California's Regulations to Control Greenhouse Gas Emissions from Motor Vehicles:

Hearing on Request for Waiver of Preemption Under Clean Air Act Section 209(b)

Dr. Robert Sawyer, Chair
California Air Resources Board

Washington, D.C.
May 22, 2007

The California Waiver

40 Years of Successful Environmental Innovation

- Waiver Procedure in place since 1967
- Recognizes California's unique conditions
- California as a laboratory for innovation
- Endorsed by NAS in 2006

Outline

- Legal and Policy Framework for EPA Review
- Background and Overview
  - Global Warming Causes and Impacts
  - AB 1493 Motor Vehicle Greenhouse Gas Regulations
- Applying the Waiver Criteria
  - Protectiveness
  - Extraordinary and Compelling Conditions
  - Consistency with Section 202(a)
- Conclusion

Legal and Policy Framework for EPA Review

- Overview
  - Only 3 Issues Before EPA
    - Protectiveness
    - CA conditions justifying program
    - Consistency with 202(a)
  - Burden on Opponents
  - Deference to California's Judgments

Legal and Policy Framework

- First Issue: Protectiveness
  - Was CA *arbitrary & capricious* in determining its standards are at least as protective as applicable federal standards?
  - **NO**

Legal and Policy Framework

2) Second Issue: Does CA need its state standards to meet compelling and extraordinary conditions? **YES**

- **1984 Waiver for California Diesel Particulate Standard:** EPA agrees its "inquiry is restricted to whether California needs its own emission control program to meet compelling and extraordinary conditions." 49 F.R. 18887, 18889-90

- Need for particular standard not the relevant issue

Legal and Policy Framework

- Third Issue: Are the standards and enforcement procedures inconsistent with Clean Air Act §202(a) ? - Not inconsistent
  - Technologically feasible within lead time provided (giving appropriate consideration to compliance costs)
  - Consistent with federal test procedures

Legal and Policy Framework

- EPA cannot consider issues not identified in section 209(b):
  - Policy considerations
  - Constitutional issues and effect of other statutes like antitrust laws
    - *MEMA v EPA,* 627 F.2d at 1114-20: The Administrator properly declined to review potential anti-trust and constitutional implications of CARB regulations under 209(b)

Legal and Policy Framework

- Burden of Proof is on Waiver Opponents –

  "The language of the statute and its legislative history indicate that California's determination that they comply with the statute, when presented to the Administrator are presumed to satisfy the waiver requirements and that the burden of proving otherwise is on whoever attacks them."

  U.S. Federal Court of Appeals in *MEMA v. EPA* (1979)

Legal and Policy Framework

- Deference to California:

  "The structure and history of the California waiver provision clearly indicate both a Congressional intent and an EPA practice of leaving the decision on ambiguous and controversial public policy to California's judgment."

Administrator Russell Train, 1975 (40 FR 23104)

Legal and Policy Framework

- Deference Especially appropriate for Greenhouse Gas emission standards :

  "Congress intended for California's standards to be "more stringent than, or applicable to emissions or substances not covered by, the national standards." (Emphasis added.)

H.R. Rep. No. 90-728 (1967), reprinted at 1967 U.S.C.C.A.N. 1938, 1958.

Supplemental Questions from Notice

- Relevance of *Massachusetts v. EPA*
  - Reaffirms principle that EPA's review here is limited to the three issues in Clean Air Act §209(b)
  - Disposes of consistency argument made by regulation opponents

Supplemental Questions from Notice

- Relevance of *Massachusetts v. EPA*
  - Supreme Court finds EPA has "unambiguous" authority to regulate GHGs under CAA §202(a)
  - Thus California's standards are consistent with EPA's authority

Supplemental Questions from Notice

- Relevance of *Massachusetts v. EPA*
  - Directed EPA to consider whether to make an endangerment finding on GHG emissions.
  - No need to delay for finding because California can regulate first, absent finding.
  - Even if finding necessary, EPA must make it no later than October 25.
    - No hurdle to finding, given overwhelming scientific evidence

Supplemental Questions from Notice

- Does it Matter that the Regulations Relate to Global Climate Change? **NO**
  - Same issue on California's need for its own vehicle emissions program
  - California has regulated pollutants first in the past
  - If anything *more* deference, not less, as a "laboratory for innovation."
  - Regulation of nonroad engines analogous – CARB sought and obtained waivers while EPA was initiating its own regulatory program

Supplemental Questions from Notice

- Does EPCA/CAFE affect CA authority? **NO**
  - Emission control and fuel efficiency have always overlapped
  - But NHTSA must take California and EPA standards as a given. 49 USC §32902(f)

Supplemental Questions from Notice

- Does EPCA/CAFE affect CA authority? **NO**
  - NHTSA commonly acknowledges emissions standards' impact:

> "The agency notes that compliance with increased emission requirements is most often achieved through more sophisticated combustion management. The improvements and refinement in engine controls to achieve this end generally improve fuel efficiency and have a positive impact on fuel economy."

68 FR 16868, 16896 (April 7, 2003) (stating effect of California's LEV II emission standards on proposed CAFE standards)

Supplemental Questions from Notice

- Does EPCA/CAFE affect CA authority? **NO**
  - Clean Air Act authorizes GHG regulation despite NHTSA's CAFE role:

"The two obligations may overlap, but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency."

*Massachusetts v. EPA, 529 U.S. _____ (*2007)[18]
slip. op. at p. 29

Supplemental Questions from Notice

- Does EPCA/CAFE affect CA authority? **NO**
  - Fuel economy and emissions control have always overlapped
  - Mass v. EPA decides the issue
  - But EPCA/CAFE compliance should help emission standard compliance

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Global Warming and California's Program to Address It

Global Warming And California's Program to Address It

- Global Warming is Happening <u>NOW</u>

Global Warming and California's Program to Address It

Global Warming is Happening NOW:

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level (see Figure SPM-3). {3.2, 4.2, 5.5}."

IPPC, Summary for Policymakers, Contribution of Working Group I to the Fourth Assessment Report, February, 2007

