

International Comparison of Policies to Reduce Greenhouse Gas Emissions from Vehicles

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Outline

- Overview of Countries and Regions that have Vehicle Fuel Economy and GHG Standards
- Issues and Methodologies of Comparing Vehicle Standards Around the World
- Comparison of Vehicle Standards around the World
- Conclusions

Overview of Countries and Regions that have Vehicle Fuel Economy and GHG Standards

At-least nine countries and regions have established or proposed motor vehicle fuel efficiency or GHG emission policies. Due to various historic, cultural and political reasons, different countries and regions chose to adopt different fuel efficiency or GHG standards

<i>Country/region</i>	<i>Type</i>	<i>Measure</i>	<i>Structure</i>	<i>Test method^a</i>	<i>Implementation</i>
United States	Fuel	mpg	Cars and light trucks	U.S. CAFE	Mandatory
European Union	CO ₂	g/km	Overall light - duty fleet	EU NEDC	Voluntary
Japan	Fuel	km/L	Weight-based	Japan 10-15	Mandatory
China	Fuel	L/100-km	Weight-based	EU NEDC	Mandatory
California	GHG	g/mile	Car/LDT1 and LDT2	U.S. CAFE	Mandatory
Canada	Fuel	L/100-km	Cars and light trucks	U.S. CAFE	Voluntary
Australia	Fuel	L/100-km	Overall light-duty fleet	EU NEDC	Voluntary
Taiwan, South Korea	Fuel	km/L	Engine size	U.S. CAFE	Mandatory

^aTest methods include U.S. Corporate Average Fuel Economy (CAFE), New European Drive Cycle (NEDC), and Japan 10-15 Cycle. See Appendix for more details.

Structures of Fuel Economy/GHG Standards Vary Greatly Among Countries/Regions

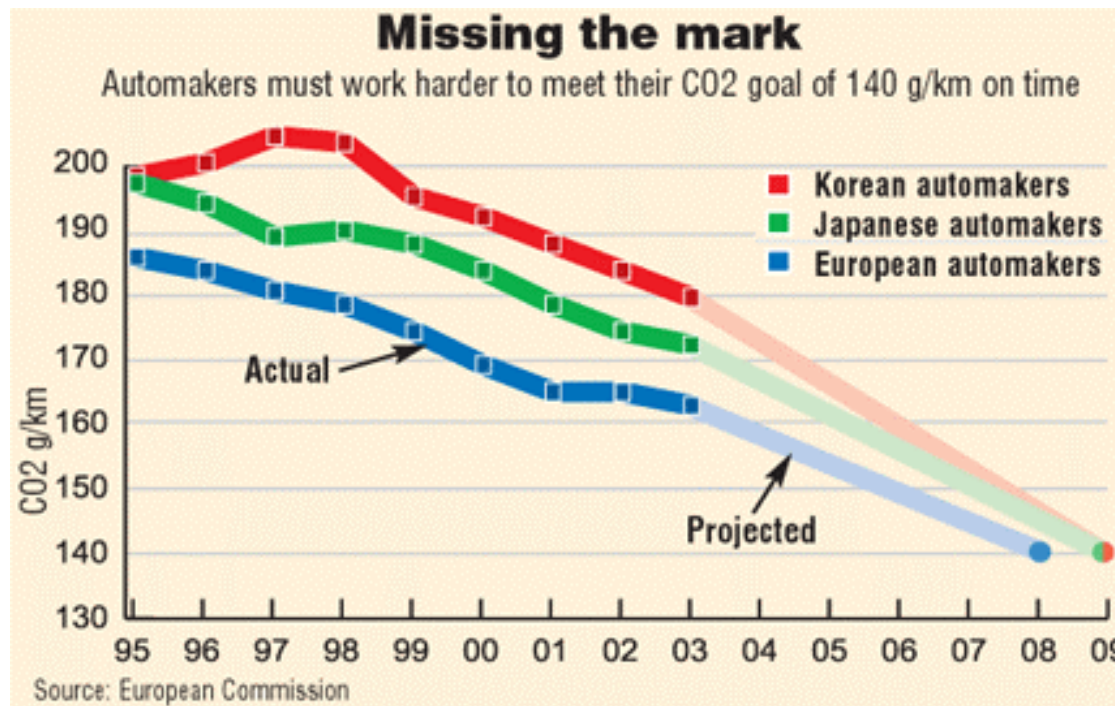
- **Based on Fleet Average:**
 - EU (CO₂, g/km)
 - Australia (L/100-km)
- **Based on Vehicle Categories**
 - US, Canada (mpg) - Cars and LDTs,
 - California (CO₂, g/mile) - (PC/LDT1, LDT2)
- **Based on Vehicle Test Weight Categories**
 - Japan (km/L) - 9 weight classes
 - China (L/100-km) - 16 weight classes
- **Based on Engine Size**
 - Taiwan, South Korea (km/L)

Newly Proposed US Truck Standards

- Existing: 2004 - 20.7 mpg, 2005 - 21.0 mpg, 2006 - 21.6 mpg, 2007 - 22.2 mpg
- Newly proposed: From 2008 – 2010, further boost to 23.5 mpg
- about 13.5% over the 2004 truck fleet level, 7% over LDV fleet average
- Six size categories between four wheels, each category has its own standards
- For three years, auto makers to chose use new classes or single truck fleet standards
- Issues: how to reconcile potential conflicts between size-based and fleet-average targets

EU Fleet Average CO₂ Standards - Progress and Targets under the ACEA Agreement

The agreement establishes industry wide targets to reach 140 grams of CO₂ per kilometer by 2008, with the possibility of extending the agreement to 120 gCO₂/km by 2012. The EU source predicted European carmakers' CO₂ emissions would be in the range of 145g/km to 148g/km in 2008



