

FIA Conference: Towards a Global Approach to Automotive Fuel Economy

United States Case Study – Sharing Experience in the Developed and Emerging Economies

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8 Place de la Concorde

Paris, France

May 15 - 16, 2008



Outline of Presentation

- About the ICCT
- Review of U.S. and California fuel economy and GHG emission standards
- Placing U.S. policies within a global context
- Lessons and future challenges

About the ICCT

- The Council is made up of leading government regulators and experts from around the world who are actively engaged in setting air pollution and climate change policies for the transportation sector. They participate as individuals based on their experience with air quality and transportation issues.
- The goal of the International Council on Clean Transportation (ICCT) is to dramatically reduce conventional pollutant and greenhouse gas emissions from personal, public and goods transportation in order to improve air quality and human health, and mitigate climate change.

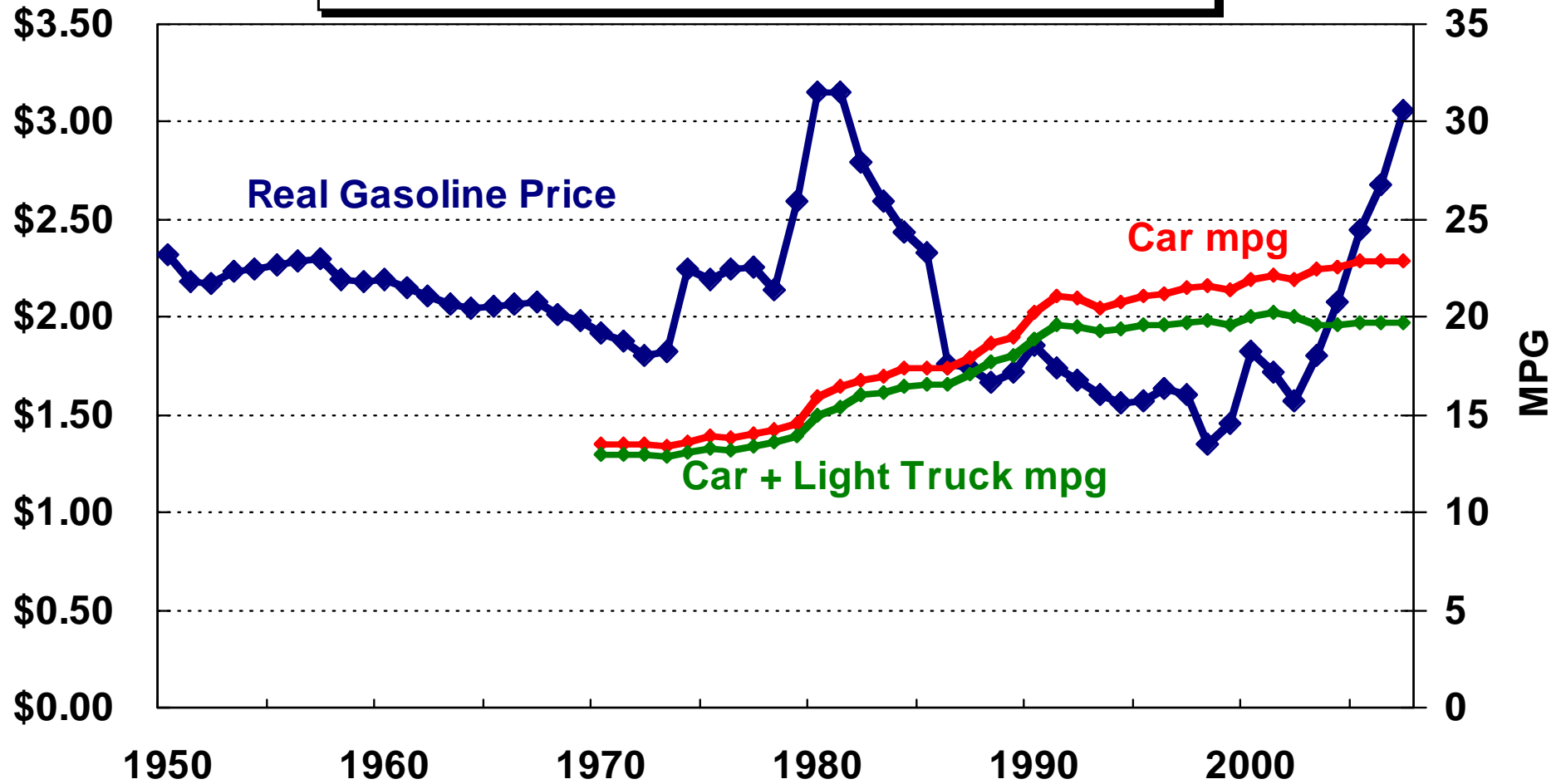


Review of US Policy

1975 - 1985	Oil Shocks: Policy response - CAFE and gas guzzler tax - nearly double vehicle fuel economy.
1985 - 2004	Stagnation: Low gas prices, regulatory inaction, erosion of fuel economy.
2002 - 2008	State Action: California sets vehicle GHG emission standards; other states follow suite.
	Federal Reform: DOT reforms CAFE design and new federal law requires 35 mpg by 2020.
2008 +	Moving Towards a New Paradigm?: High oil prices and climate change spur EPA, DOT and State interest in regulating vehicles.

The Need to Conserve Energy Varies by Fuel Price

Real Gasoline Prices and In-Use Fleet MPG
(2007 \$ per gallon)



In-Use MPG from Transportation Energy Data Book: 2007

Legal History of Federal Fuel Economy and GHG Emissions Policies