Lyell Glacier

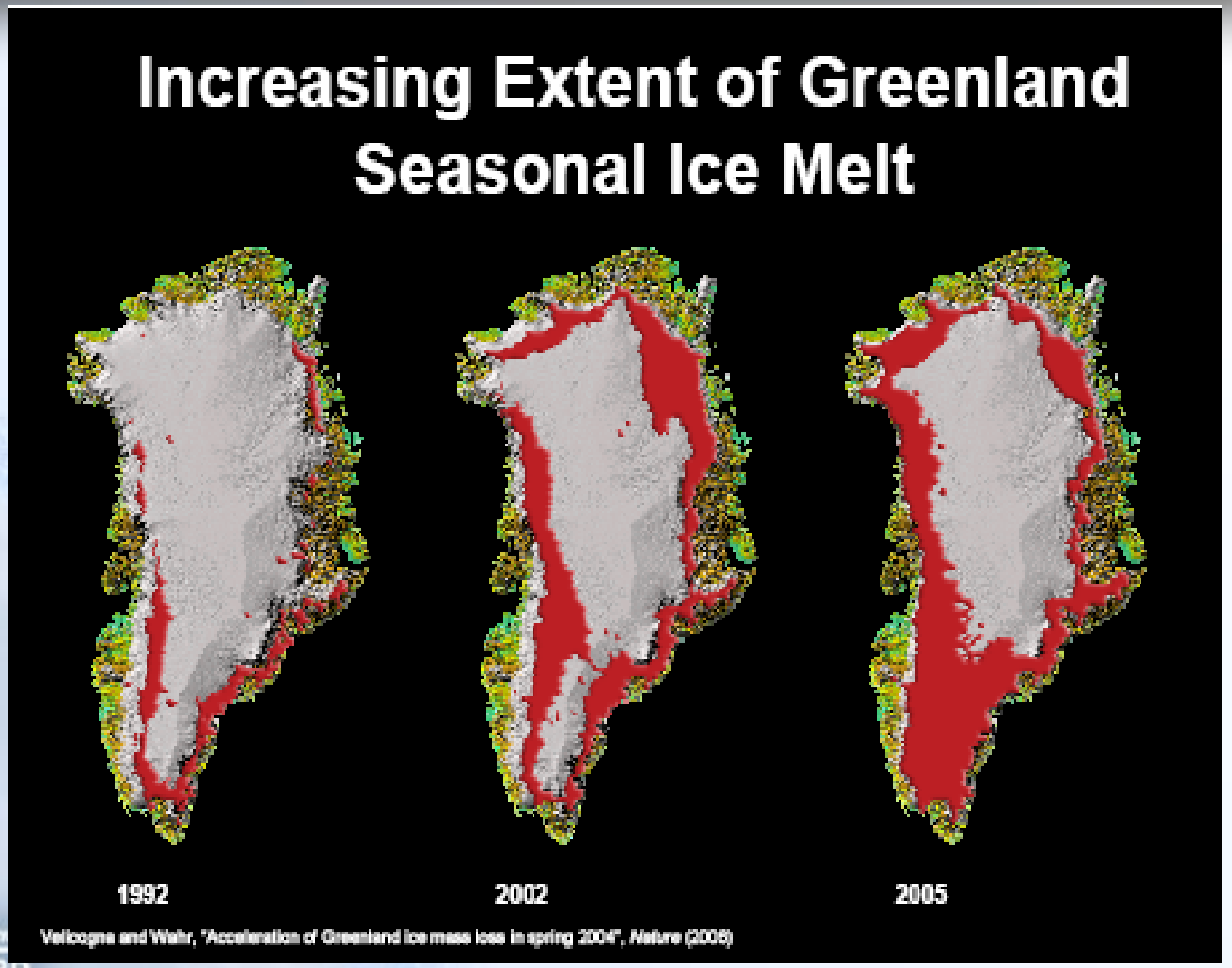
Yosemite National Park

1903

2003

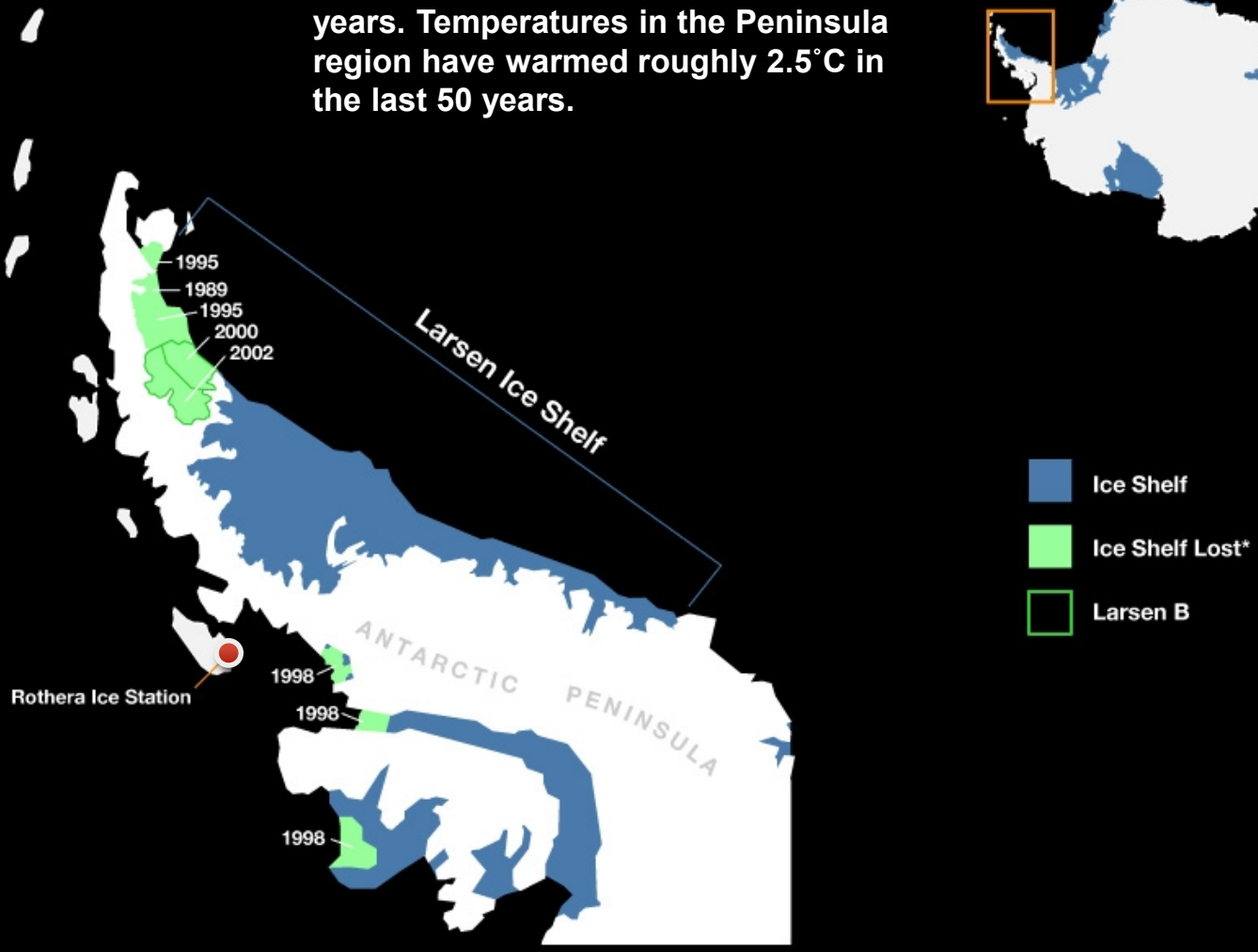
Global Warming and California's Program to Address It

Worldwide Impacts Beyond Question



Disappearing Ice Shelf

The Antarctic Peninsula has lost large chunks of its ice shelves in recent years. Temperatures in the Peninsula region have warmed roughly 2.5˚C in the last 50 years.



J. Kaiser, Science, 297; 2002

Kilimanjaro

2005

Global Warming and California's Program to Address It

- North American Impacts Projected
  - Water Impacts: "Warming in western mountains is projected to cause decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources. *** D [14.4, B14.2]"

IPPC, Summary for Policymakers, Working Group II Contribution to the Fourth Assessment Report, April, 2007

Global Warming and California's Program to Address It

- North American Impacts Projected (cont'd)
  - Fire & Pest Impacts: "Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned. *** N [14.4, B14.1]"

IPPC, Summary for Policymakers, Working Group II Contribution to the Fourth Assessment Report, April, 2007

Global Warming and California's Program to Address It

- North American Impacts Projected (cont'd)

  Heat Wave/Public Health Impacts: "Cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century, with potential for adverse health impacts. The growing number of the elderly population is most at risk. *** D [14.4]"

IPPC, Summary for Policymakers, Working Group II Contribution to the Fourth Assessment Report, April, 2007

Global Warming and California's Program to Address It

- North American Impacts Projected (cont'd)
  - Coastal Impacts : "Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Population growth and the rising value of infrastructure in coastal areas increase vulnerability to climate variability and future climate change, with losses projected to increase if the intensity of tropical storms increases. Current adaptation is uneven and readiness for increased exposure is low. *** N[14.4]" (Emphasis added.)

