

International Experience in Improving Fuel Efficiency and Reducing Greenhouse Gases



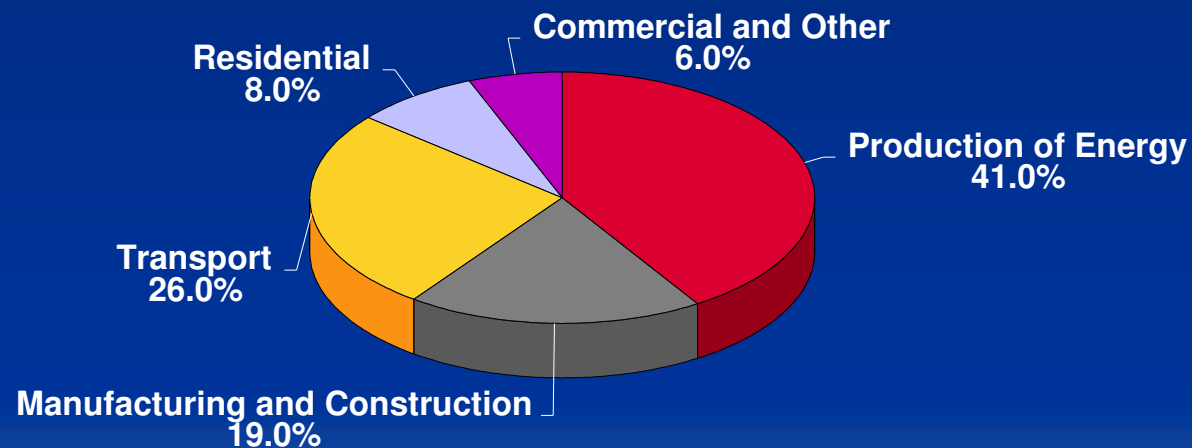
Michael P. Walsh
Driving Lower Emissions
Brussels, Belgium
13 September, 2006

Outline

- Vehicles Are Important
- Countries Have Different Motivations
- Many Different Policy Instruments Are Being Used
- A Variety of Technologies are Already Available To Substantially Reduce GHGs and Improve Fuel Efficiency