- Massachusetts v EPA (April 2, 2007). U.S. Supreme Court ruled that EPA has statutory authority to regulate GHG emissions from motor vehicles. And EPA's authority to set vehicle GHG standards can co-exist with DOT's authority to regulate fuel economy under CAFE.
- Presidential Executive Order (May 14, 2007) requires EPA – in collaboration with DOT and DOE – to establish federal GHG emission standards for passenger vehicles by end of 2008.
- Center for Biological Diversity v. NHTSA (Nov. 15, 2007). Federal 9th Circuit Court of Appeals overturns light truck CAFE rule (2008 – 2011) for, in part, assigning zero value for climate change benefits, no backstop, sets less stringent standards for light trucks, and does not regulate work trucks.
- Energy Independence and Security Act (December 2007) requires DOT to issue new fuel economy standards to achieve 35 mpg for cars / light trucks by 2020.

Reformed CAFE

- Architectural change: Single, or flat, fuel economy standards -- one for cars, a less stringent standard for light trucks -- changed so that the standard varies by vehicle size.
- Tremendous competitiveness implications: Each vehicle manufacturer assigned a unique fuel economy standard based on the average size of its fleet each year.
- Key decision on attribute: Size was chosen as the vehicle attribute because of the importance of light weighting and the agency's safety concerns.
- Important Nuance: Slope of the compliance curve flattens to eliminate regulatory incentive for upsizing vehicles.

Size-based Reformed CAFE (2008 - 2011)



Jeep Wrangler



Toyota Sienna



Kia Sedona



Ford Explorer



Honda Pilot

Sample Vehicles' Visual Footprint & CAFE Targets

Manufacturer	Nameplate	Footprint (ft. ²)	MY 2011 Target (mpg)
DaimlerChrysler	Wrangler	41.1	28.3
Ford	Explorer	48.2	25.2
Honda	Pilot	49.0	24.8
Toyota	Sienna	49.6	24.6
Kia	Sedona	50.9	24.1
Ford	F150	58.6	22.4
GM	H2	59.1	22.3
GM	Silverado	72.4	21.8
DaimlerChrysler	Ram 1500 Quad Cab	76.1	21.8



