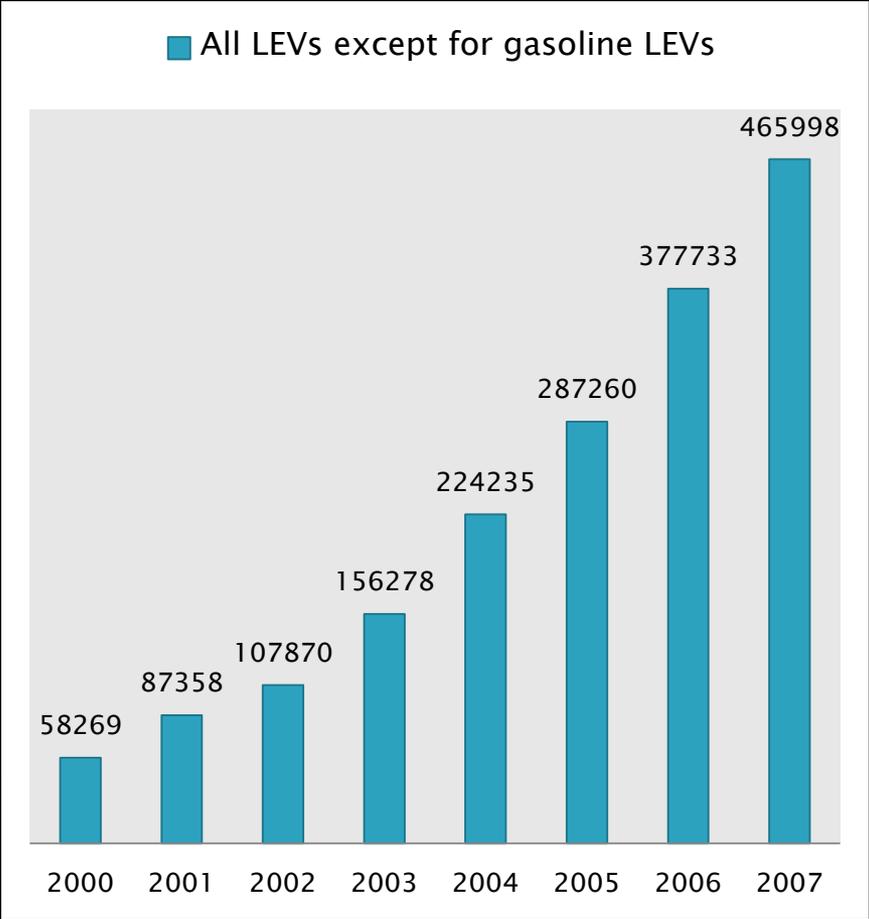
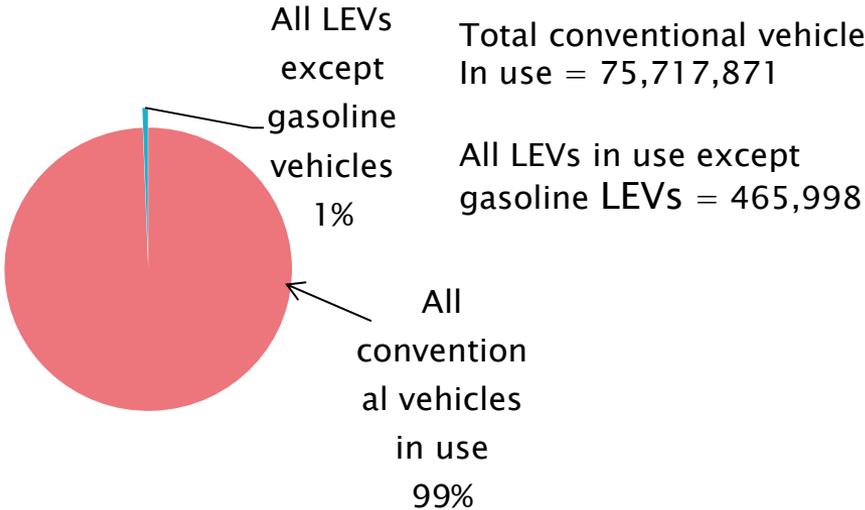
■ Electric vehicles	2447	2600	3821	10726	23771
■ Plug-in hybrid vehicles			165	279	4132