Prius – 104 g/km
Civic Hybrid – 116 g/km
Insight – 80 g/km

Source: UK VCA website

ACEA Agreement

- Lack of internal “structure” to address “disparities” in carbon intensity
- Lack of OEM-specific commitments and transparency

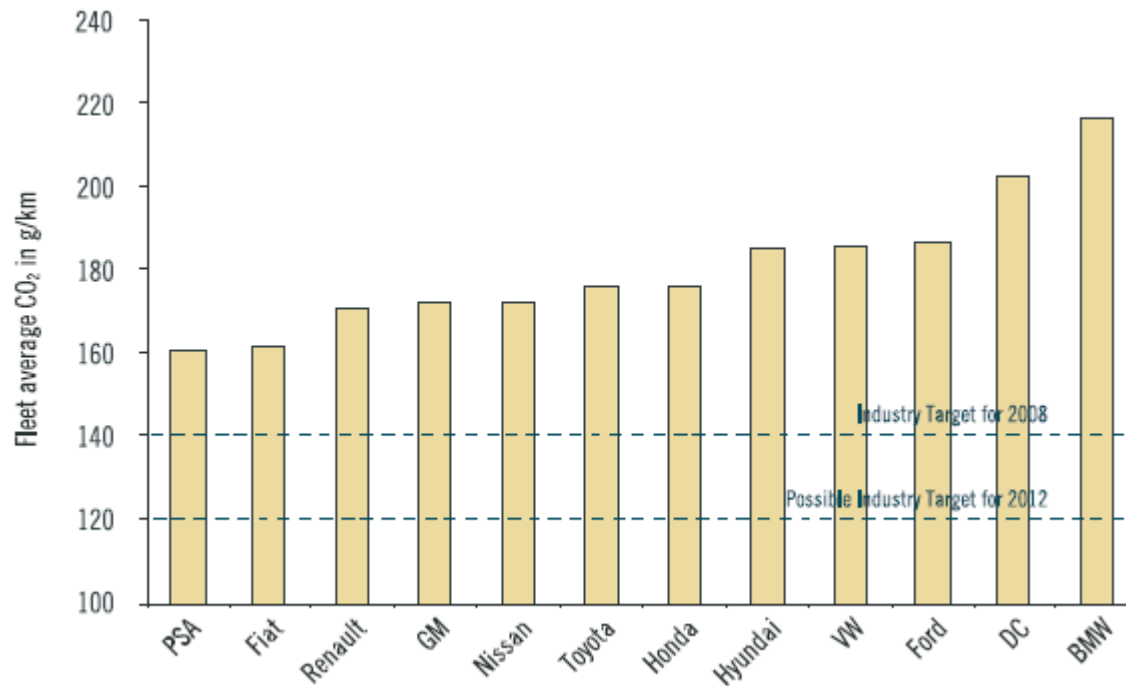


FIGURE 1: CARBON-INTENSITY OF OEMS, EUROPEAN SALES, 2004

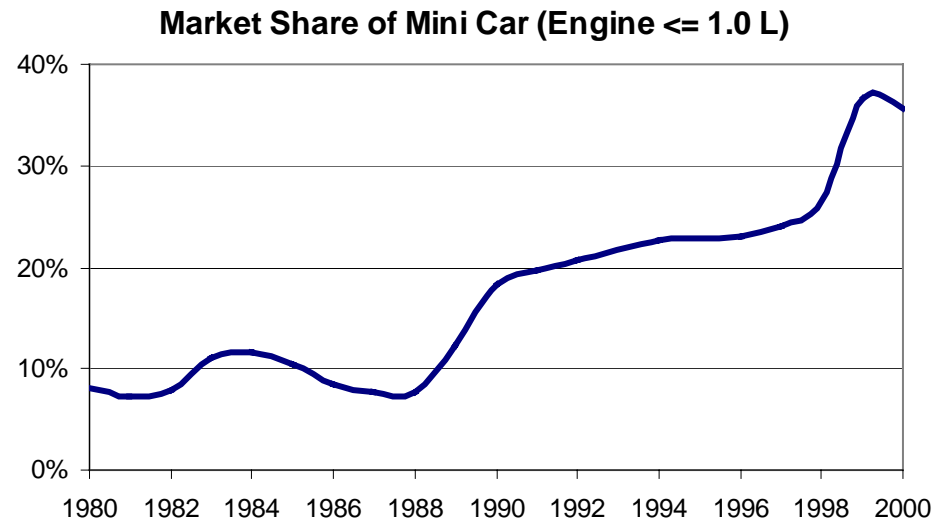
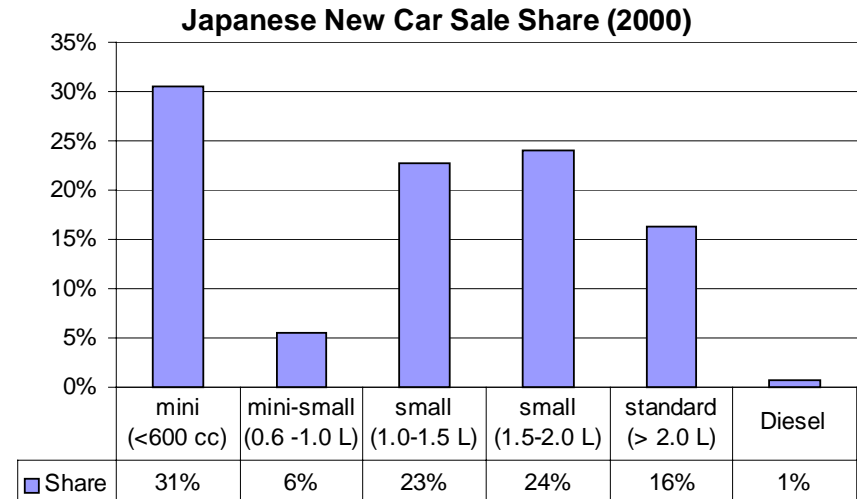
Source: WRI and SAM Research. 2004 data was obtained from Automotive News Europe for sales and the Federal German Transport agency for CO₂ emissions. Because sales-weighted CO₂ emissions data is not available, CO₂ emissions were averaged across all model types (including variations in engine type, etc.) to derive a fleet-wide average for each OEM.