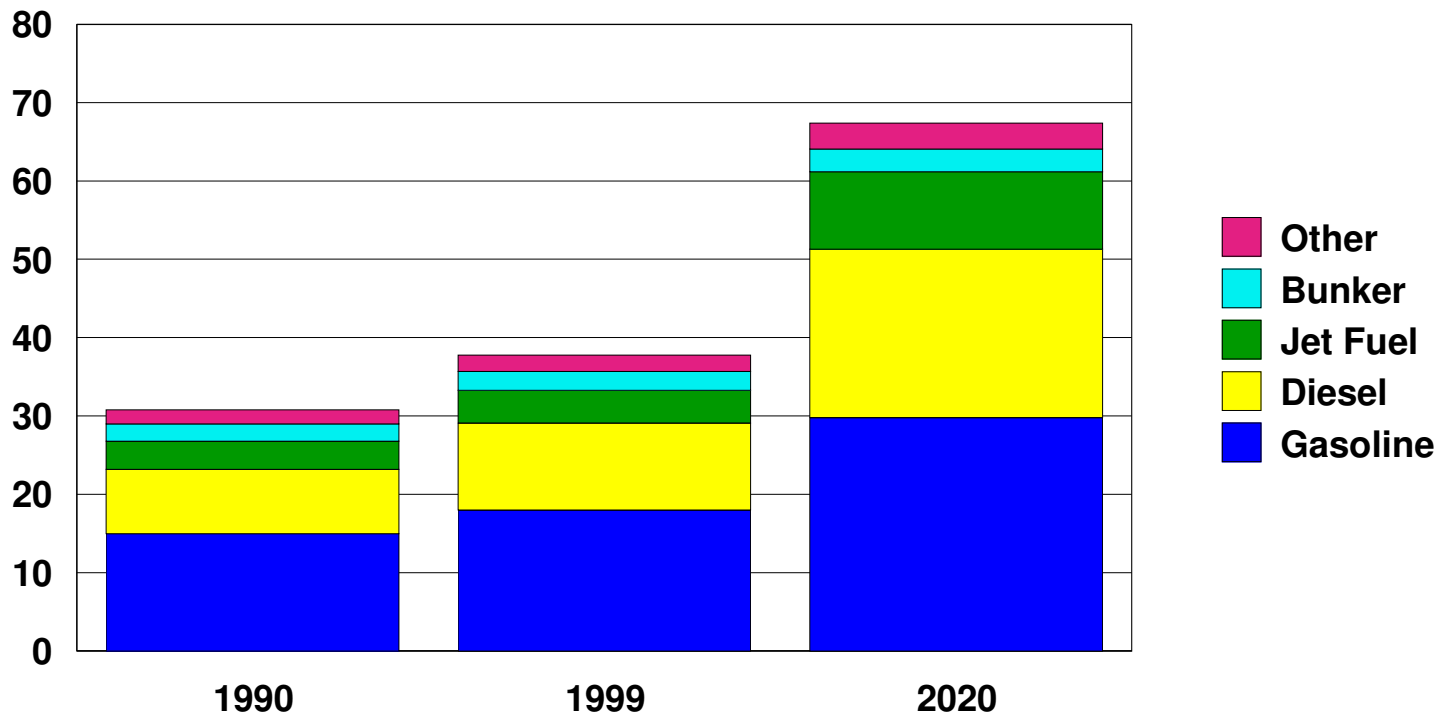


Share of worldwide CO₂ emissions from the combustion of fuel, by sector



Recent and Projected World Transportation Fuel Demand

Million Barrels/Day Oil Equivalent

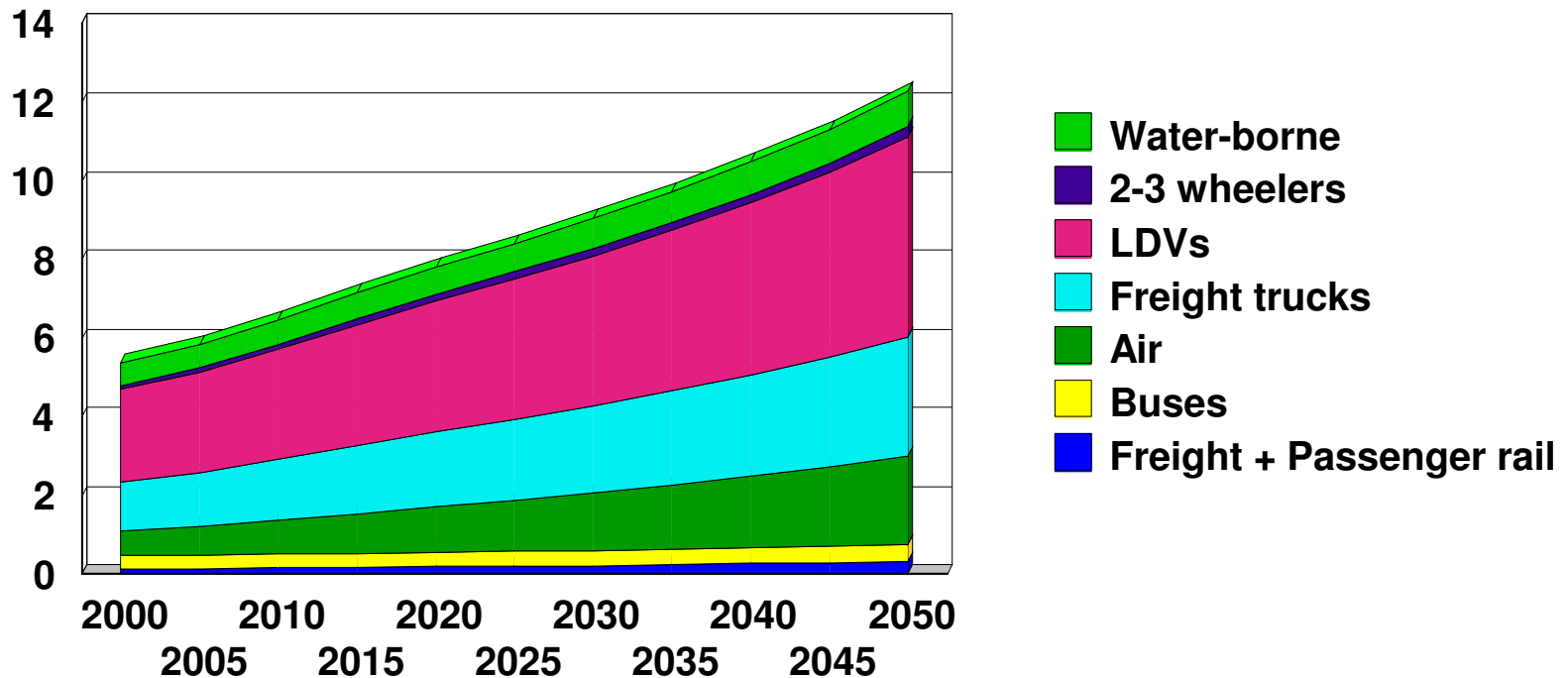


Source: EIA/DOE (2001)

Transportation is the Fastest Growing CO₂ Emissions Source

World Transport Vehicle CO2 Emissions By Mode

Megatons
Thousands



WBCSD

Various Motivations For Countries

- Reduce Climate Change
- Reduce Oil Imports
 - Energy Security
 - Balance of Payments
- Sustainability

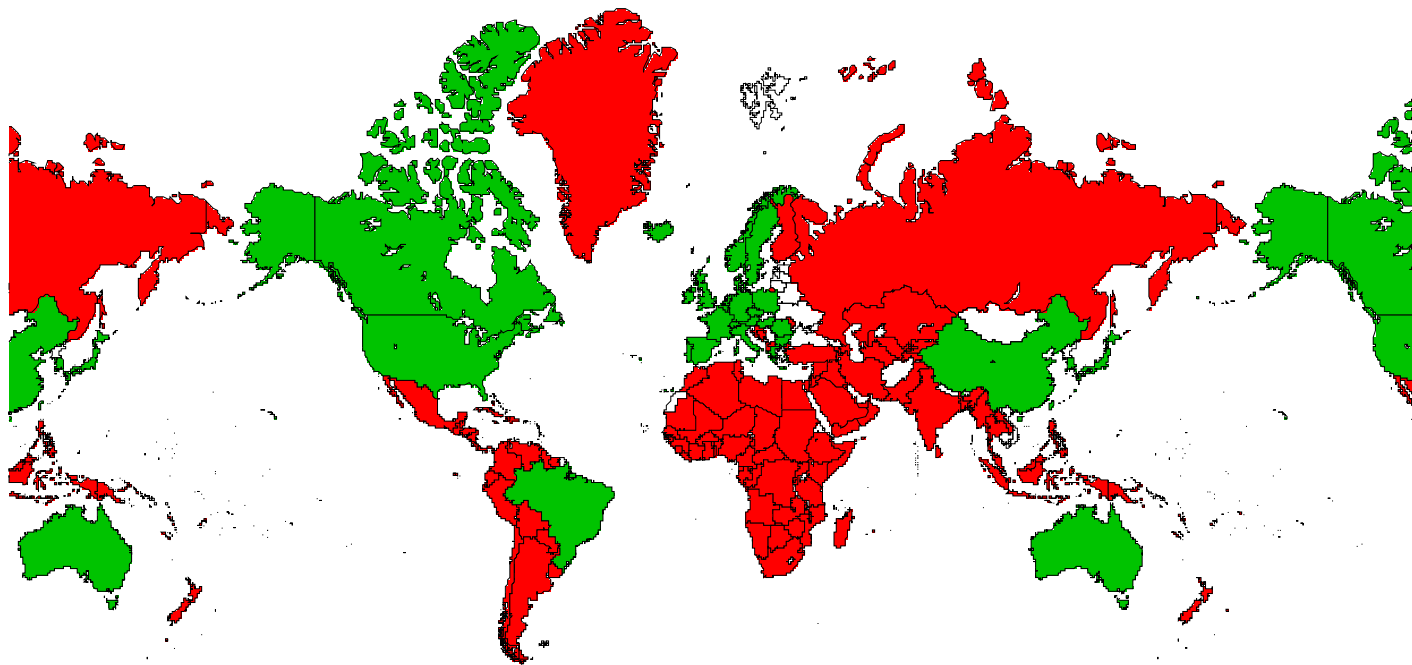


Approaches To Reducing Fuel Consumption - Greenhouse Gases Around The World

- Tax Policy
- Fiscal Incentives
- Traffic Incentives
- Fiscal Penalties
- Regulation
 - Fuel Economy/Consumption
 - CO2 Emissions
 - Greenhouse Gases
- Voluntary Agreements
- Renewable Fuels Requirements/Incentives
- Vehicle Technology Mandates/Incentives
- Joint Government/Industry Research