**Hybrid vehicles
(5-fold increase)**



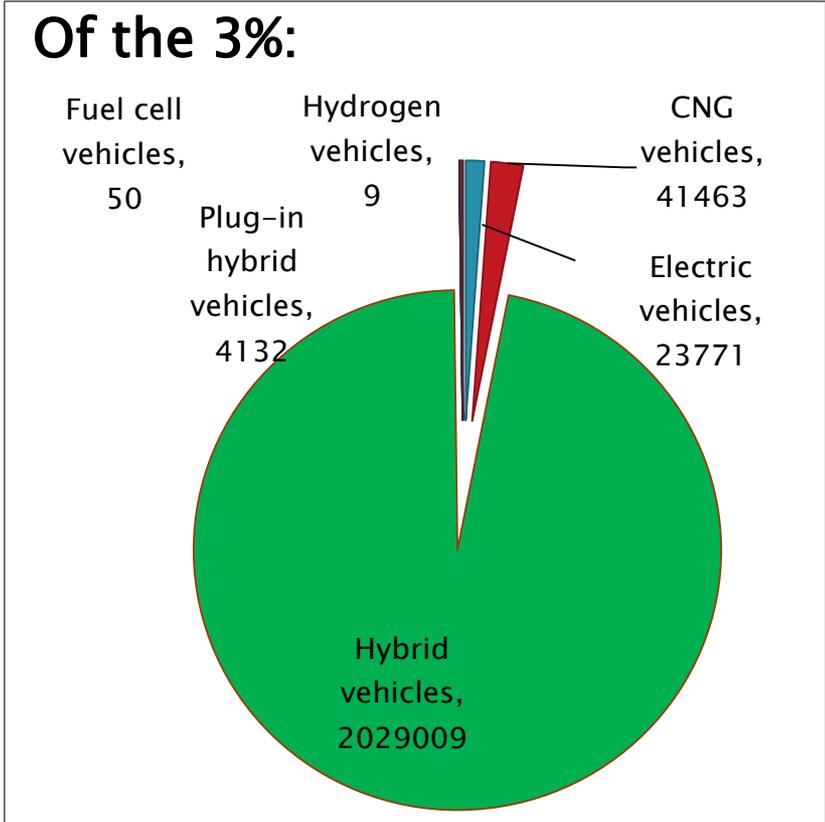
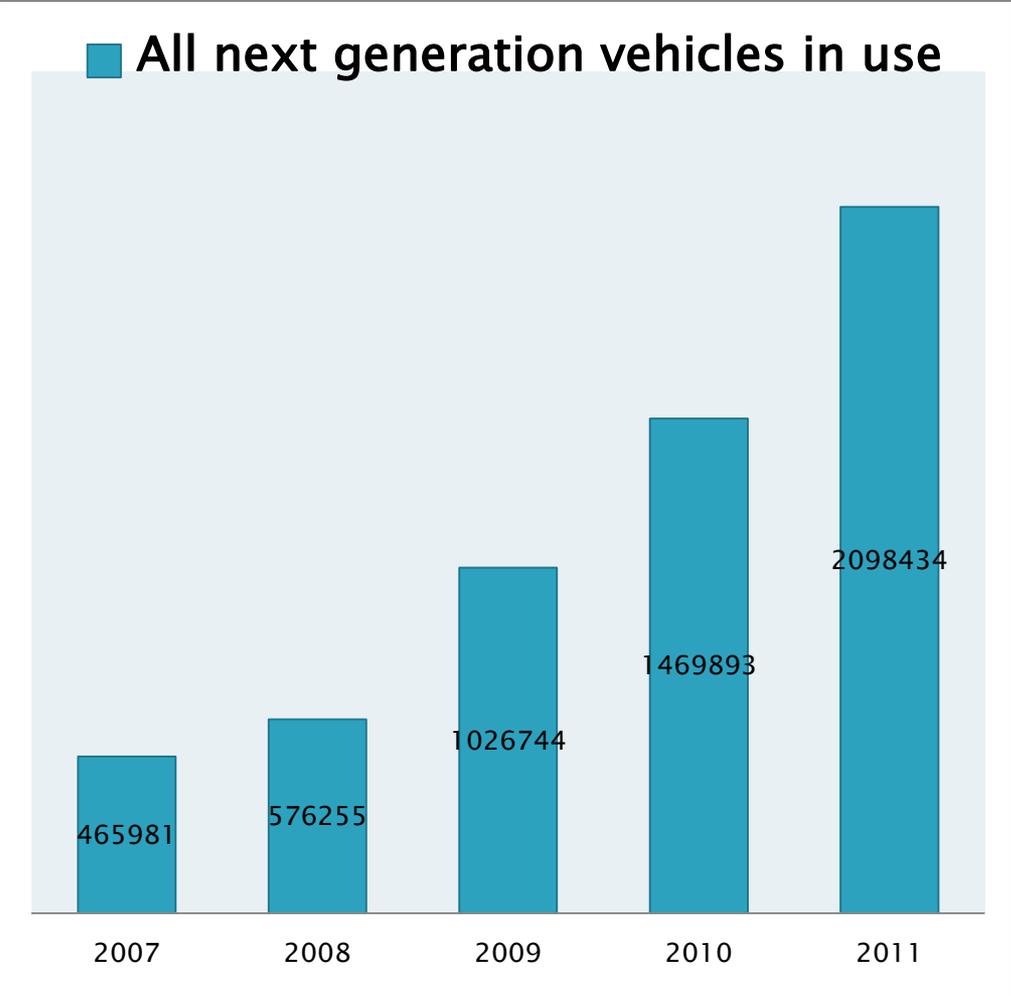
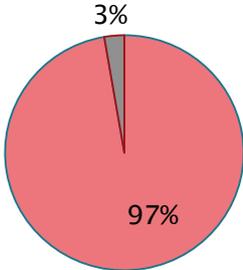
■ Hybrid vehicles	429274	536473	983831	1418400	2029009
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Status as of 2007– Non-Gasoline LEVs Were 1% of Total Vehicles In Use