Japan has the lowest GHG emission rates

-Mini Car Shares Soaring in Japanese Auto Market

The majority of vehicles sold in Japan are already in compliance with the 2010 standards (represented about 23% improvement over the 1995 baseline).

Neither Camry nor Civic is the best seller in Japan. It's Suzuki's Wagon R tall car (1.3 L)

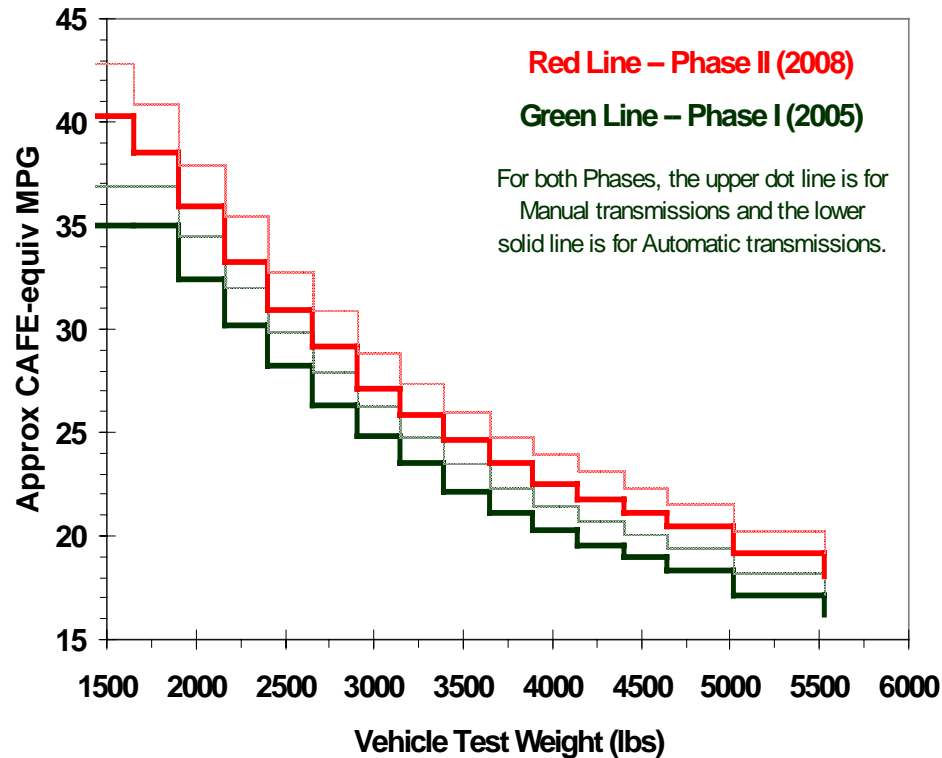


California ARB approved GHG standards

- Different from CAFE Car/Truck categories. Based on CA LEV emission categories
- **Car/light-duty truck 1 (PC/LDT1) category** includes all passenger vehicles regardless of weight and light-duty trucks weighing less than 3,750 lbs equivalent test weight (ETW).
- **Light-duty truck 2 (LDT2)** for light trucks weighing between 3,751 lbs ETW – 8,500 lbs gross vehicle weight (GVW), and vehicles 8,500 to 10,000 lbs GVW that are classified as medium-duty passenger vehicles.
- 20% GHG reduction by 2012, 30% by 2016

Timeframe	Year	GHG emission standard (g/mi)		CAFE-equivalent standard (mpg)	
		PC/LDT1	LDT2	PC/LDT1	LDT2
Near-term	2009	323	439	27.6	20.3
	2010	301	420	29.6	21.2
	2011	267	390	33.3	22.8
	2012	233	361	38.2	24.7
Medium-term	2013	227	355	39.2	25.1
	2014	222	350	40.1	25.4
	2015	213	341	41.8	26.1
	2016	205	332	43.4	26.8