IPPC, Summary for Policymakers, Working Group II Contribution to the Fourth Assessment Report, April, 2007

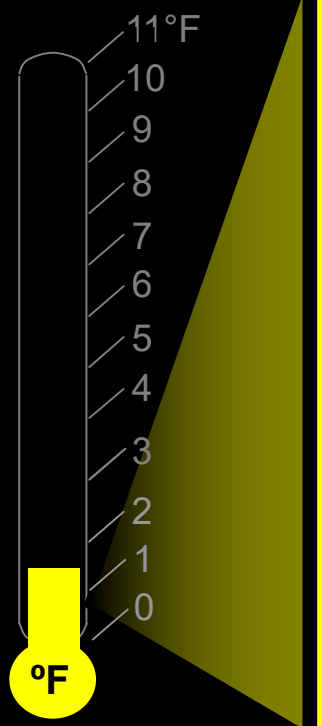
Global Warming and California's Program to Address It

- U.S. Impacts Acknowledged:
  - Heat waves are "very likely" to increase in frequency and severity
  - These changes in weather and climate are "likely" to affect air quality in several ways including higher concentrations of ground-level ozone.

U.S. Climate Action Report 2002, pp. 106-107.

California Climate Impacts

(over the past 100 years)



1.3 ºF higher temperatures

~7 inch sea level rise

12% decrease in fraction of runoff between April and July

Snowmelt and spring blooms advanced 2 days/decade since 1955

Cal/EPA-OEHHA, "Environmental Protection Indicators for California" (2002), *www.oehha.ca.gov/multimedia/epic/Epicreport.html*

Global Warming and California's Program to Address It

- Humankind is Substantial Cause of these Worldwide Impacts:

  "…clear evidence of human influences on the climate system…" and "The observed patterns of change over the past 50 years cannot be explained by natural processes alone, nor by the effects of short-lived atmospheric constituents (such as aerosols and tropospheric ozone) alone."

U.S. Climate Change Science Program, Synthesis and Assessment Product 1.1, April 2006

Global Warming and California's Program to Address It

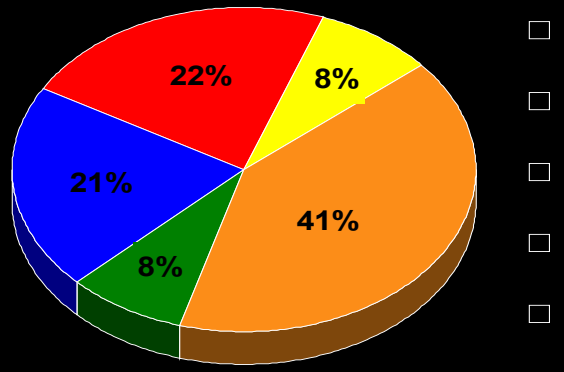
- Humankind is Substantial Cause of these Worldwide Impacts:

  "Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations12. … Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns (see Figure SPM-4 and Table SPM-1). {9.4,9.5}

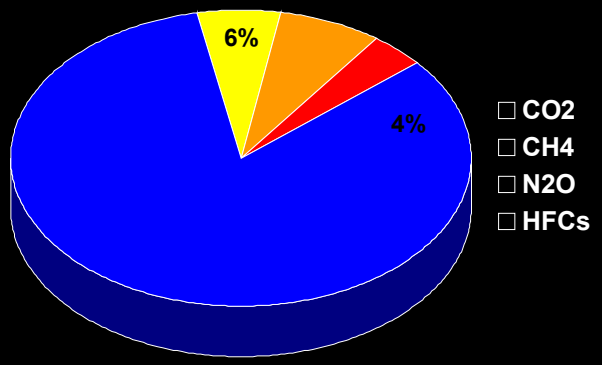
IPPC, Summary for Policymakers, Contribution of Working Group I to the Fourth Assessment Report, February, 2007

California Greenhouse Gas Emissions

GHG EMISSION SOURCES
[~500 MMT CO_2 eq]



GHG EMISSIONS BY TYPE



CO_2, N_2O | CO_2, CH_4, N_2O | CO_2 | CO_2 | HFCs

CEC, "Inventory of California Greenhouse Gas Emissions and Sinks: 1990-2004" (2006), www.climatechange.ca.gov/policies/greenhouse_gas_inventory/index.html

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California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

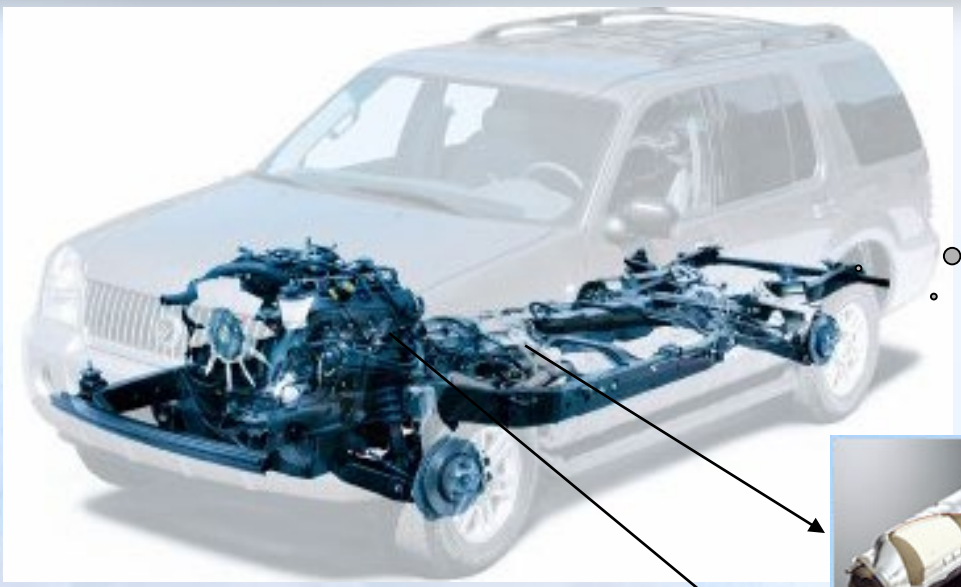
AB 1493 (Pavley) Regulations

- Statute requires ARB to set regulations achieving the

  "…maximum feasible and cost-effective reduction of greenhouse gas emissions…from…" "…noncommercial personal transportation."