Selected Programs Around the World To Reduce Fuel Consumption and/or Greenhouse Gases



- No Active Program
- Program in Effect

Energy Policy and Conservation Act (EPCA) of 1975

- Mandated by Congress in response to 1973-74 Arab oil embargo
- Goal was to reduce oil demand by 2 mmbd
 - Roughly 6 mmbd of gasoline used in 1975
 - Average fuel economy in 1975 was 13.2 mpg
- Standards first took affect in 1978
 - 18 mpg for cars increasing to 27.5 by 1985
 - Light trucks standards increased less steeply, from about 15 mpg to 20.5 mpg by 1987
- Gas Guzzler Tax Included
- In 2003, NHSTA raised light truck standards by 1.5 mpg over 3 years
 - 21.0 mpg for MY2005, 21.6 mpg for MY2006, and 22.2 mpg for MY2007



CAFE Worked: Oil, Cost, and GHG Savings in 2000

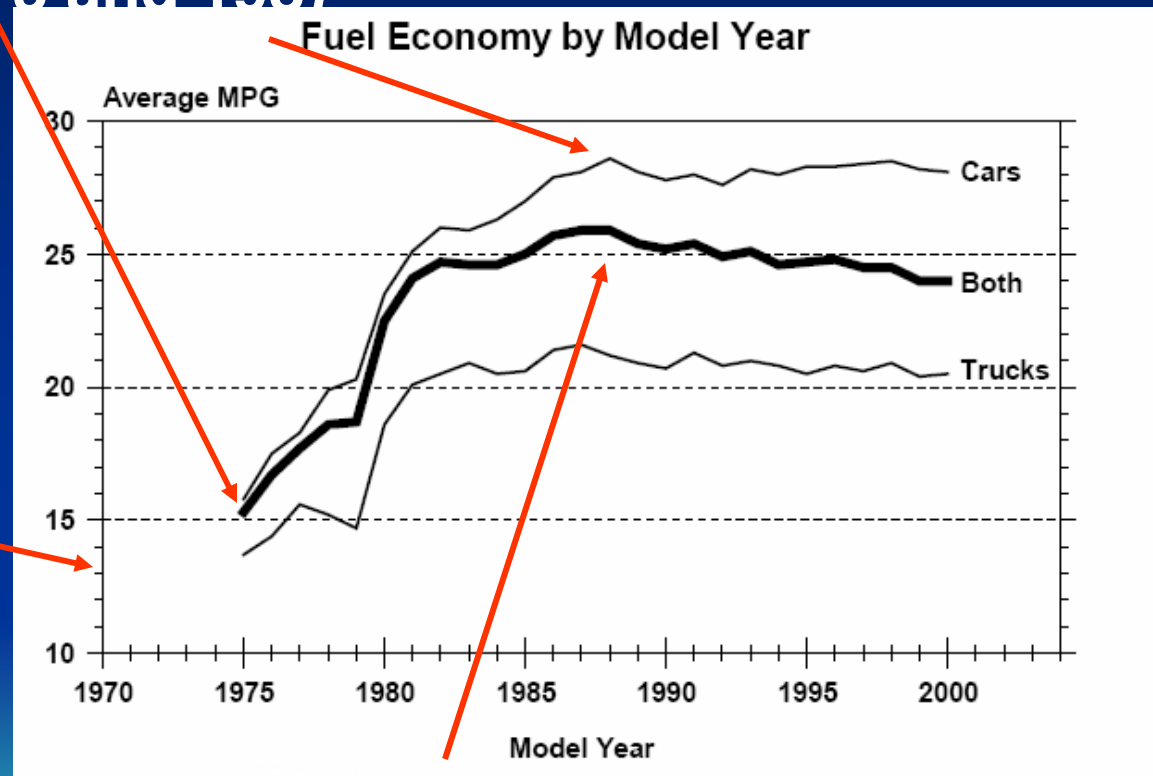
- Oil savings in 2000 = 2.8 mmbd (NRC 2002)
 - 25% reduction in demand for gasoline
 - 13% reduction in demand for oil (19.5 mmbd total)
- Oil cost savings in 2000 = about \$70 billion/yr
 - \$66 billion in direct consumer savings (@\$1.54/gallon)
 - Reduced imported oil price by \$1 to \$1.80/bbl, yielding \$3-6 billion savings in 2000, and \$40-80 billion cumulative (undiscounted) from 1975 to 2000 (NRC 2002)
- Global Warming Pollution savings in 2000 = 100 million metric tons of carbon/yr (NRC 2002)
 - 7 percent reduction in overall US emissions



Why CAFE Worked: Increase in Average Fuel Economy

Average fuel economy for new cars increased 46% between 1975 and 1987

1975 average on-road fuel economy = 13.2 mpg



CAFE prevents PC and LDT fuel economy from declining, though fleetwide average has been declining ever since 1987 due to increase share of light trucks

What Didn't Work With CAFE

- “SUV” Loophole
 - Light trucks (pickups, SUVs, and minivans) held to lower standard than cars and with rise in minivans and SUVs, average fuel economy has dropped since 1987
- Flex fuel vehicles loophole
 - Alternative fuel vehicles assigned higher fuel economy values for CAFE compliance purposes, but not required to actually use alternative fuel
- Failure to regularly update standards to reflect new technologies
 - 30% higher fuel economy possible if technologies since 1981 were not applied to increasing weight and acceleration
 - Weak construction of CAFE laws and lack of political will