Highlights of Chinese Motor Vehicle Fuel Consumption Standards

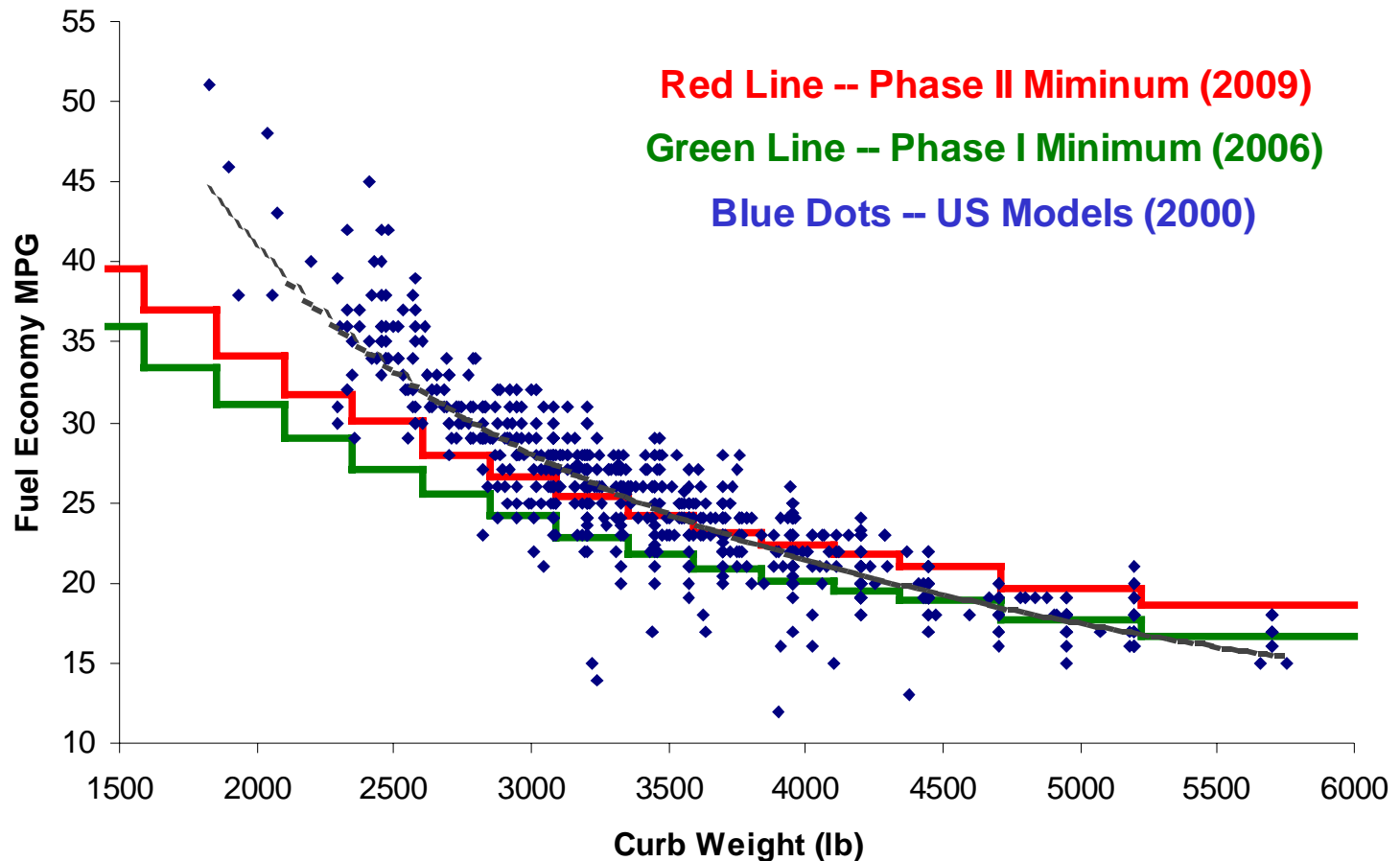


- M1 and M1G type vehicles (EU classification), including passenger cars, SUVs and MPVs less than 9 seats
- Two separate sets of standard for:
 - passenger cars with manual transmission
 - passenger cars with automatic transmission, SUVs and MPVs with 3+ rows (all transmission types)
- Weight-based, 16 classes (based on EU emission wt. categories)
- Based on European Test Cycle (NEDC)
- Liters/100 km
- **Maximum fuel consumption level for individual vehicle models within each wt. class, instead of average value associated with each wt. class**

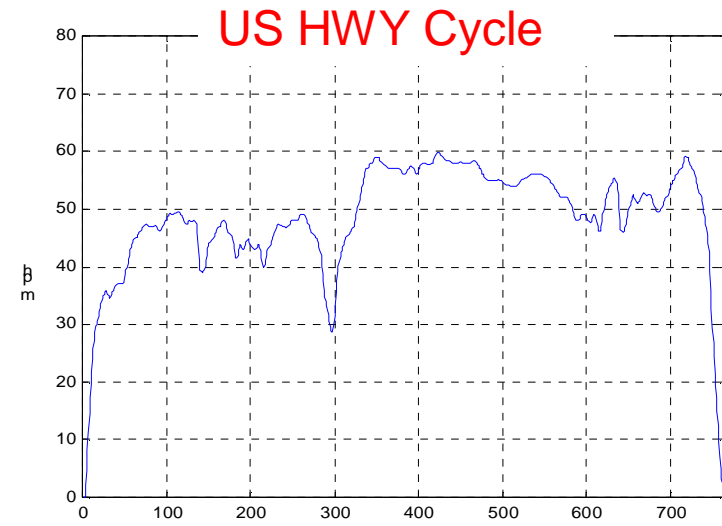
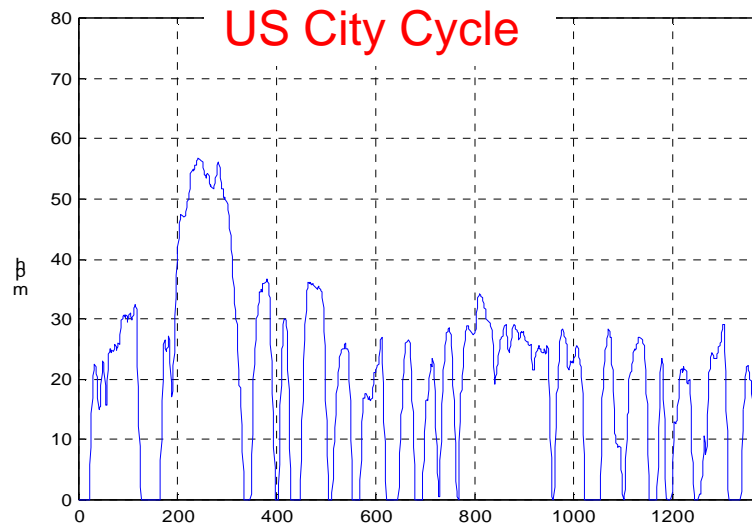
“CAFE-equivalent” Chinese Standards vs. US