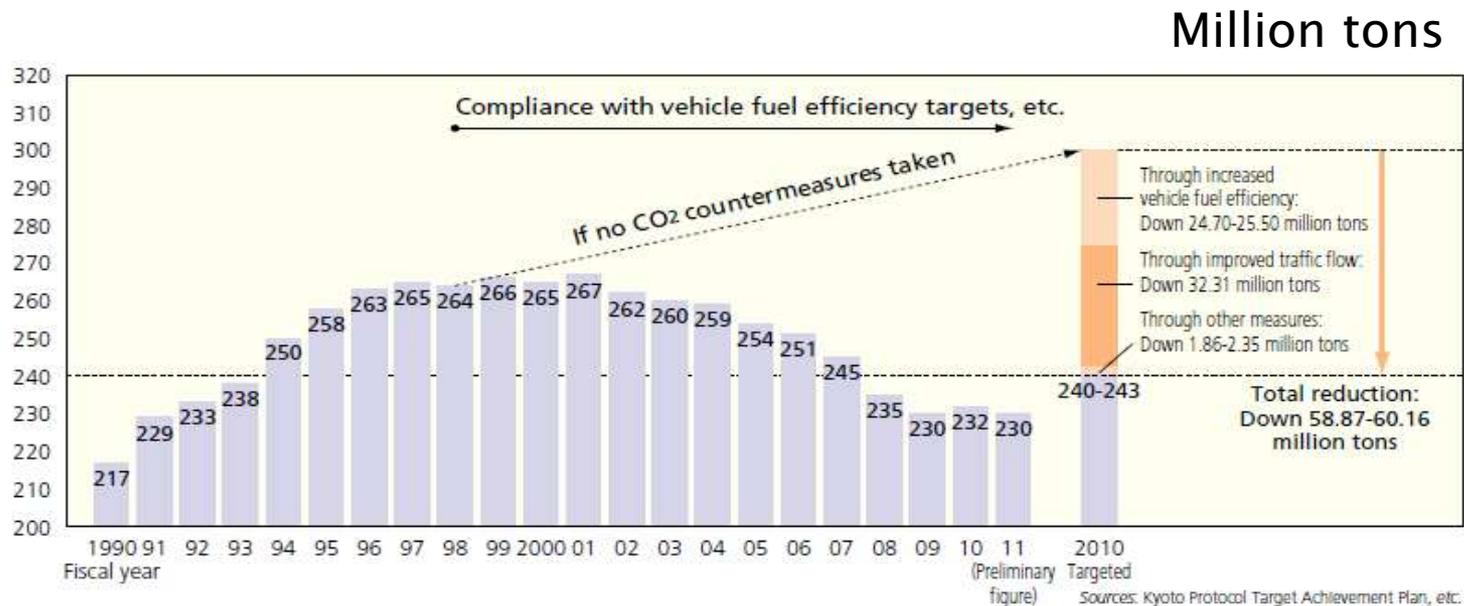
Outcome As of 2011 – NGVs Are 3% of Total Vehicles in Use

■ Conventional vehicles in use = 75,512,887
■ All New-Generation Vehicles in Use = 2,098,434



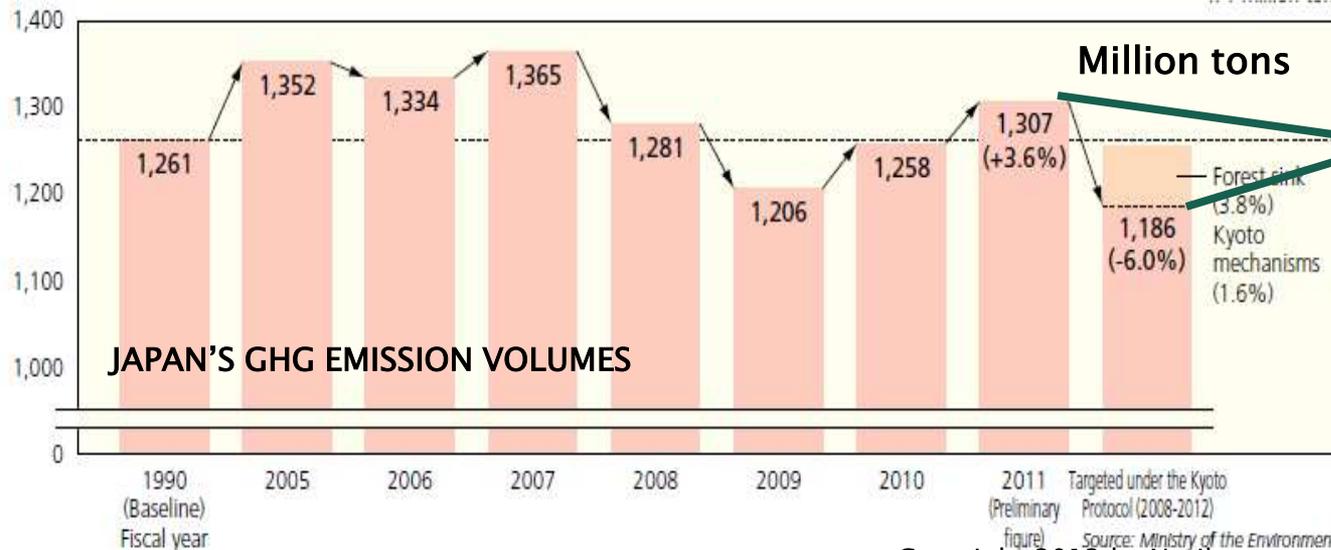
Outcome As of 2011 - CO₂ Emission in Transport Sector Lowered