CA Approach: CO₂ Equivalent Emission Standards

- California has unique authority under Federal Clean Air Act to set own motor vehicle pollution standards
- Program now being expanded to include regulation of greenhouse gases
- Longstanding, successful history of programs to control motor vehicle emissions
 - Over 95% reduction over the past four decades of smog-forming pollution controls (beginning in 1960's in CA)
 - Standards have been continuously adjusted to take advantage of new technologies (unlike CAFE)

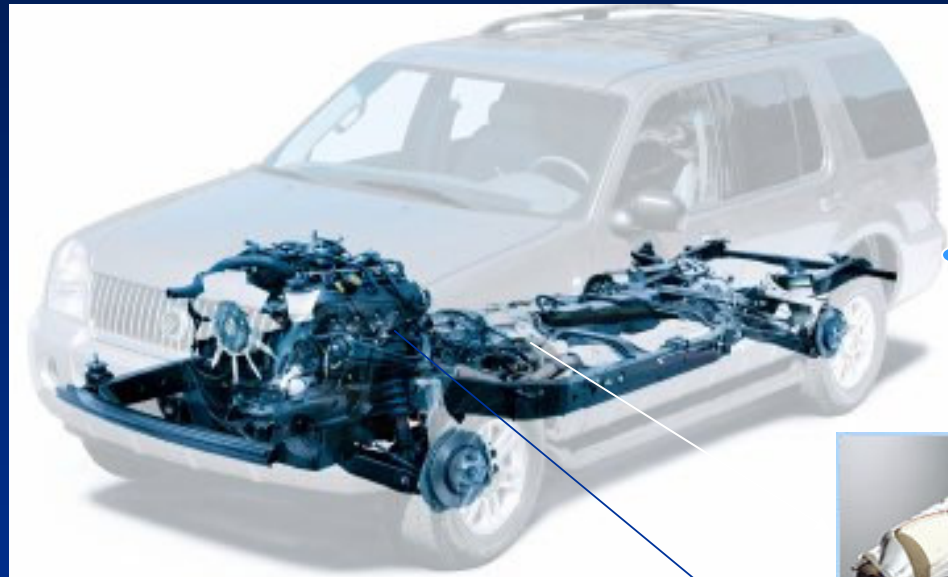


CA Approach: CO₂ Equivalent Emission Standards

- AB 1493 law passed Legislature in July 2002, regulations adopted September 24, 2004
- Maximum feasible CO₂-equivalent emission standards
 - 30% reduction by 2016 (phase in begins 2009)
 - Bundle of gases, CO₂, HFC, N₂O, CH₄
- Cost-effective to drivers
 - \$1047 extra cost paid back in about 5 years