Hummer H2



Ford F150



Chevy Silverado



Dodge Ram 1500

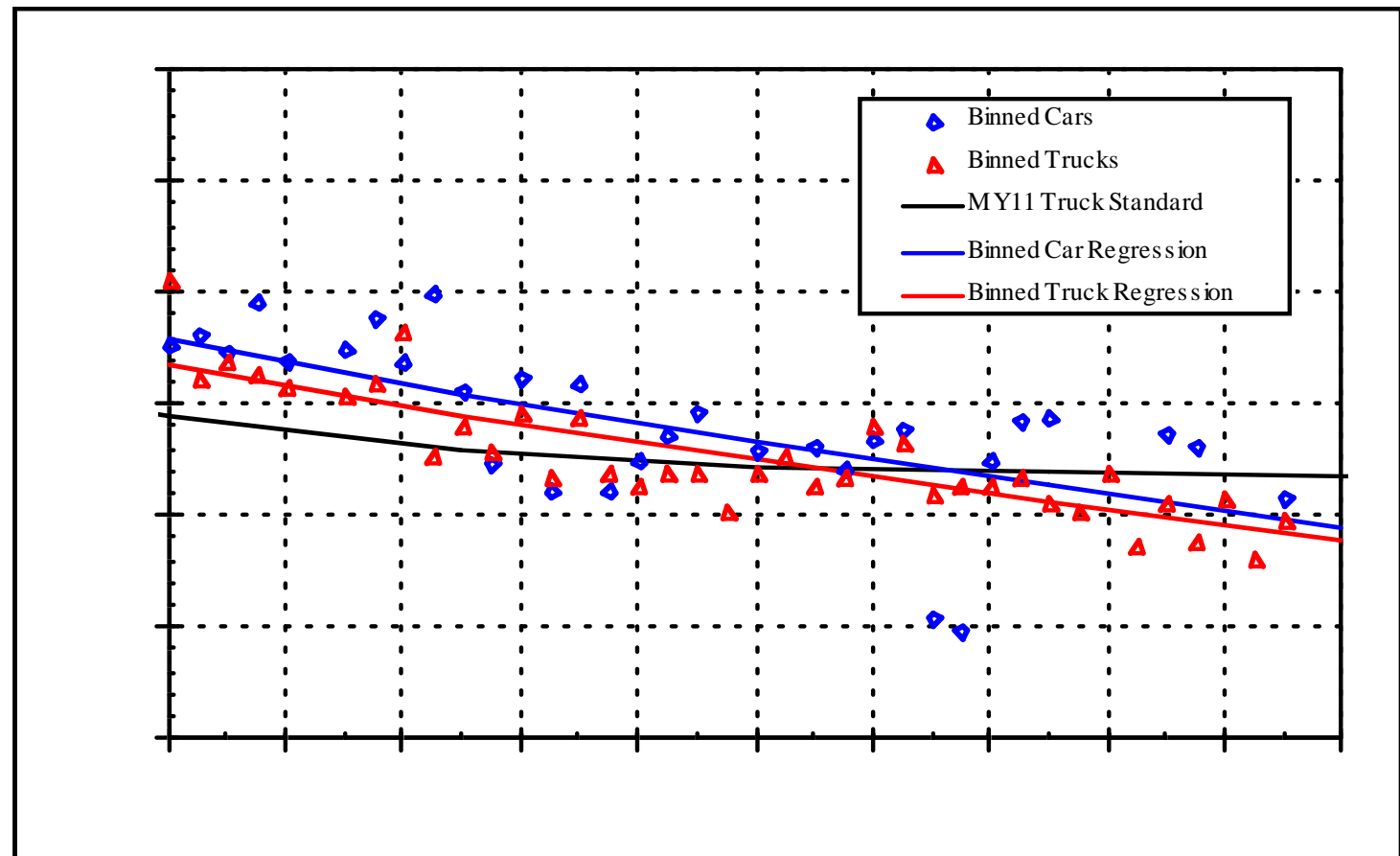
Recent CAFE Proposal (2011- 2015)

- Sets size-based standards for cars and light trucks.
- For the combined fleet, sets standards for 5 years (2011 to 2015) from 27.6 to 31.6 mpg.
 - Passenger vehicles from 31.2 to 35.7 mpg
 - Light trucks increase from 25.0 to 28.6 mpg.
- Impressive annual rate of improvement at 4.5%
- Issues raised by 9th Circuit superseded by EISA and so only partially addressed.
 - Backstop - only for domestic passenger vehicles
 - Weaker standards for trucks - maintained
 - New standards for heavy work trucks - delayed
 - Value for CO₂ - \$7/ton

Why Set Separate Standards for Cars and Trucks?

Average car mpg differs from average truck mpg by approximately 1 mpg at any given footprint.

- Based on analysis of Ward's™ data for all 2007 model year vehicles.
- 600+ (345 unique) car and 1100+ (385 unique) truck configurations.
- Used statistical regression analysis to determine mpg variation