- ▶ Increase in LEVs contributed to decline in CO₂ emissions.
- ▶ After peaking in 2001, CO₂ emissions in Japan's transport sector steadily declined
- ▶ It registered 230 million tons in 2011—well below the 2010 emissions target for the fourth consecutive year



Challenges Ahead: Japan's Overall CO₂ Emissions Must Be Further Lowered

- ▶ Total GHG emissions in 2011 rose 1.307 billion tons in Japan's overall economy--3.6% above the 1990 level or 9.6% higher than the target.
- ▶ This is largely due to increased consumption of fossil fuels for power generation following the 2011 earthquake and tsunami, which outweighed a decline in GHG emissions from a decline in the manufacturing sector
- ▶ To achieve the "6% below 1990" target, further reductions are needed

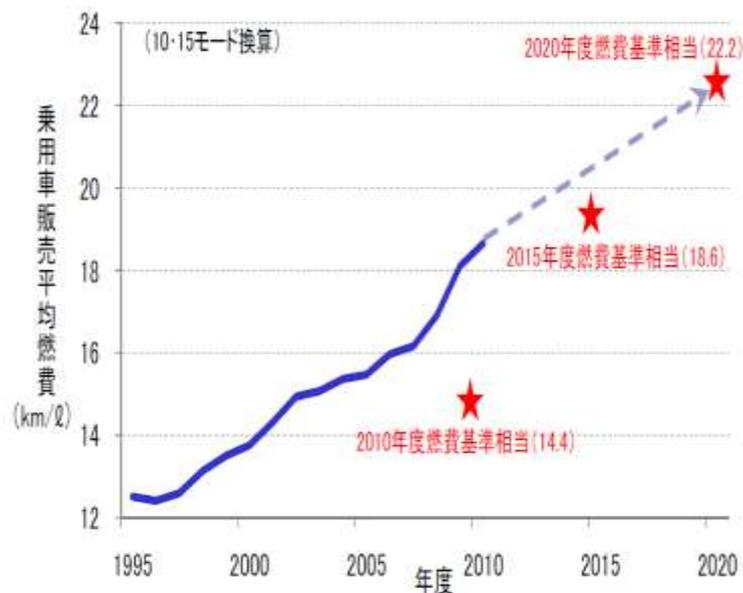
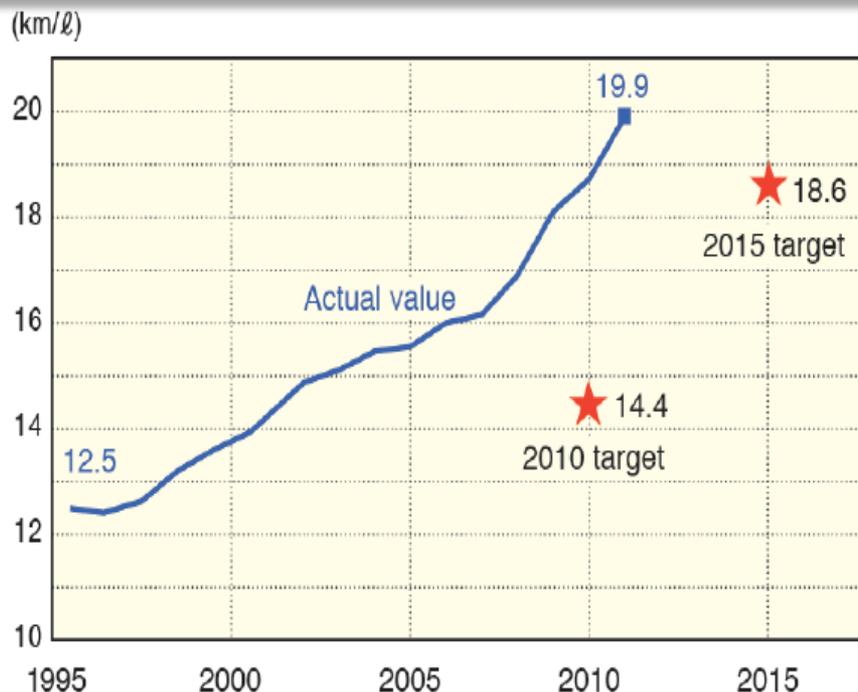


Reduction of 121 million tons needed

What is the Outlook for the Japanese Next Generation Vehicle Strategy?