Vehicle Climate Change Emission Sources



Black Carbon?
Ozone

CO₂

Methane

Nitrous Oxide

HFC

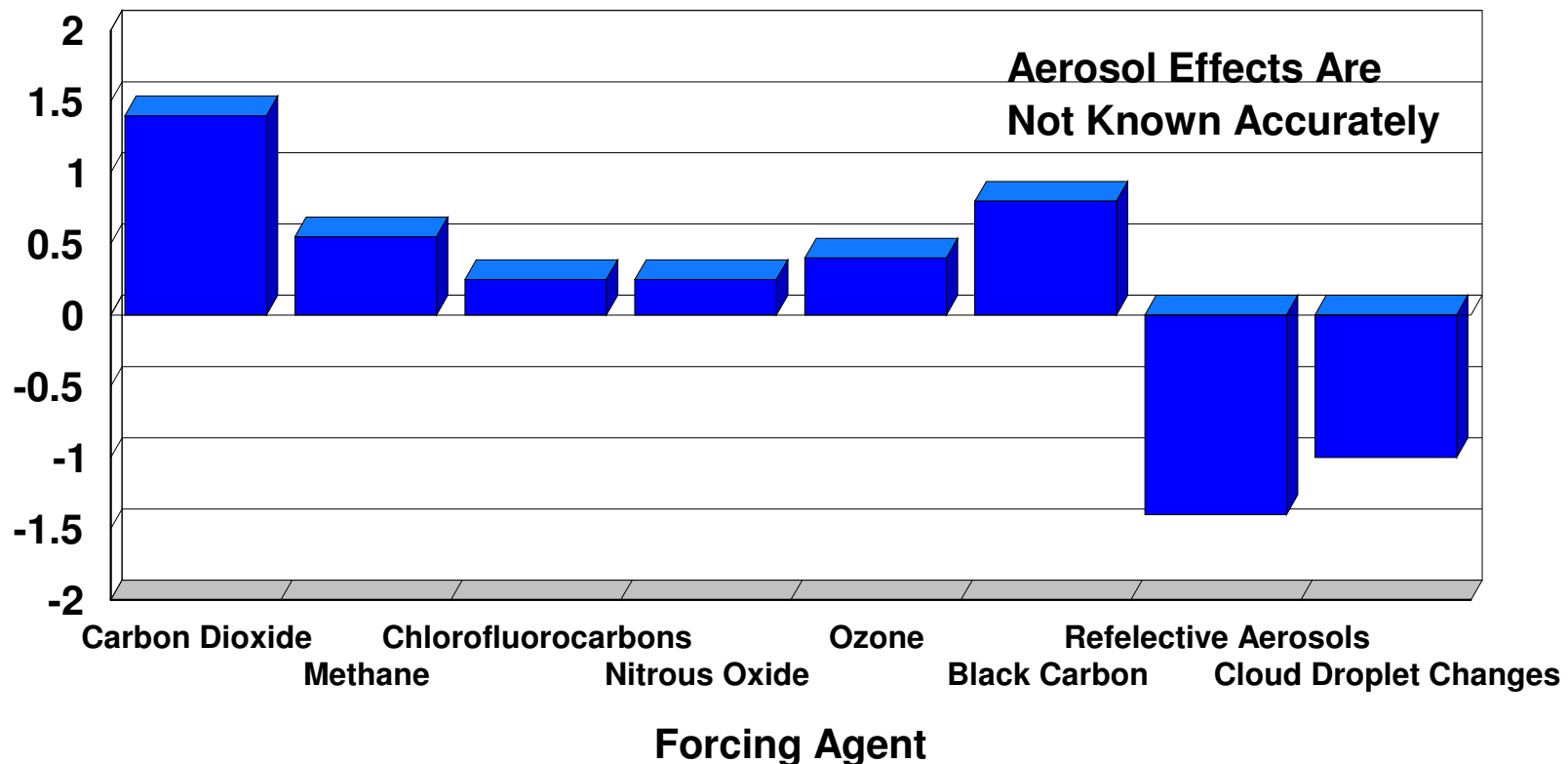
CO₂

CO2 Is Not The Whole Story

Climate Forcings

Recent evidence indicates
Reducing 1 kg of BC is equal
To reducing 2.5 tons of CO2

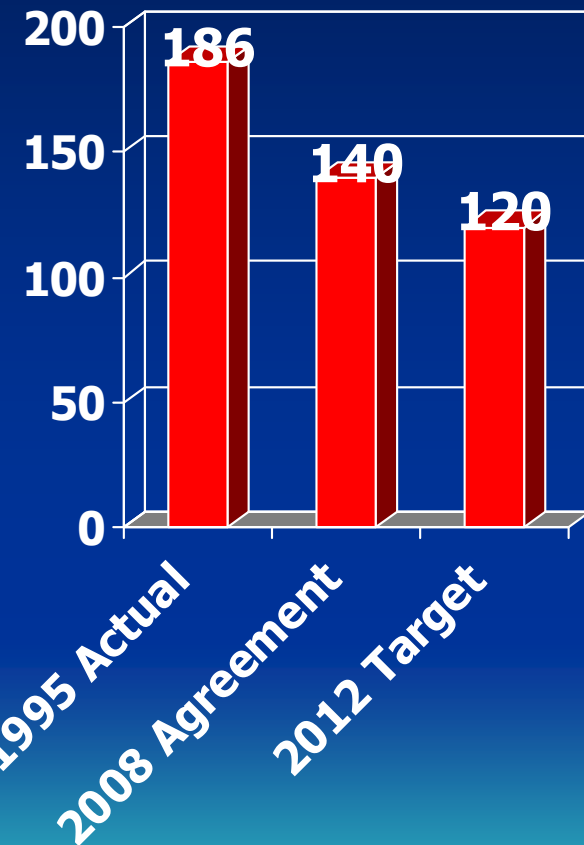
Watts Per Square Meter



Source: Hansen, Scientific American, March 2004

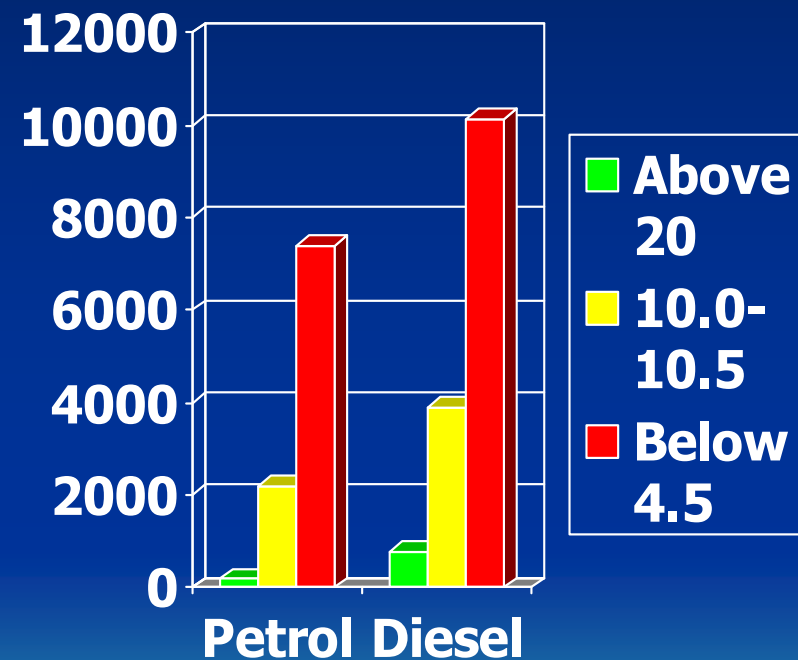
European Agreement (g CO₂/km)

- Some 120 g/km Cars in 2000
- Target Range of 165-170 g/km in 2003
- Review Feasibility of 120 g/km for Average car by 2012 in 2003
- Latest Data Indicates Targets Will Not Be Met Without Standards
- Not Very Transparent