Chap. 200, Stats. 2002

Vehicular GHG Sources



CO_2

Methane

Nitrous Oxide

Engine

Transmission

A/C compressor

HFCs

CO_2

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations

- What is feasible and cost-effective?
  - Capable of being accomplished (technological feasibility)
  - Economical to a vehicle's owner or operator

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations

- When can the regulations' requirements apply?
  - regulations effective 1/1/06
  - 2009 and later model year
  - allows early credits

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations– Pollutants Regulated

- Combined GHG emissions
  - (CO_2, CH_4, N_2O, HFCs)
- All vehicular GHG sources
  - (tailpipe, air conditioner)
- "CO_2-equivalent" emissions
  - (weighted according to "global warming potential")

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations

- Two categories (as in LEV II)
  - PC/LDT1
    - Passenger cars, small trucks and SUVs
  - LDT2/MDV
    - Large trucks and SUVs
- Exemption for work trucks

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations: Fleet-Average Emission Standards

Tier	Year	CO_2-equivalent emission standards (g/mi)	
		PC/LDT1	LDT2
Near-term	2009	323	439
	2010	301	420
	2011	267	390
	2012	233	361
Mid-term	2013	227	355
	2014	222	350
	2015	213	341
	2016	205	332

~22% reduction in 2012

~30% reduction in 2016

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Overview

AB 1493 Regulations

- Flexibility
  - Credit Trading between PC/LDT1 and LDT2/MDV and between manufacturers
  - Optional Compliance Mechanism for Alternatively Fueled Vehicles
  - Early Credits
  - Less stringent requirements for small & intermediate volume manufacturers

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

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California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

- Protectiveness
  - California's motor vehicle program as a whole remains as protective as the federal EPA program
    - Trade-offs between emissions are permissible so long as "the entire set of [California] standards are at least as protective of the public health and welfare as the Federal standards." (H.R. Rep. No. 95-294 at 301-302 (1977), reprinted at 1977 U.S.C.C.A.N. 1077).

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

- Protectiveness
  - California's motor vehicle program as a whole remains as protective as the federal EPA program
    - ZEV regulations, 78 FR 78190 at 78191-92 (December 28, 2006) (finding program with ZEV amendments through 2011 as protective as federal program).

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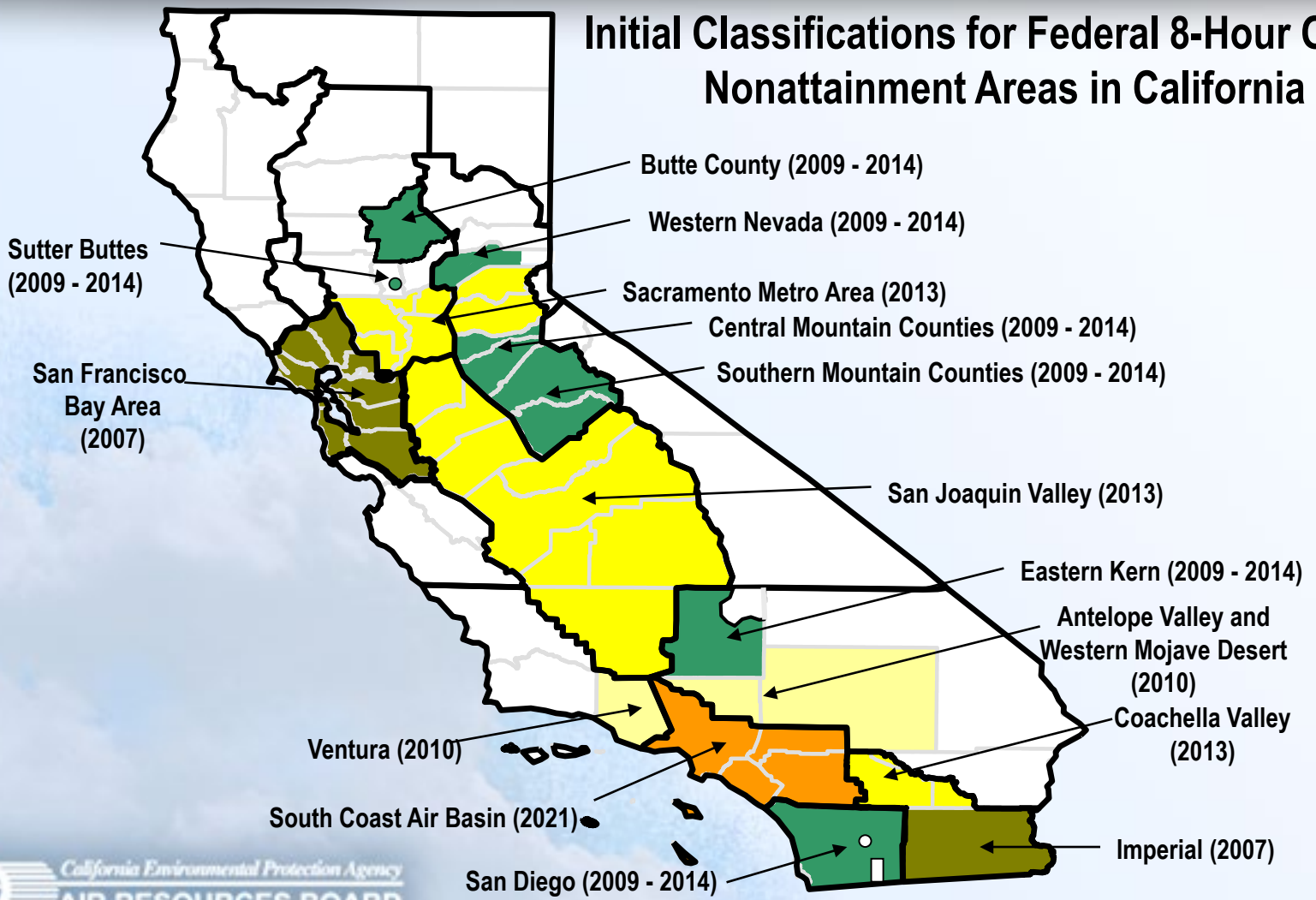
Extraordinary & Compelling Conditions

- EPA decisions confirm limited test – CA's need for *program*, not for each individual standard:

  "CARB has continually demonstrated the existence of compelling and extraordinary conditions *justifying the need for its own motor vehicle pollution control program,* which includes the subject 2007 California Heavy Duty Diesel Engine Standards." (*Emphasis* added.) 70 FR 50322 at 50323 (August 26, 2005)

  – *Accord*, LEV II Waiver Decision, 68 FR 19811 at 19812 (April 22, 2003), and ZEV Amendments Waiver Decision, 71 FR 78190 at 78192, (December 28, 2006)