Facilitating Factors – Future Vehicle Fuel Efficiency

The past record suggests that the fuel efficiency standard will likely continue to rise to 22.2 km/l (52.17 mpg) by 2020

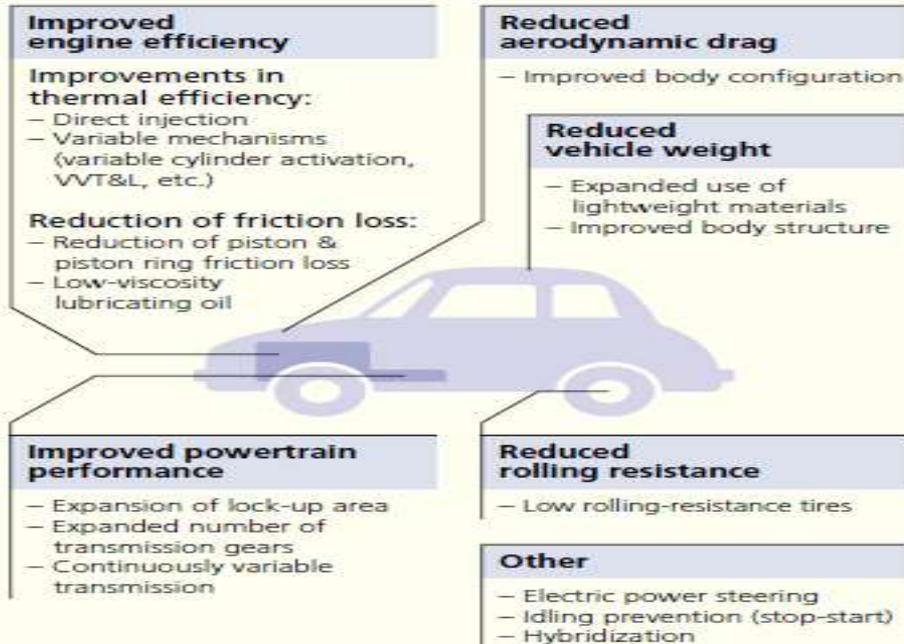


Note: All figures here are 10・15-mode test cycle. *Source: Japan Automobile Manufacturers Association*

Facilitating Factors – Cumulative Continuous Technology Improvements

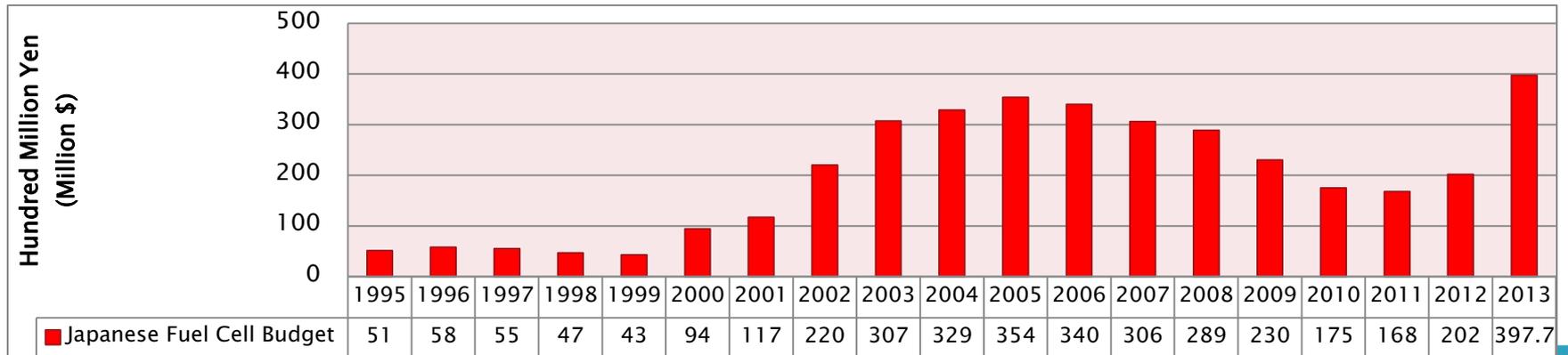
Continuous technology improvements would improve fuel efficiency and reduce CO2 emissions