Yearly Car Tax in Denmark

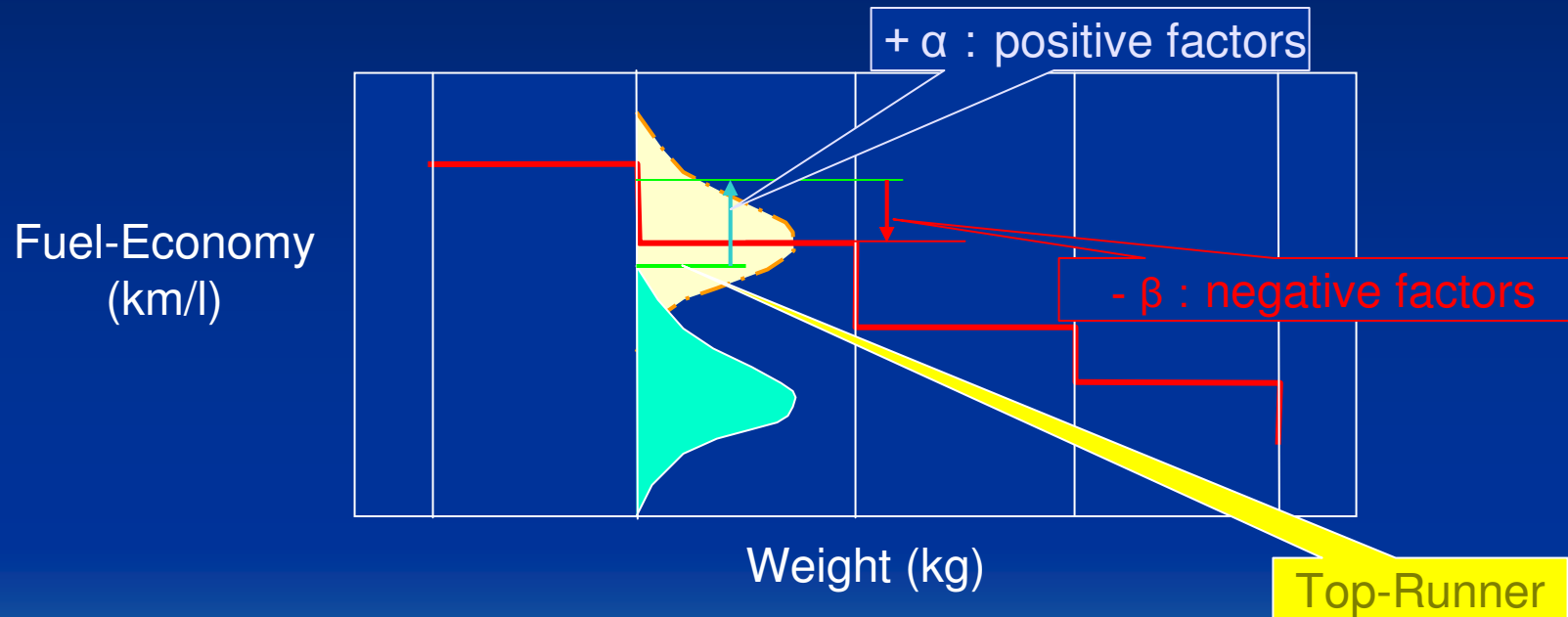
- 24 Different Car Classes Based On Kilometers Per Liter of Fuel
- Diesel Taxed More Than Gasoline
- Annual Increase with Inflation Plus 1.5% Per Year



Top-Runner Standard for Fuel Economy in Japan

Target Standard Values

Based on the fuel economy of the most fuel efficient vehicle which is on sale



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

Source: Japan MLIT

Target Standard values for Light-duty Vehicles (passenger Vehicles) for Fuel Economy Regulation

Set in FY1998.
Target Year:
FY2010

Class by weight	<702	703 -827	828 -1015	1016 -1265	1266 -1515	1516 -1765	1766 -2015	2016 -2265	2266<
Gasoline (km/l)	21.2	18.8	17.9	16.0	13.0	10.5	8.9	7.8	6.4
Diesel (km/l)	18.9			16.2	13.2	11.9	10.8	9.8	8.7

*Values for light-duty trucks were also set at the same time

More information can be found at; http://www.eccj.or.jp/top_runner/chapter7_1_01.html



Fuel Economy Improvement required for Heavy-Duty Vehicles

Set in FY2005.

Source: Japan MLIT

	Target year	Base year (2002) Fuel Economy	Target standard value (average)
Trucks	2015	6.32 km/L (15.8L/100km) (415 g-CO ₂ /km)	7.09 km/L (14.1L/100km) (370 g-CO ₂ /km) <i>(12.2% improvement)</i>
Buses	2015	5.62 km/L (17.8L/100km) (466 g-CO ₂ /km)	6.30 km/L (15.9L/100km) (416 g-CO ₂ /km) <i>(12.1% improvement)</i>



Other Actions to Improve Fuel Economy

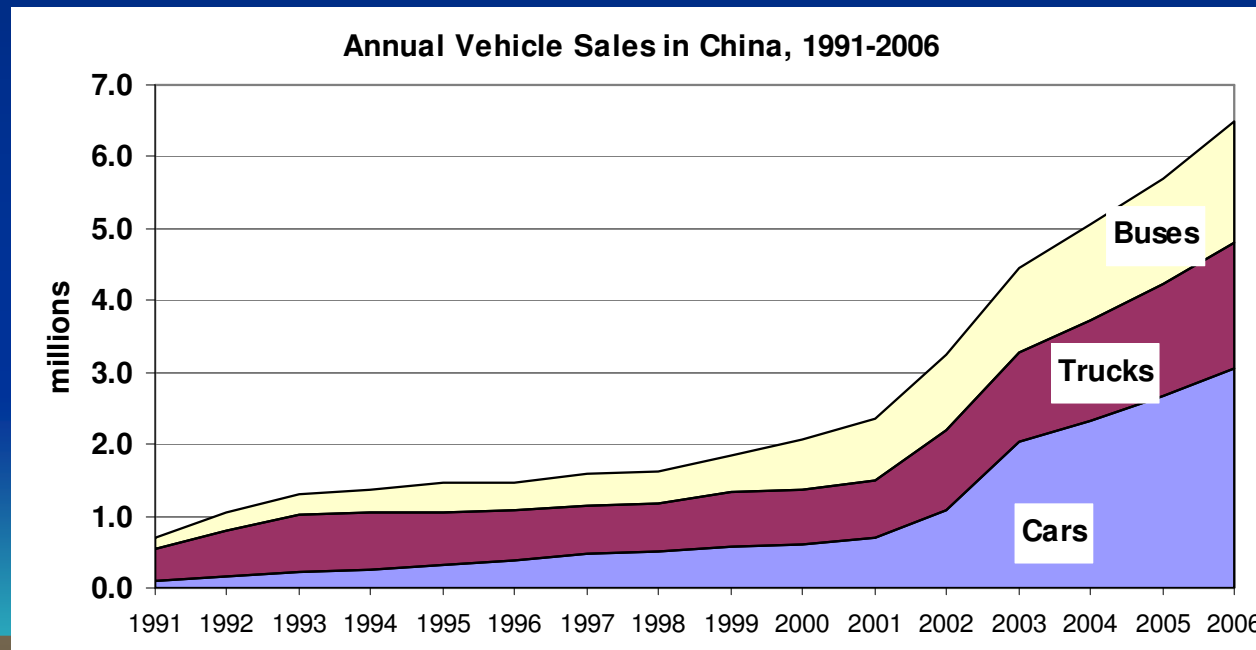
- **Establish and Strengthen Fuel Economy Standards**