Extraordinary & Compelling Conditions

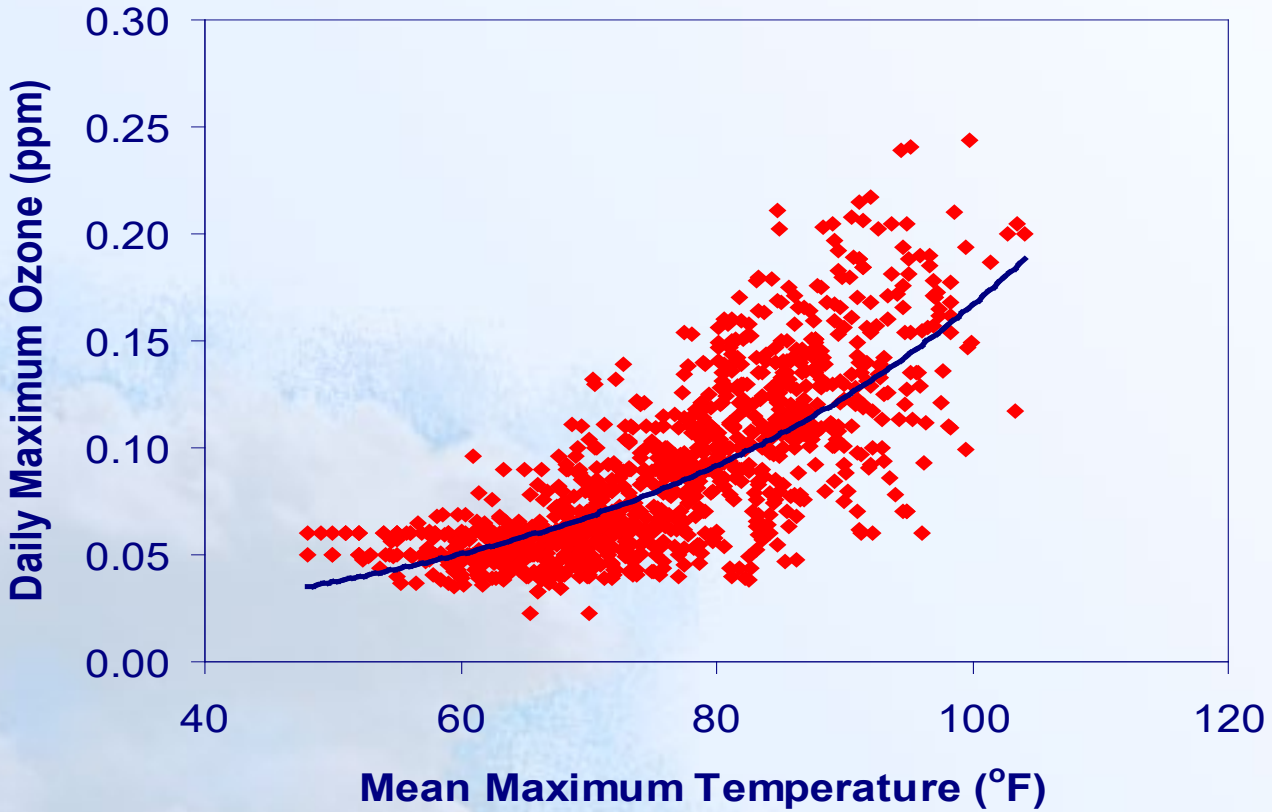


Extraordinary & Compelling Conditions

- Even if EPA improperly applies the test solely to greenhouse gas emissions and global warming impacts, California's conditions met

Extraordinary & Compelling Conditions

Hotter Days Lead to More Smog



South Coast Air Basin

Ozone Levels

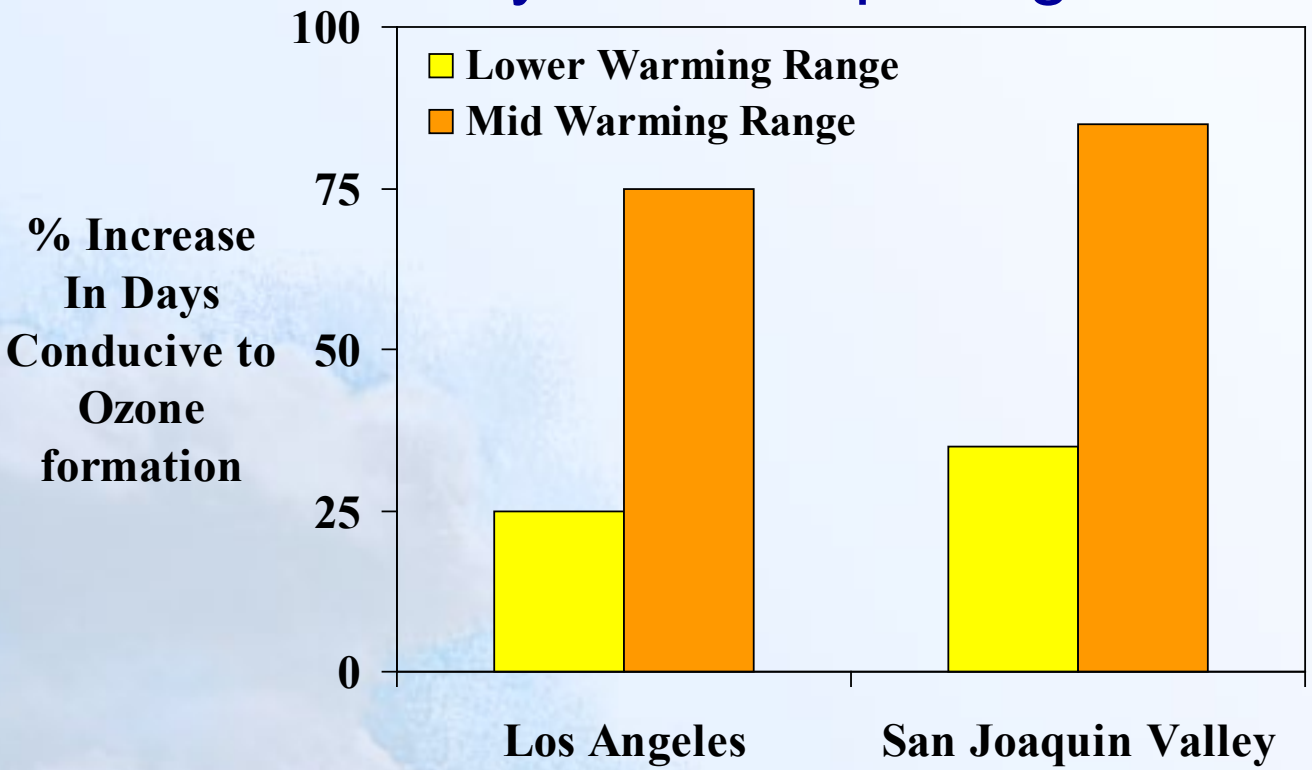
(1996-1999)

California Environmental Protection Agency
AIR RESOURCES BOARD

Our Changing Climate: Assessing the Risks to California (2006), www.climatechange.ca.gov. Source: Air Resources Board, 2000