Legal History of California GHG Standards

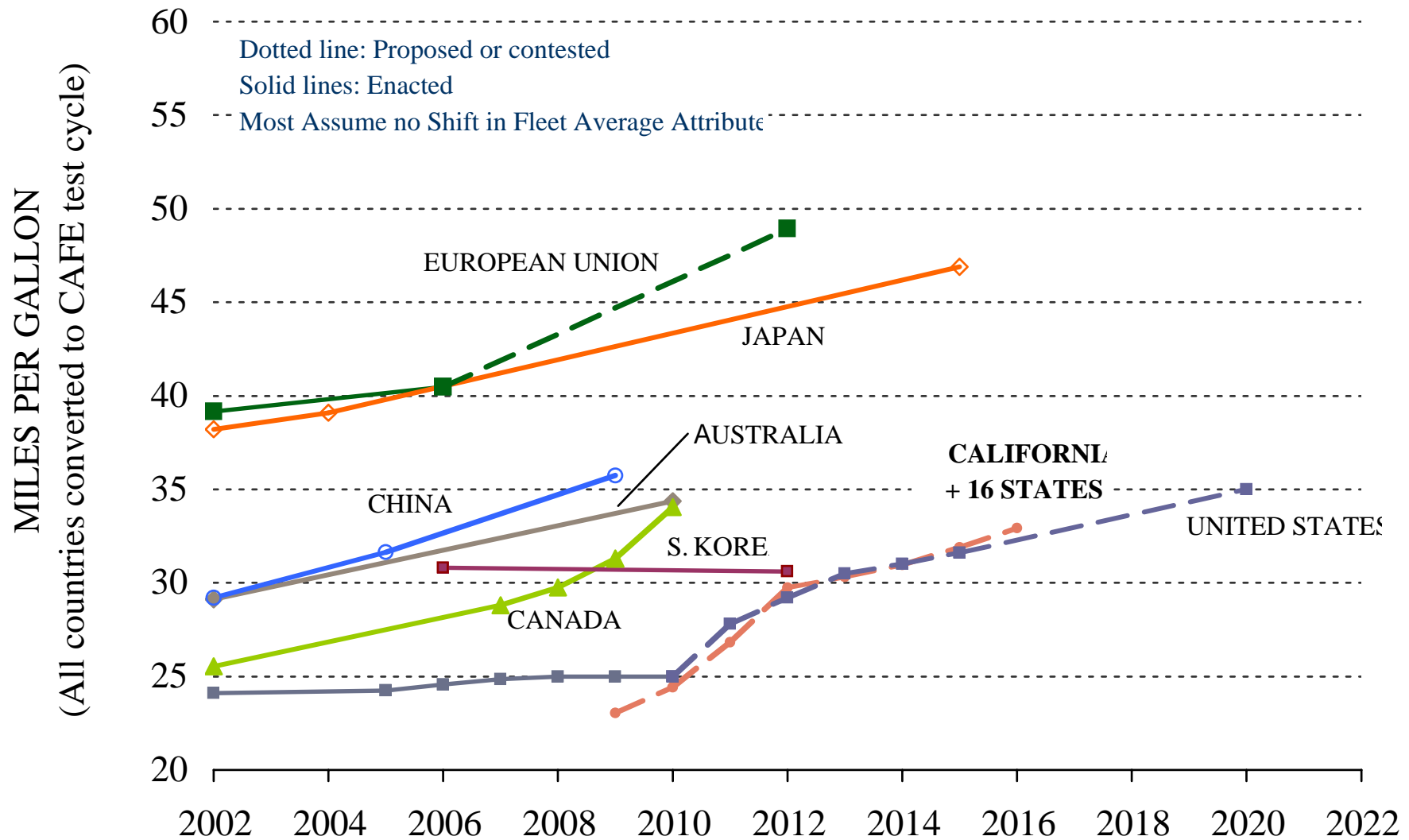
- Massachusetts v EPA (April 2, 2007). U.S. Supreme Court finds greenhouse gas emissions are air pollutants under Clean Air Act. And that EPA's authority to set vehicle GHG emission standards could co-exist with DOT's authority to regulate fuel economy under CAFE.
- Green Mountain Chrysler v. Crombie (September 2007). Federal district court of Vermont rules that Vermont's adoption of California's GHG standards was not preempted by federal laws. The court concluded that this is "not rightly a case about federal preemption, but about potential conflict between two federal statutes."
- Central Valley Chrysler-Jeep v. Goldstone (December 11, 2007). California federal district court finds AB 1493 not preempted by federal laws.
- U.S. E.P.A. denies California's petition for a waiver for its GHG emission standards on December 19, 2007. California and 16 states that adopted or pledged to adopt would equal half US passenger vehicle sales. First time waiver refused; more than 50 have been granted.
- Governor Schwarzenegger files legal challenge to contest federal denial of waiver request on January 2, 2008.