- Loose on Light, Tight on Heavy Models

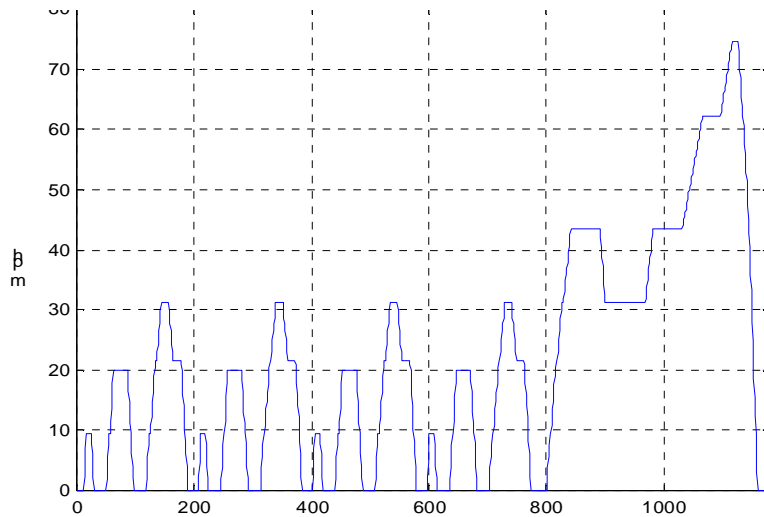
(converted to approximate U.S. equiv. CAFE ratings)



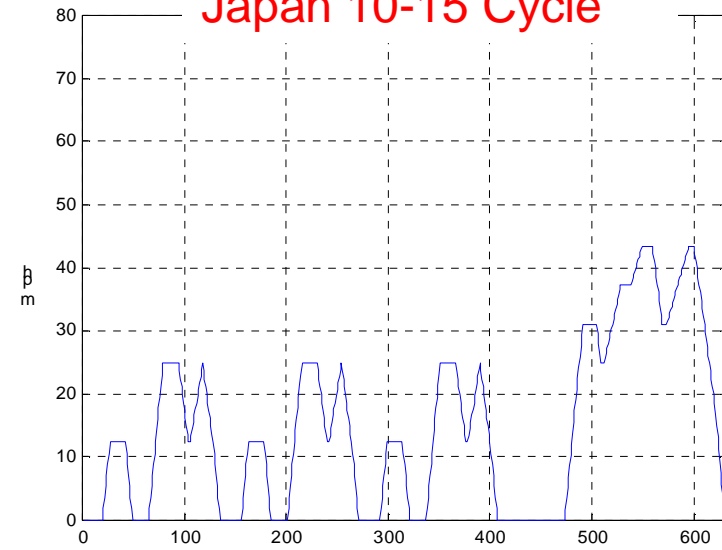
Differences in test driving cycles are crucial



New European Drive Cycle (NEDC)