Extraordinary & Compelling Conditions

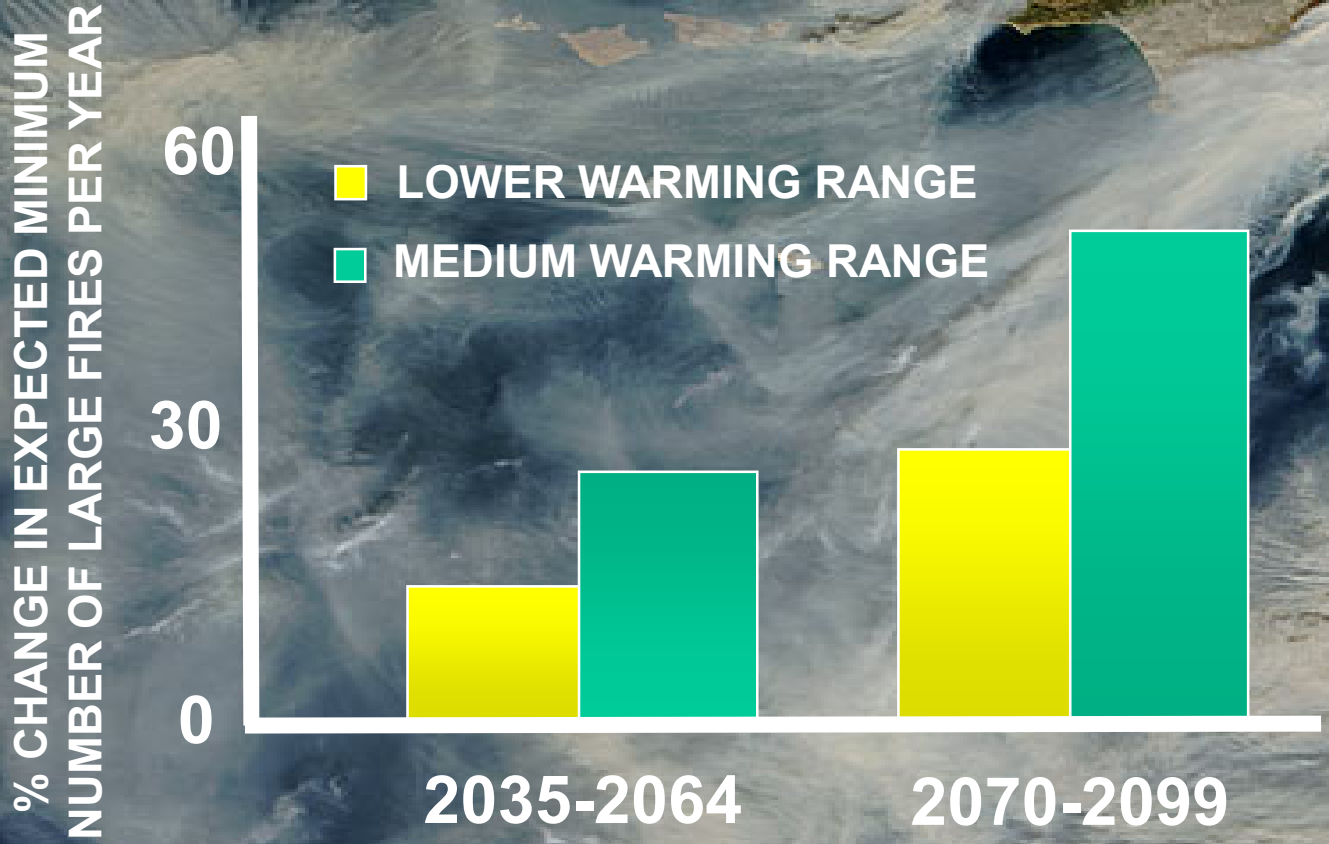
More Smog Likely: Section 209(b) clearly covers this extraordinary and compelling condition



Our Changing Climate: Assessing the Risks to California (2006), *www.climatechange.ca.gov*

Data from GFDL B1 and A2 runs. SOURCE: Kleeman et al. 2006

Increase in Wildfires



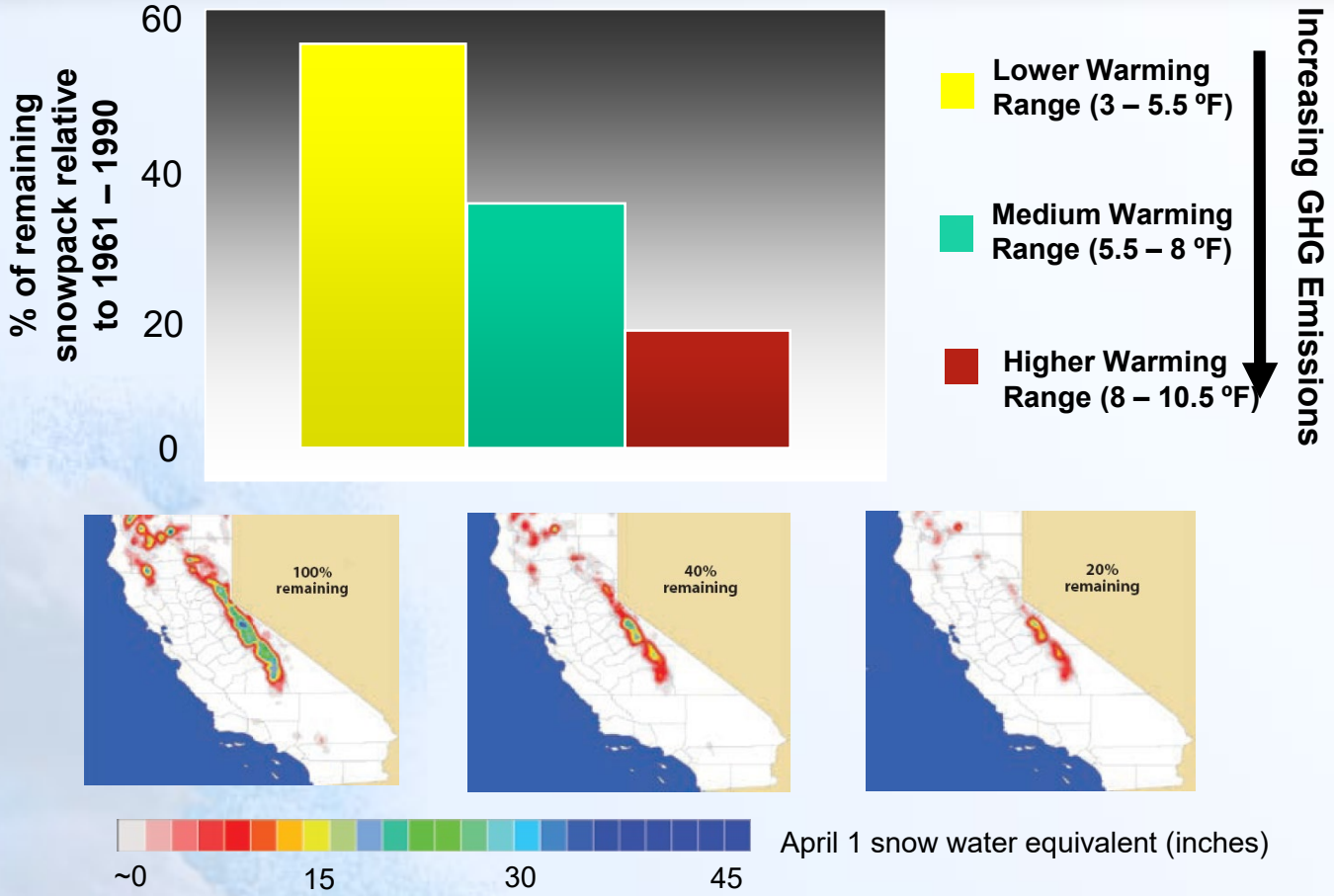
Source of data : Westerling and Bryant, "Climate change and wildfire in and around California: Fire modeling and loss modeling" (2006), *www.climatechange.ca.gov*

Extraordinary & Compelling Conditions

- Additional California Impacts
  - Snow pack
  - Sea level rise
  - Agricultural (wine, dairy)
  - Tourism
- Expert Reports