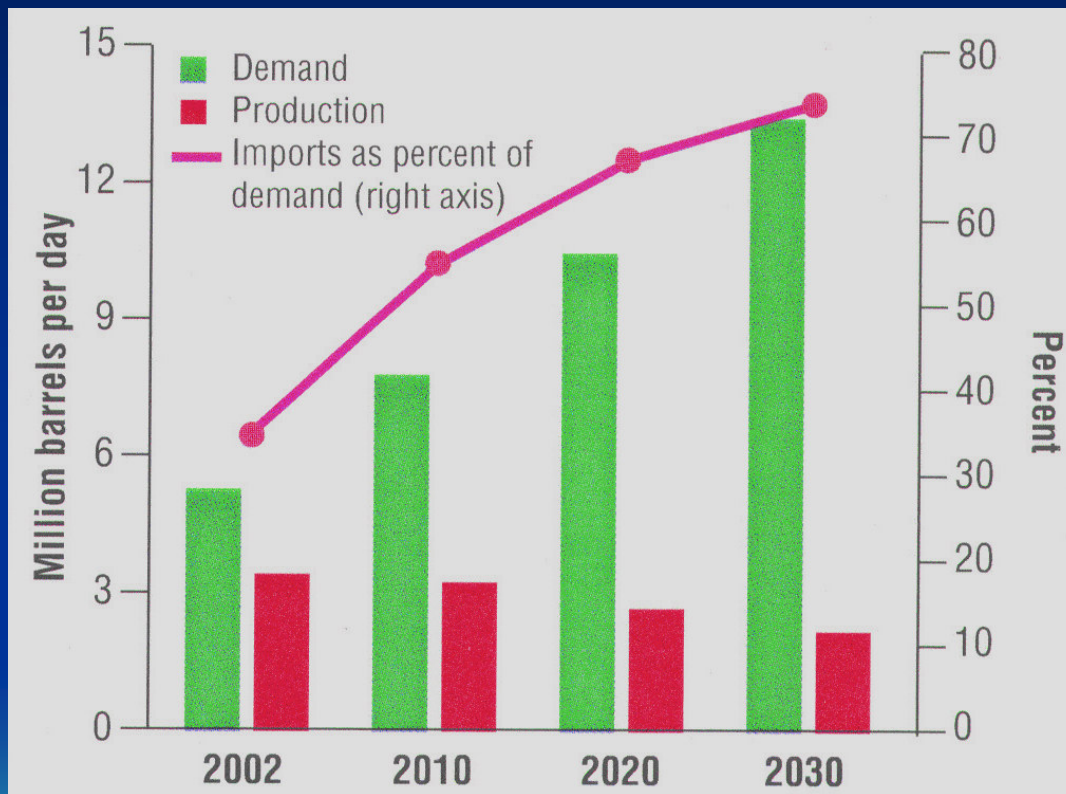
- **Labeling**
- **Lower taxes for Fuel Efficient Vehicles**
- **R&D**

China to become the second largest vehicle market this year, with total new sales project to be 6.5 millions. Car market exploded in the past several years. New car sales are project to be surpass 3.0 millions this year.

Annual growth in new car sales averaged about 20% since 92, trucks 7%, buses 13%



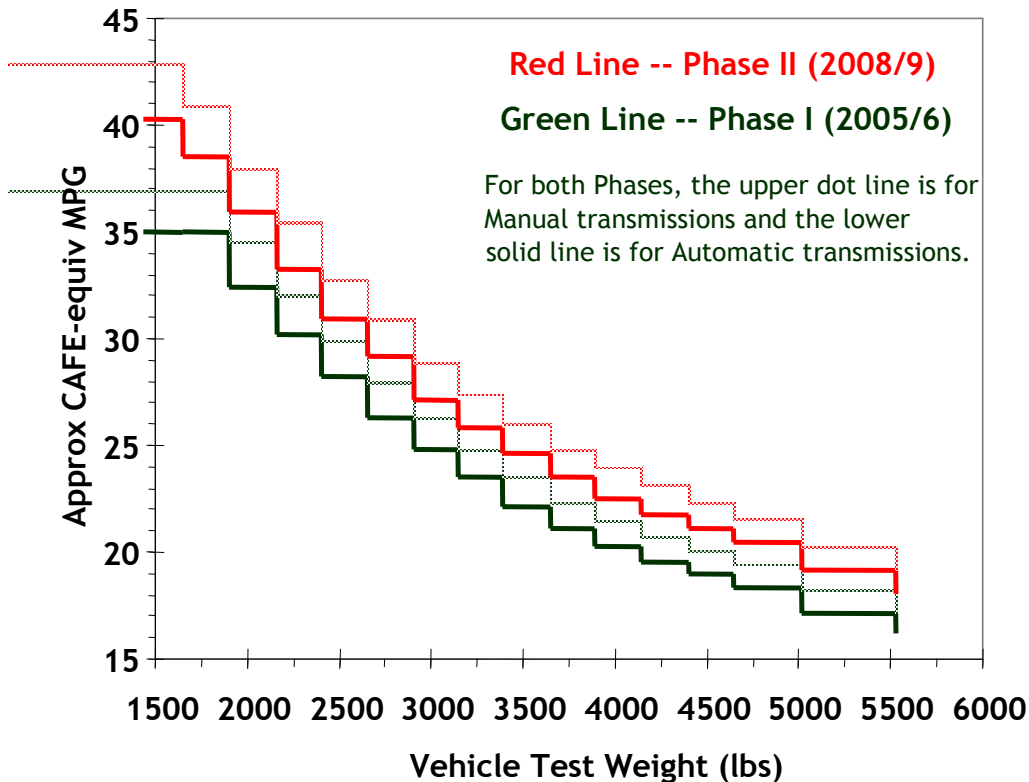
China's petroleum production, consumption, and imports projected by IEA