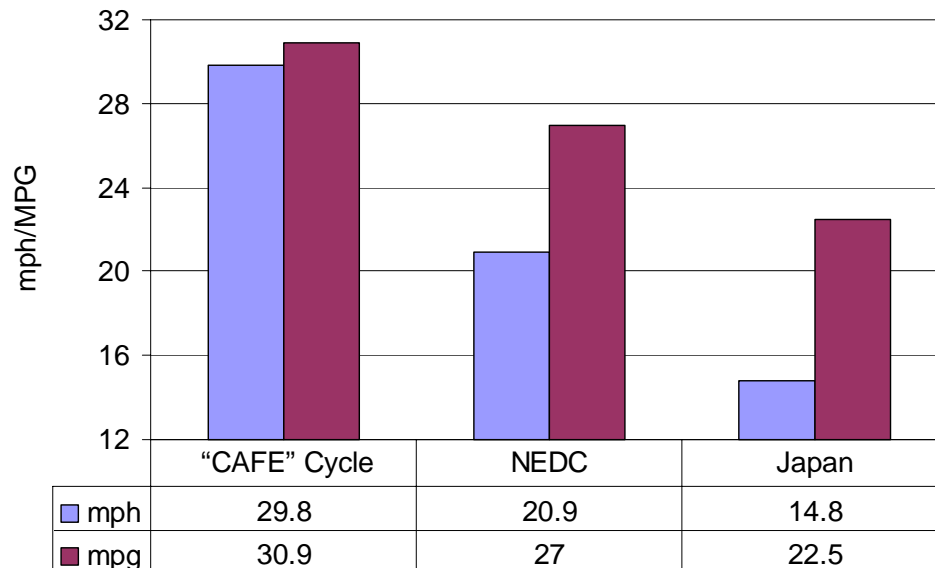
Japan 10-15 Cycle



Comparisons of US, EU and Japan Test Drive Cycles

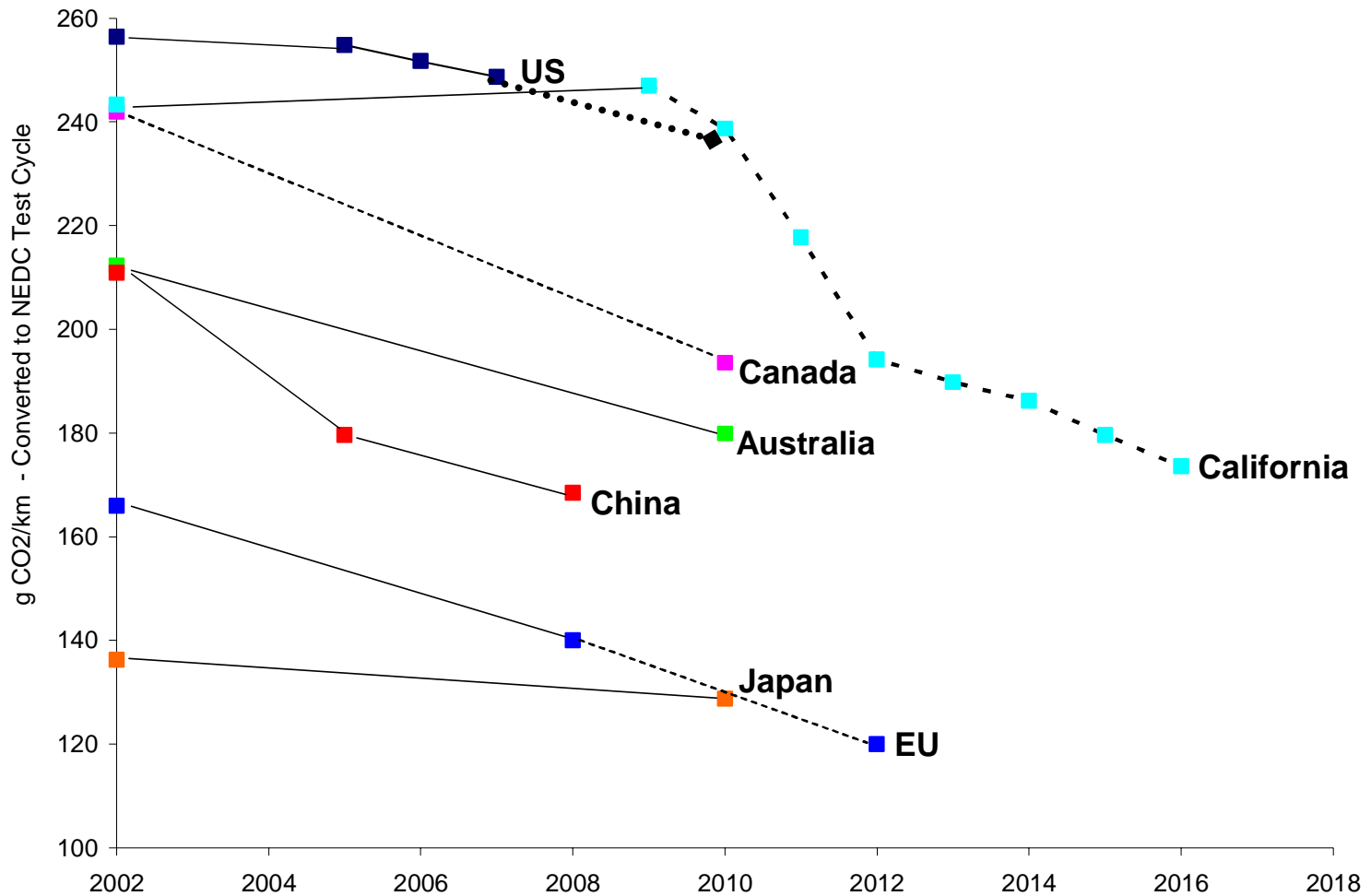
<i>Test cycle</i>	<i>Average speed (mph)</i>	<i>Sample vehicle^a mpg rating</i>	<i>Average adjustment to match CAFE</i>	<i>Country/region applied</i>
U.S. combined "CAFE" cycle	29.8	30.9	1.00	United States, Canada, Taiwan, California,
NEDC	20.9	27.0	1.13	European Union, China, Australia
US City	19.5	26.8	1.18	South Korea
Japan 10-15	14.8	22.5	1.35	Japan

^aMY2002 Ford Focus was used as the sample vehicle.