● VEHICLE TECHNOLOGIES FOR INCREASED FUEL EFFICIENCY



Japan Ensured Robust and Stable R&D Budget

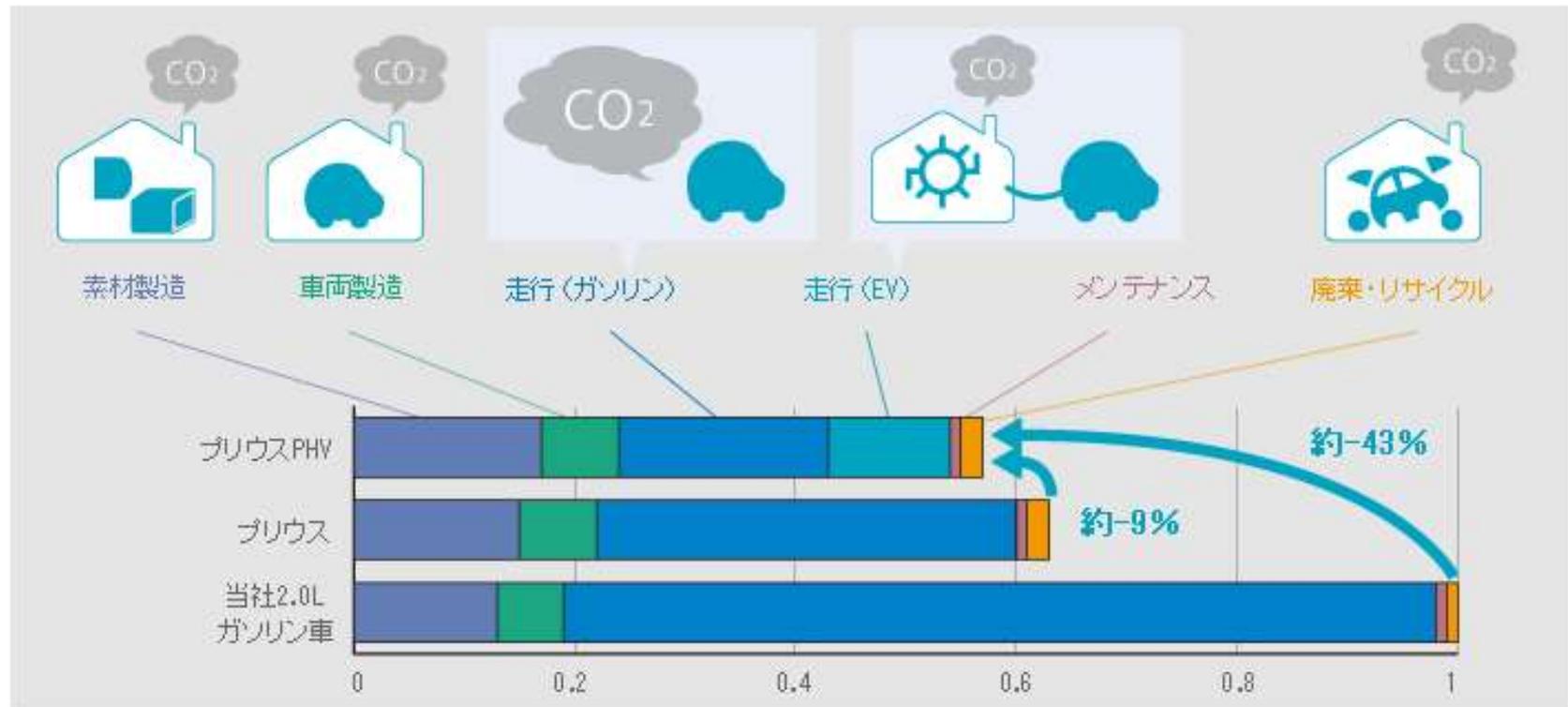
- Fuel cell budget for FY2013 was plused-up in December 2012.
- Currently it is \$397.7 million--double the previous year and largest in the world.



Activities		FY2013 Budget
Line Item	PEMFC R&D 固体高分子形燃料電池実用化推進技術開発 (FY2010-2014)	\$31.9 million
	SOFC R&D 固体酸化物形燃料電池等実用化推進技術開発 (FY2013-2017)	\$12.4 million
	Hydrogen Utilization Technology Development 水素利用技術研究開発事業	\$20 million
	Fuel Cell Vehicle and Hydrogen Station Demonstration Project 地域水素供給インフラ技術・社会実証事業	\$7.5 million
	Construction of Center of Excellence Hydrogen Research Test Center 水素エネルギー製品研究試験センター(HyTrec)	\$29.4 million
Subsidy	Installation of Hydrogen Fueling Station 水素供給設備整備事業費補助金	\$46 million
	Installation of Ene-Farm 民生用燃料電池導入緊急対策費補助金 (A supplement added in Dec 2012)	\$250.5 million
Total		\$397.7 million