Extraordinary & Compelling Conditions

Decrease in Sierra Nevada Snowpack

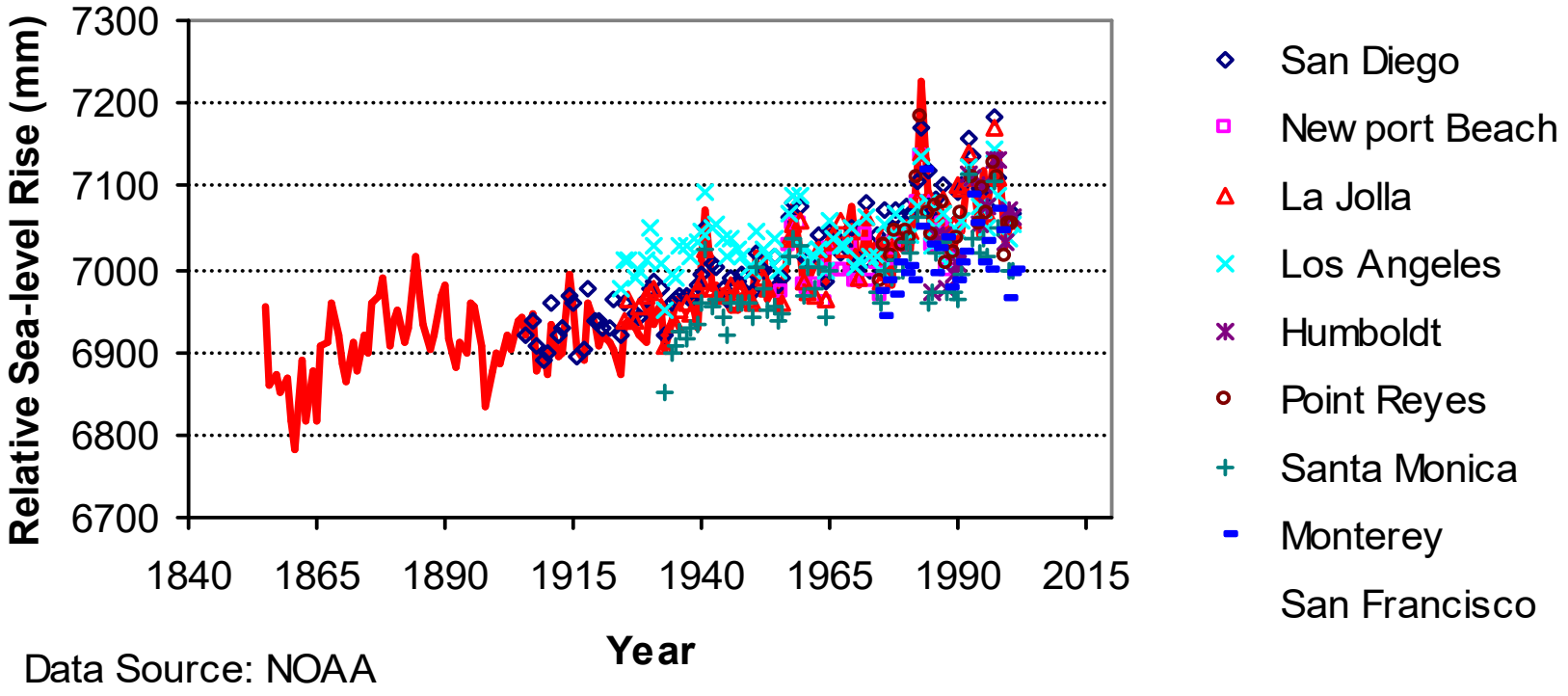


Our Changing Climate: Assessing the Risks to California (2006), *www.climatechange.ca.gov*

California Environmental Protection Agency AIR RESOURCES BOARD

Extraordinary & Compelling Conditions

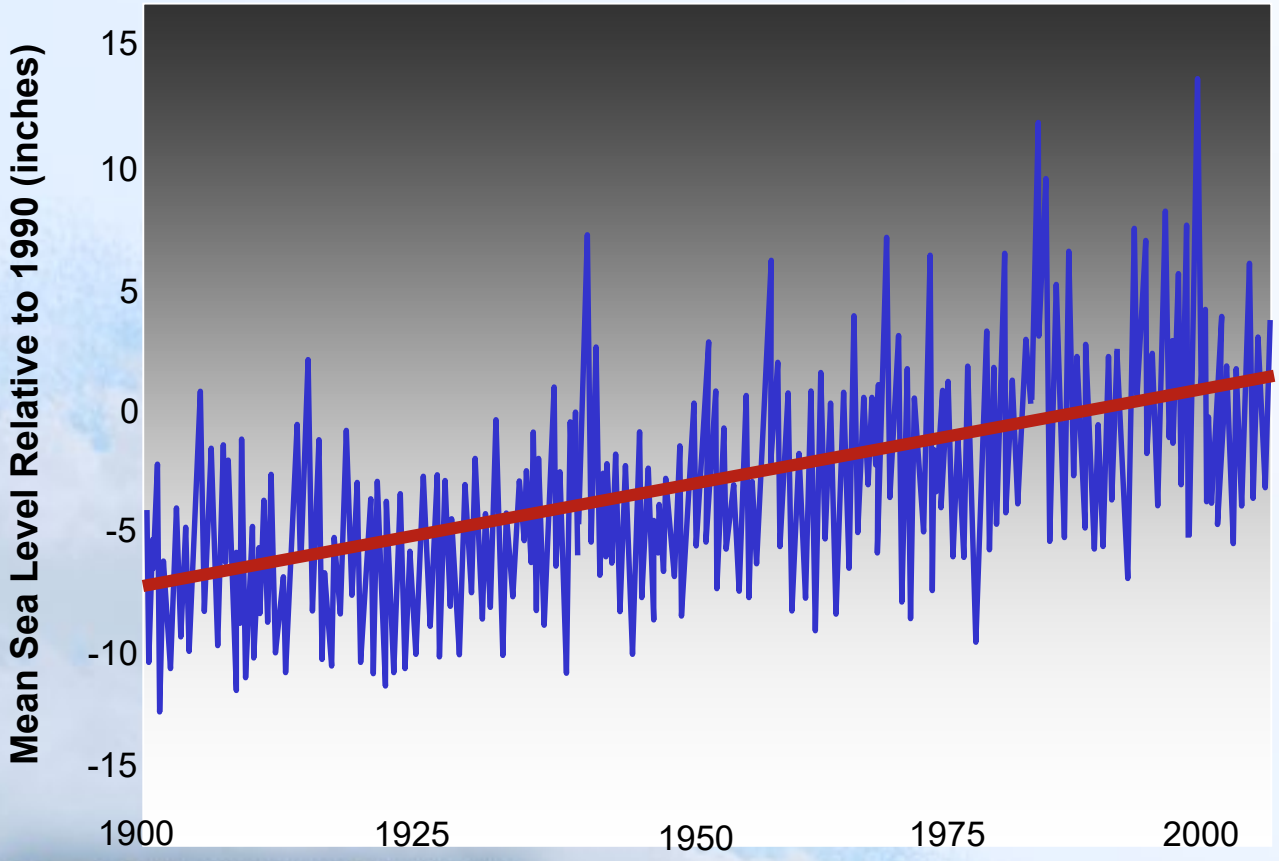
- Current CA Impacts – Sea Level Rise



Data Source: NOAA

Extraordinary & Compelling Conditions

Current CA Impacts: Rising Sea Levels in the San Francisco Bay



2/3rds of California and millions of acres of farm land rely on water from the Delta.

The Delta supports more than $500 million in crop production.

Salt water intrusion could threaten groundwater supplies and crops.