Design Elements

- Vehicle category-based corporate average GHG emissions standard
- Greenhouse gases emitted by motor vehicles include:
 - CO₂, CH₄ and N₂O emissions resulting directly from operation of the vehicle,
 - CO₂ emissions resulting from operating the air conditioning system,
 - HFC (refrigerant) emissions from the air conditioning system due to either leakage, losses during recharging, or release from scrappage of the vehicle at end of life, and
 - Upstream emissions associated with the production of the fuel used by the vehicle.
- Allows non-tailpipe emission reduction technologies, such as improved air conditioning system.

Placing the U.S. policies in a Global Context

Standardized Comparison of International Fuel Economy and GHG Standards



Source: *Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update*, International Council on Clean Transportation, 2007

Influence of Weight and Engine Size

Market	Japan	EU	US
Fleet Average Kerb Weight (kg)	1,280	1,334	1,769
Fleet Average Engine Size (liters)	1.5	1.7	3.4
Fleet Average CAFE mpg	39.3	40.0	24.7
Fleet Average NEDC gCO ₂ /km	152	161	254
Representative Vehicle	Honda Fit	Opel Meriva	Chrysler 300

- Compared with Europe, the U.S. fleet has 15 mpg lower fuel economy, twice the engine size, and is 435 kg heavier (see table).
- The estimated fuel economy penalty for the U.S. fleet due to an extra 435 kg (or almost 1,000 pounds) is between 5 and 8 mpg on the U.S. test cycle.

Recent Applications of Mass-Based Technologies

Manufacturer	Lightweighting Technology	Mass Reduction
GM	Hollow intake valvestems on Corvette LS3 engine	13% reduction in valvetrain mass
Nissan	VR38 engine uses sprayed plasma cylinder coating rather than iron sleeves	2.8 kg
BMW	New M3 V8 engine includes: aluminum/silicon alloy engine block, aluminum alloy pistons, magnesium/HSS alloy connecting rods, short HHS crankshaft, and small diameter lightweight valve shafts.	15 kg relative to older V6 engine
Chrysler	Optimized steel allocation through improved body simulation software	Up to 54 kg
Supplier	Prototype plastic exhaust system with improved acoustics relative to standard metal systems	3-4 kg
GM	Replace five piece steel/plastic SUV step with one piece plastic counterpart	50% reduction in step mass
Chrysler	Replace door hardware and trim unit with improved plastic module	10% relative to old parts
Chrysler	Replace aluminum throttle control module with plastic	28% relative to old module
Toyota	1/X concept car with carbon-reinforced fiberglass construction and downsized engine	830 kg
Mitsubishi	D5 features nylon-based plastic fenders	4 kg
Ferrari	New 599GTB engine redesign	21 kg relative to 575M predecessor
Ferrari	New 599GTB aluminum body design	13% relative to 575M predecessor, despite 8% longer wheelbase
Honda	Acura MDX aluminum instrument panel supports	4.8 kg
Honda	Acura MDX aluminum hood	7 kg
Hyundai	Extensive use of plastics in QarmaQ (skin and structural parts, glazing)	60 kg relative to conventional construction

Note: HSS = high-strength steel

Sources: 1. *Automotive Engineering International*, SAE International, April 2007-February 2008.
2. *Automotive News*, Crain Communications, Inc, Online Search of Articles.

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The Importance of Leadtime

- Important to allow manufacturers sufficient time to ensure quality, reliability and investment.
 - Spread across fleet – 5-year minimum product cycles
 - Longer leadtime is needed for new technologies
 - Costs increase dramatically if normal development cycles are not followed
- But this is not what's required / practiced in the U.S.
 - EPCA required 18 month leadtime as a minimum, treated as maximum by agency.
 - EISA limits single rule to 5 model years.

Key Elements of Program Design

Region/Country	Basis	Attribute	Averaging	Function
California	Class-based	/	Unlimited	Stepwise
US (proposed)	Attribute-based	Footprint	Corporate Average	Continuous
EU		Weight	Corporate Average / Pooling	Continuous
Japan		Weight	Corporate Average within Weight Bins	Stepwise
China		Weight	None	Stepwise

Lessons and Future Challenges

1. Set long-term, mandatory standards to promote business investment in new technologies.
2. Attribute-based standards help distribute compliance burden equitably among manufacturers, but require a backstop to ensure program goals are achieved.
3. Size-based standards are superior to weight-based: lower cost, greater benefits.
4. Complementary fiscal policies are necessary to dampen the trend towards heavy, high-horsepower vehicles.

For additional information, please
visit our website at www.theicct.org