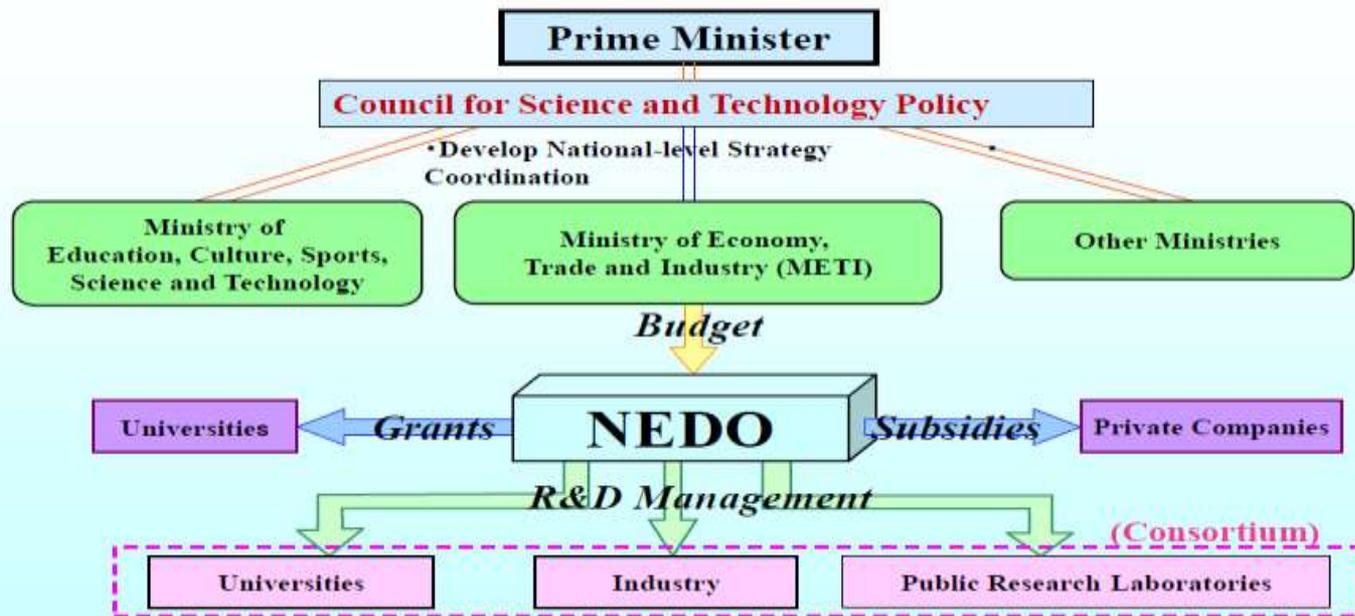
Facilitating Factors – Increase in Proportion of NGVs 次世代自動車 vs. Gasoline Vehicles

- ▶ Next generation vehicles would cut CO2 emission more than gasoline vehicles
- ▶ Hybrid vehicles could cut CO2 emissions by 43%



Facilitating Factors – Policy Implementation Supported by Entire Government

- ▶ Policies are supported by Japanese Diet, Prime Minister, and government ministries; METI administers policies and programs and many other ministries provide support
- ▶ Objective and critical evaluations of strategies, policies and programs are enforced



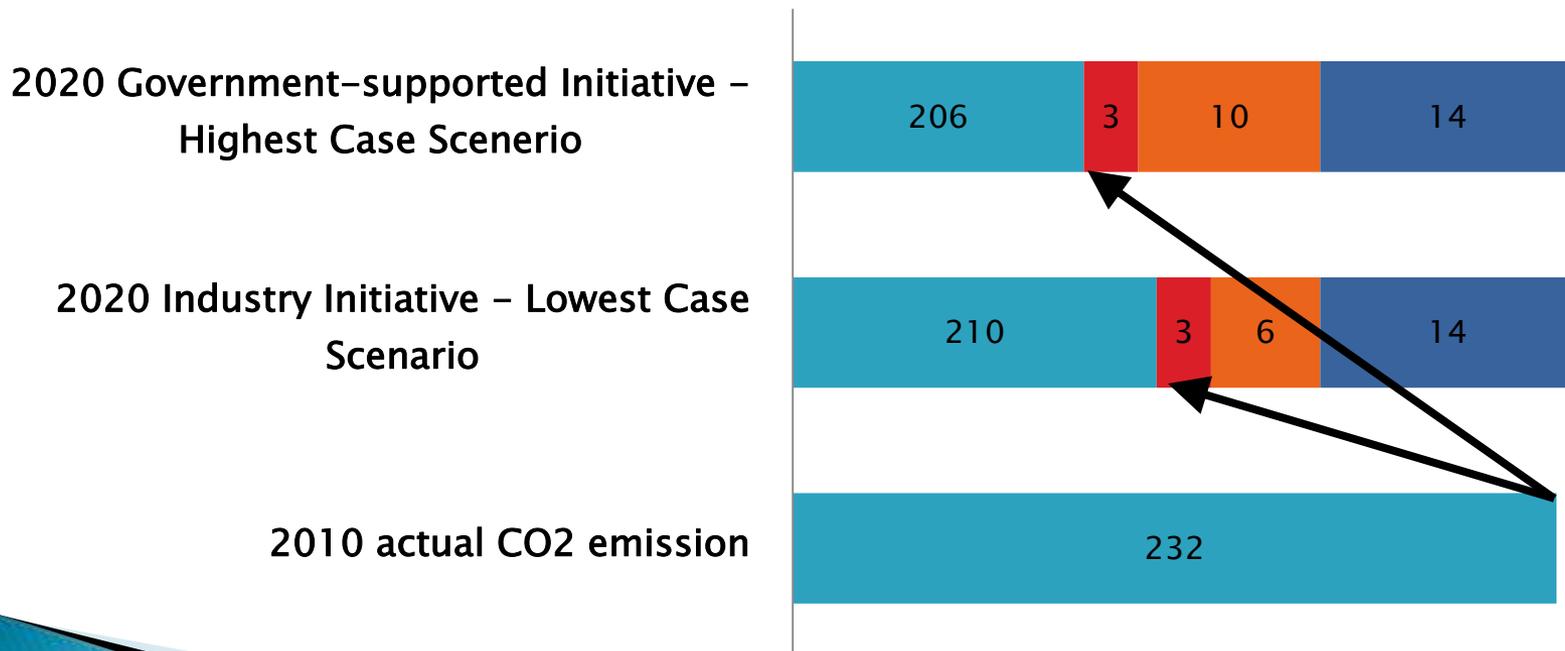
Facilitating Factors - Prime Minister's Leadership Role