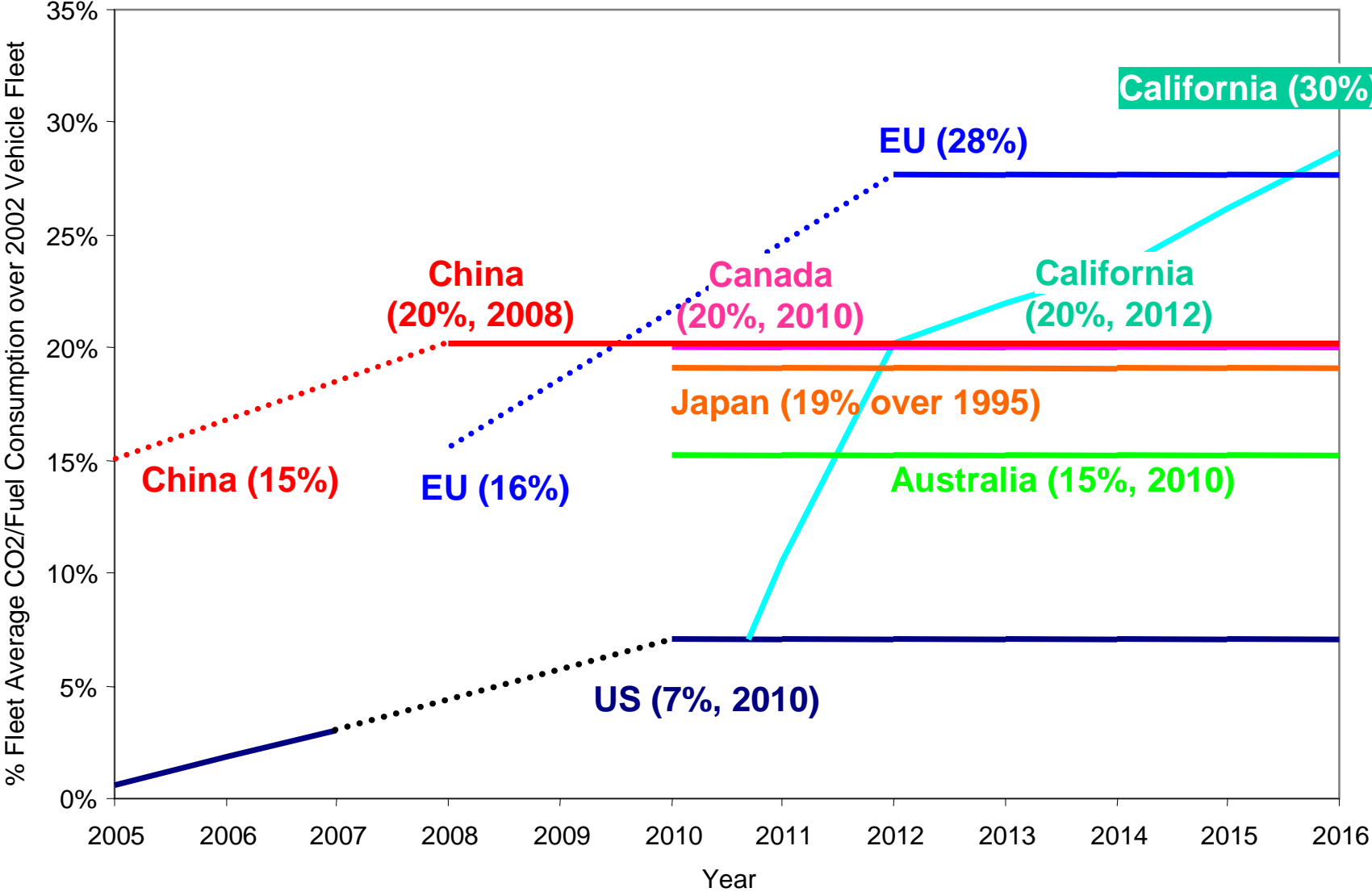


Many factors affect fuel economy ratings. However, there is a general positive correlation between average speed and fuel economy rating

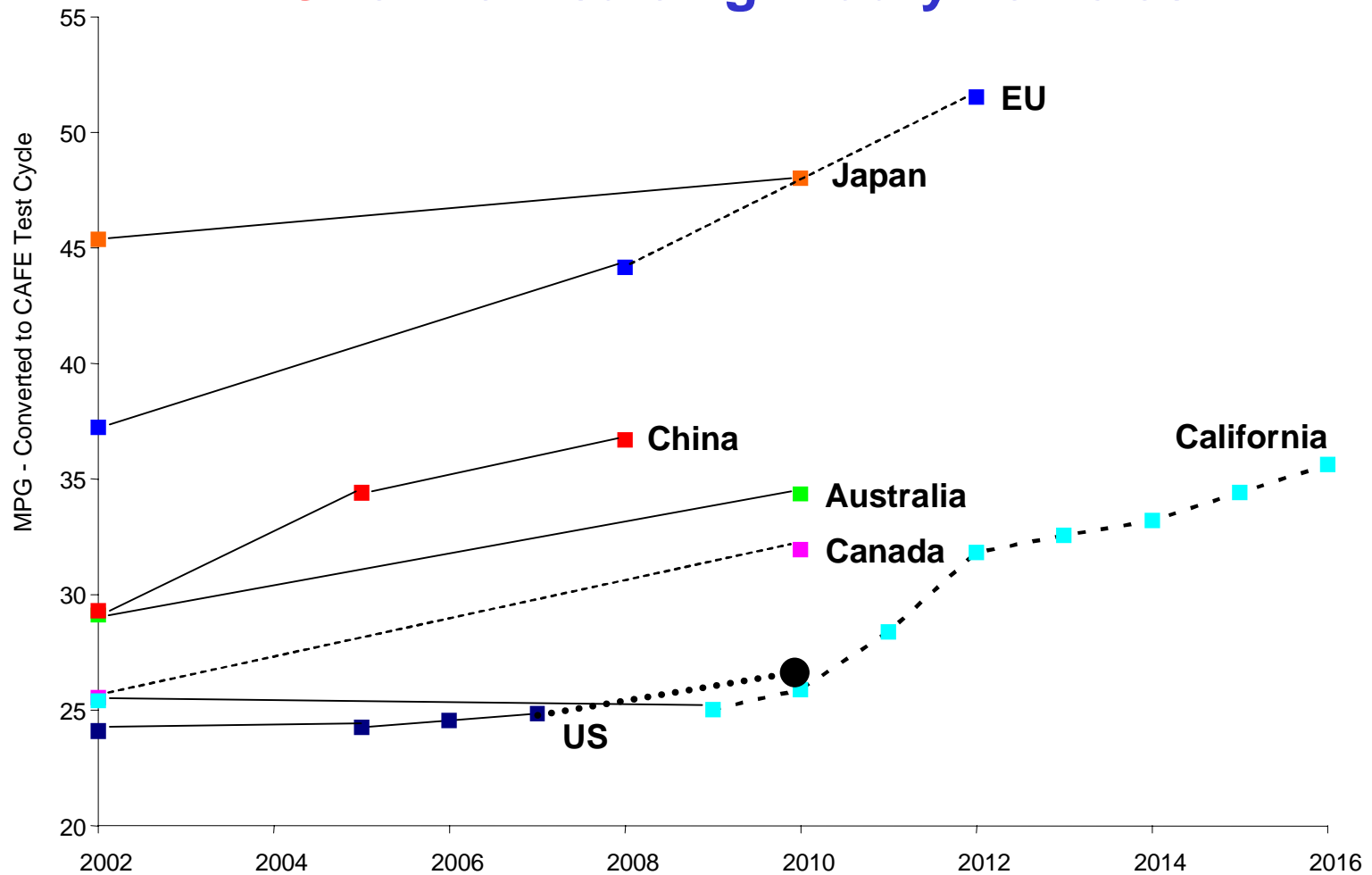
Comparison of fleet average fuel economy and GHG emission standards standardized by NEDC-converted gCO₂/km for new-sale light-duty vehicles