China currently ranked 2nd in oil consumption in the world after US. From 1993 China has turned into an oil net-import country, and in 2004 the net-import oil amount has reached 40% of the total oil use. About half of imports from Mideast. IEA projects imports share to reach 60% by 2010, 70% by 2020

Source: World Energy Outlook 2004

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**

Recent Vehicle Tax Reform

Vehicle Category by Engine Displacement	Tax Rate
Automobiles	
1.0 to 1.5 liters	3%
1.5 to 2.0 liters	5%
2.0 to 2.5 liters	9%
2.5 to 3.0 liters	12%
3.0 to 4.0 liters	15%
4.0+ liters	20%
Commercial Buses	5%
Motorcycles	
<250cc	3%
>250cc	10%

- Vehicle purchase tax has two components: exercise tax levied to automakers, and sales tax levied to consumers
- Sales tax levied to consumers - 10% (no reform proposal yet)
- **Reformed** Exercise tax levied to auto makers
 - reduce tax rate on small engine (1.0-1.5 L) from 5% to 3%,
 - increase tax rate on larger engine (> 4L, from 8% to 20%)
 - eliminate SUV prestige (SUV used to enjoy special rate of 5%)
- **Stalled proposal:** Levy penalty tax on vehicle models that fail fuel consumption standards.

The Great Diesel vs. Gasoline vs. Hybrids Debate

- Big pushes from EU-based OEMs for dieselization - VW and Bosch recently sponsored a top Chinese government think tank for dieselization study which I participated in
- Dieselization vs. Hybridization? Or EU path vs. US/Japan path?
- Cities resisting European Diesels because of high pollution



Summary and Conclusions



- Many Technologies to reduce mobile source fuel consumption and GHG emissions available today
- The technology is evolutionary – not revolutionary
- Some already in use or in product plans; others under development and available soon
- Technology costs could be paid for through fuel savings
- Reducing fuel consumption does not require sacrifices in performance and other attributes that consumers value
- Reducing fuel consumption does not require compromises in vehicle safety or emission regulations
- Starting To Look Beyond Cars

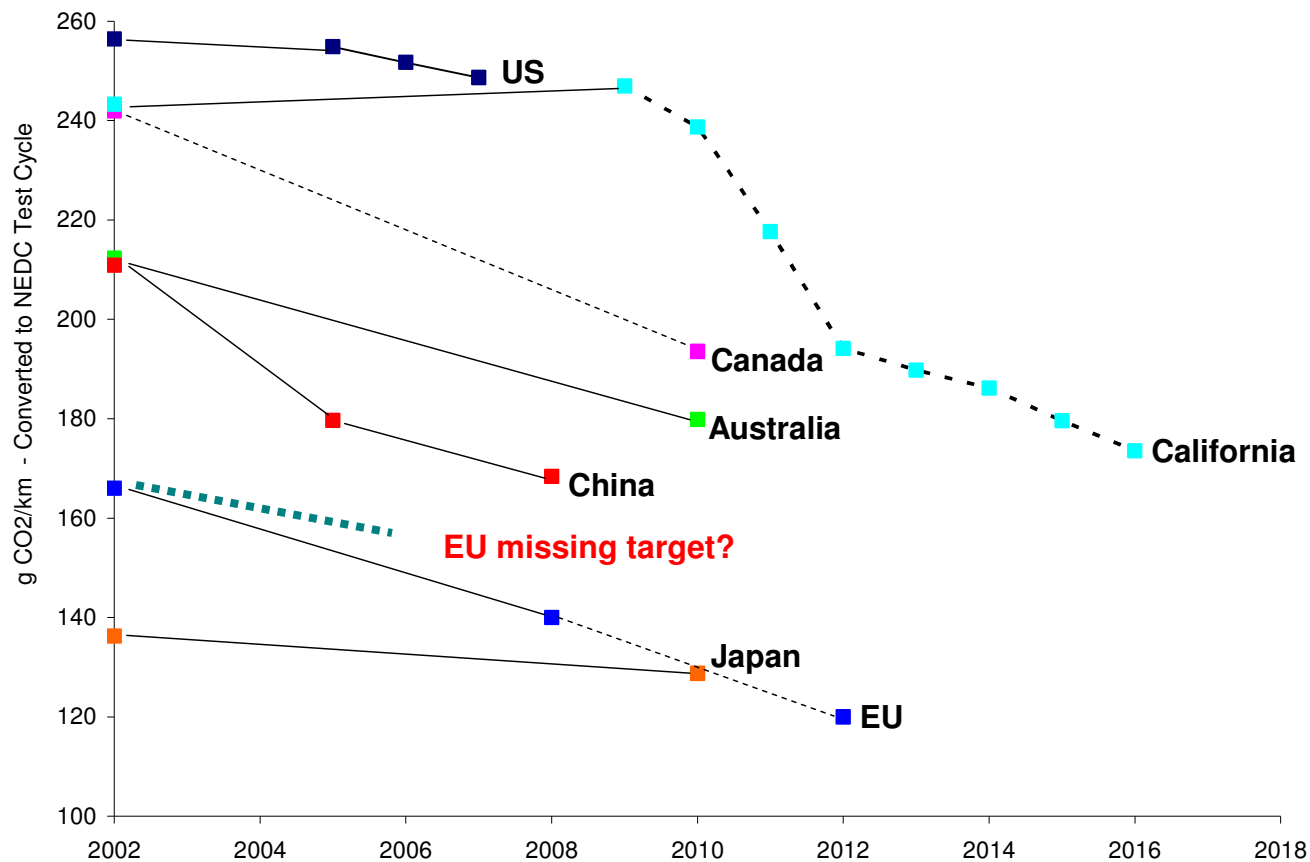


Summary and Conclusions (2)

- Fuel economy standards provide greatest certainty in achieving fuel savings goals
- Purchase incentives and fuel taxes can provide incentive for continuous improvement
- Strong fuel economy standards provide greater incentives for industry to invest in new technologies, and enhance global competitiveness of domestic auto industries



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



Source: Comparison of Passenger Vehicle Fuel Economy and GHG Emission Standards around the World, by Feng An and Amanda Sauer, Report for *the Pew Center on Global Climate Change*