A 2012 statement from Prime Minister's Office identifies need for breakthroughs to achieve full scale fuel cell vehicle commercialization (red font is original text)

- ▶ We need **technology breakthroughs** and **hydrogen infrastructure** to succeed in full-scale fuel cell vehicle commercialization (**diffusion**)
- ▶ To break through the big wall of fuel cell development, it is indispensable that we deploy **the entire national strength of the government, academia, and industry and tackle R&D to attain ground-breaking basic technology**
- ▶ The next generation vehicles must cut cost of fuel cells to **1/100th** of today's cost **and achieve sufficient durability and hydrogen storage technology by 2030**
- ▶ In addition to technology development, Japan needs to define clear hydrogen energy policy to moving to hydrogen energy

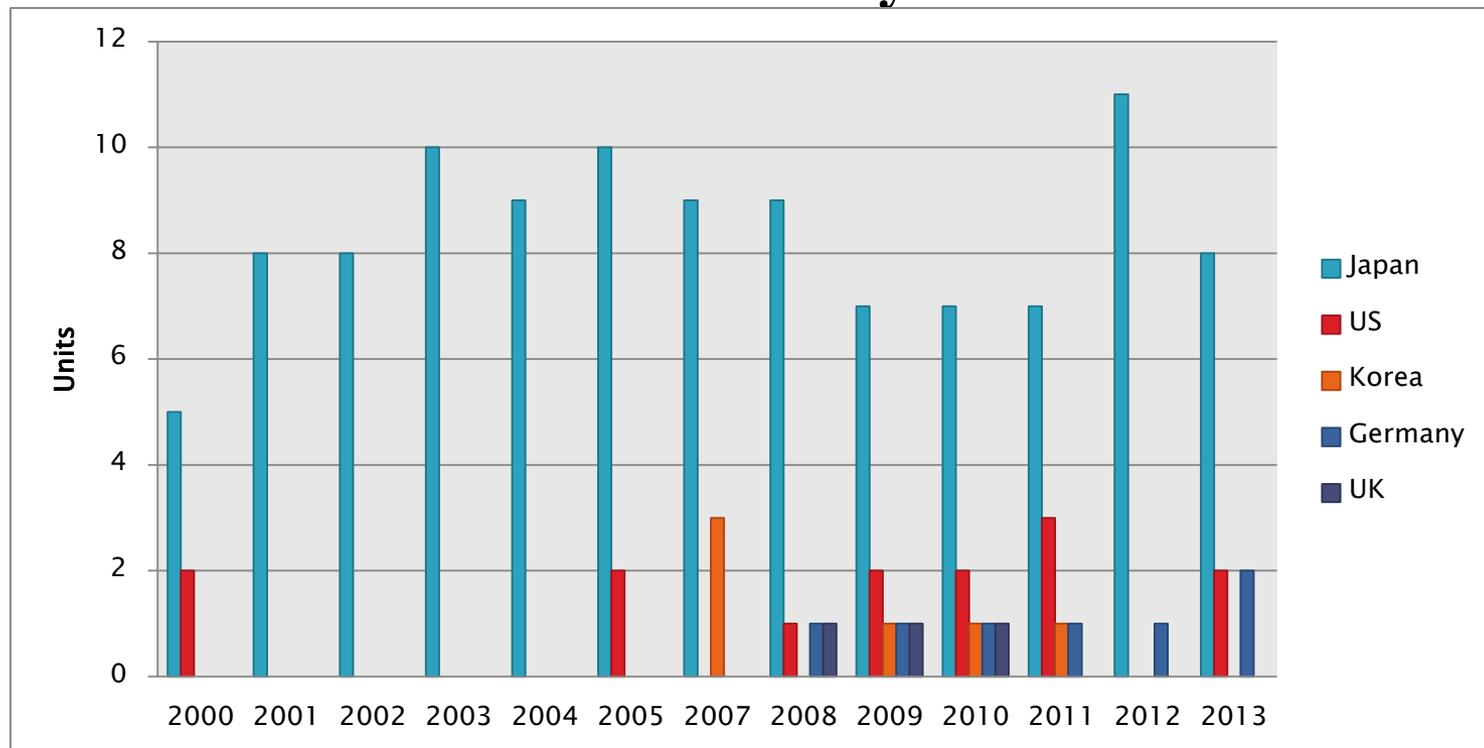
Facilitating Factors – Industry and Government Collaboration

- CO2 Emissions
- CO2 emission reduction gained by truck fuel efficiency improvement
- CO2 emission reduction gained by vehicle fuel efficiency improvement after 2010
- CO2 emission reduction gained by vehicle fuel efficiency improvement before 2009



Outlook – Japan Likely Will Remain as the Global Leader in the Green Vehicle Race

ACEEE's Green Book publishes the top 12 Greenest Vehicles on the market annually



Japan has been the global leader for the past decade.

**Thank you
and Good Luck!**

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