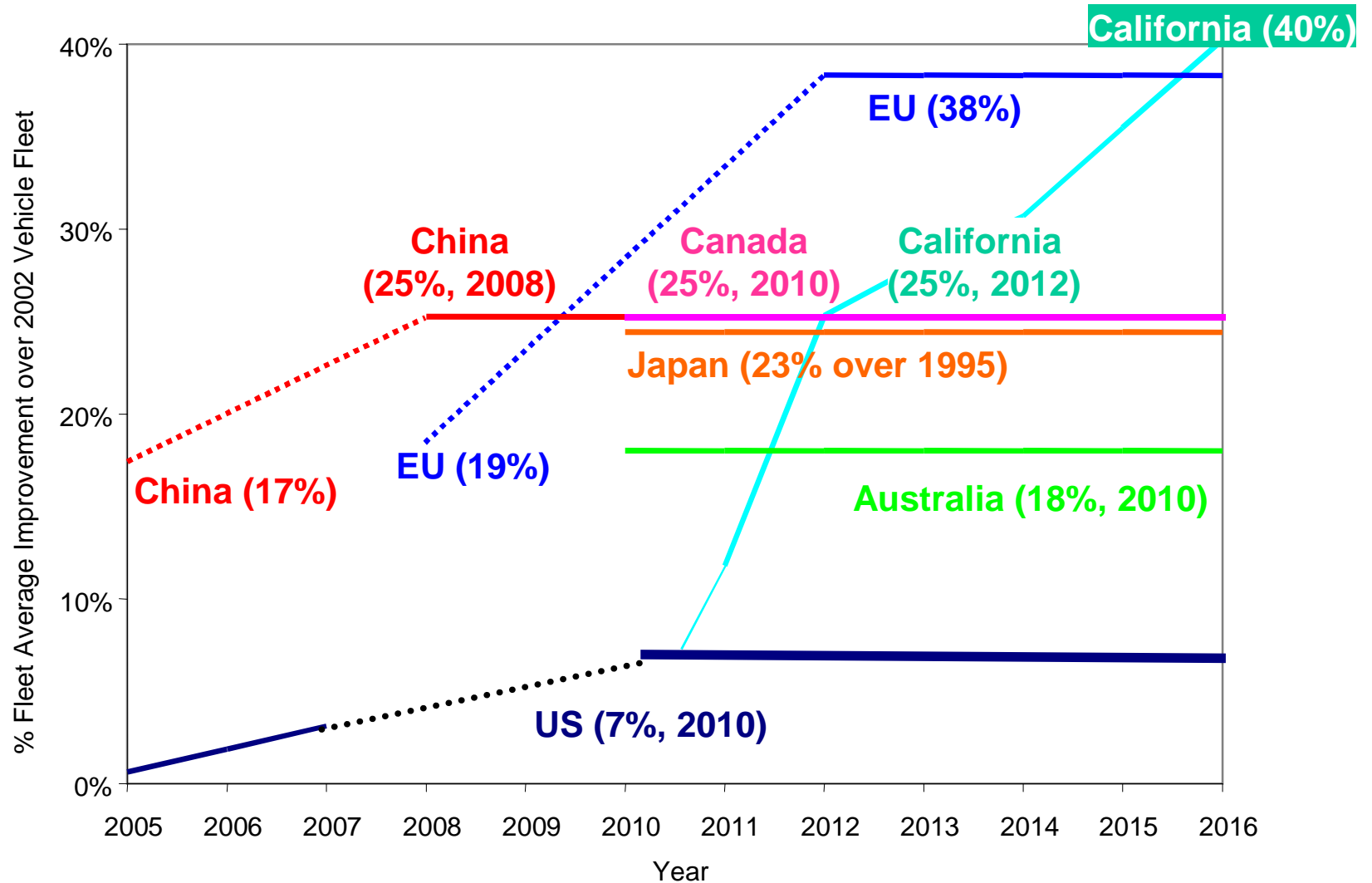
Fleet Average CO2/Fuel reduction over 2002 Vehicle Fleet



Comparison of fleet average fuel economy and GHG emission standards standardized by CAFE-converted MPG for new-sale light-duty vehicles



Fleet Average MPG Improvement over 2002 Vehicle Fleet



Conclusions

Our analysis shows that if all future standards are successfully implemented:

- EU and Japan have most stringent vehicle standards
- In the next 10 years or so, EU, China, Canada and California all would have fleet average GHG reduction greater than 20% over the 2002 baseline case.
- In contrast, the US standards not only have the lowest absolute fuel economy rating, but also have the lowest percentage gains in the foreseeable future.
- The California GHG standards, if realized, could significantly narrow the gaps between US and EU standards.
- Japan has already made significant improvement in its fleet average fuel economy between 1995 and 2002. It's in a process of proposing higher fuel economy standards.
- NHTSA has proposed new light-duty truck reform and standards beyond 2007