Source of data ; Cayan et al., "Projecting future sea level" (2006), *www.climatechange.ca.gov*

Extraordinary & Compelling Conditions

- Impacts in the San Francisco Bay

  -- Some areas will be permanently inundated without coastal armoring

  -- Sea level rise will accelerate coastal erosion

  -- Although levees have been built to contain 100-year flood events, a 12-inch increase in sea levels would mean that these events would likely occur once every 10 years

Extraordinary & Compelling Conditions

- California Climate Impact Scientists:
  - Dr. Timothy Barnett (Scripps): Detection and Attribution (General)
  - Dr. Reinhard Flick (Scripps): Sea Level Rise/Beach Impacts
  - Dr. James Hansen (Personal Opinion): avoiding large climate change
  - Dr. Laurence Kalkstein (U of DE): Heat-Related Mortality Impacts
  - Dr. David Karoly (U of OK): Detection and Attribution (California)
  - Dr. Michael Kleeman (UC-Davis): Ozone Impacts
  - Dr. Edwin Maurer (Santa Clara Univ.): Water Storage and User Impacts
  - Dr. Iris Stewart-Frey (Santa Clara Univ.): Early Snowmelt
  - Dr. Anthony Westerling (Scripps): Wildfire Impacts
  - Dr. Philip Williams (& Associates) : San Francisco Bay-Delta Impacts

Extraordinary & Compelling Conditions: Conclusion

- There is no question that greenhouse gas emission reductions from the subject regulations are essential to address these and other conditions in California

- *Massachusetts v. EPA* confirms need for incremental progress

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Technological Feasibility: Lead Time Revisited

- Lead Time and Cost: 3-step test
  - Have theoretical objections been answered?
  - Have the major steps needed to refine the technologies been identified?
  - Have plausible reasons been offered for believing steps can be completed in time?

Natural Resources Defense Council v. U.S. EPA,
655 F.2d 318 (D.C. Cir. 1981)

Technological Feasibility: Lead Time Revisted

- Lead Time and Cost – *International Harvester* Basic Market Demand Test:

  "We are inclined to agree with the Administrator that as long as feasible technology permits the demand for new passenger automobiles to be generally met, the basic requirements of the Act would be satisfied, even if this might occasion fewer models and a more limited choice of engine types."

  International Harvester Co. v. Ruckleshaus, 478 F.2d 615 (D.C. Cir. 1973)

Lead Time Revisited

- Lead Time and Cost: *International Harvester* Basic Market Demand Test invoked by EPA in past waiver proceedings:
  - 43 F.R. 25729 (June 14, 1978) - fewer (or no) diesel-powered passenger car models as a result of 1980 MY passenger car standards
  - 49 F.R. 18887 (May 3, 1984) - 1986 passenger car standards triggered need for trap oxidizers on diesels
  - 41 F.R. 44209 (Oct. 7, 1976) - California standards could result in elimination of two stroke motorcycles

Technical Feasibility: Overview

- General Approach
- Technologies evaluated
- Technologies selected
- Cost
- Industry criticism

Technological Feasibility: General Approach

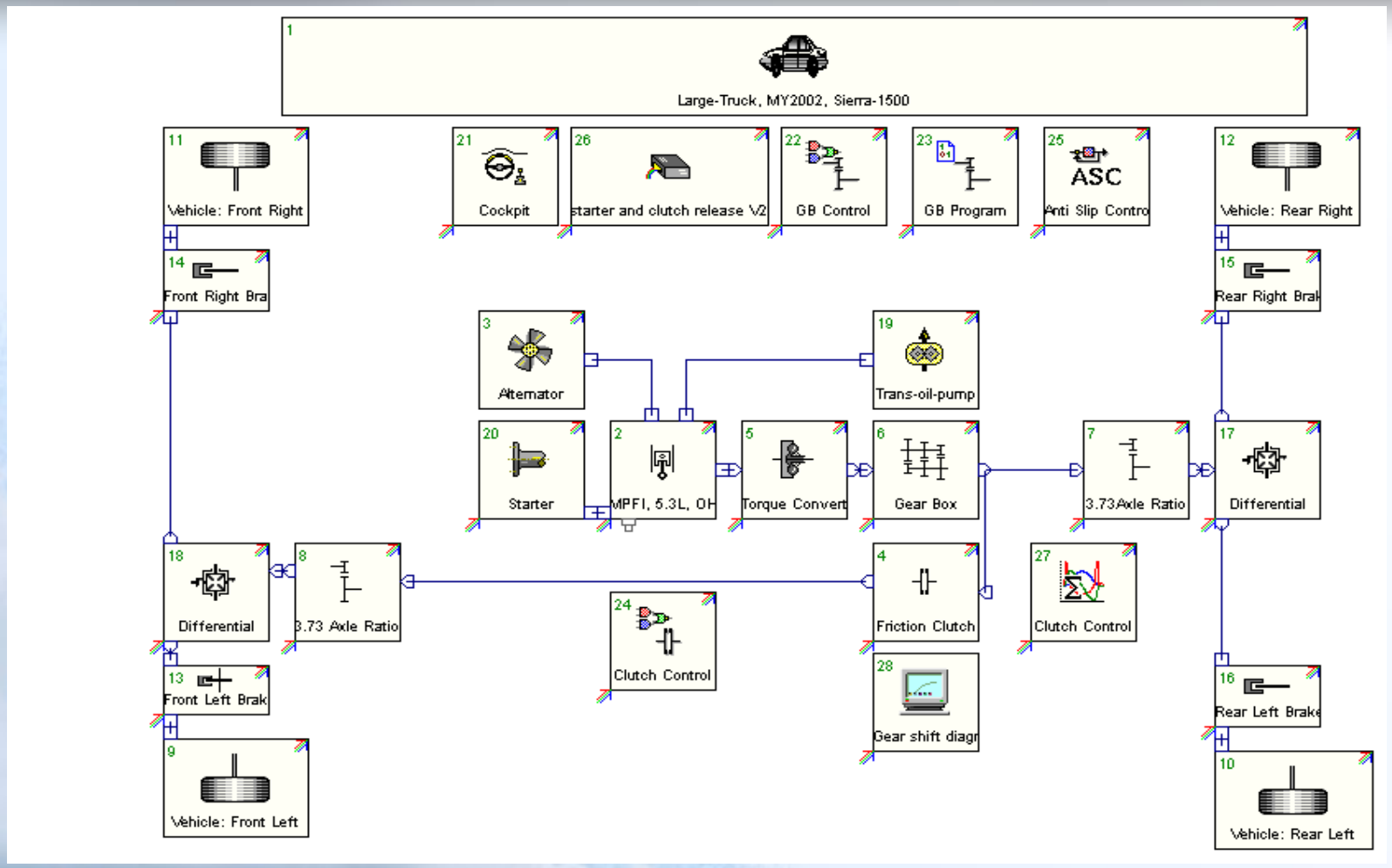
- Awareness of available and emerging technologies
  - NAS report 2002
  - ARB technology symposium 2003
- Comprehensive technical study sponsored by NESCCAF
  - AVL engine/vehicle modeling of GHG emissions
  - Meszler Engineering for air conditioning technology
  - Martec for hardware costs
  - EPA review concluded "EPA selected the NAS and NESCCAF studies because we believe they are the most credible peer-reviewed analyses in the literature…" and are "…the most authoritative on the subject."

    Interim Report: New Powertrain Technologies and Their Projected Costs, EPA420-R-05-012, October 2005

Technological Feasibility: Vehicle Computer Simulation

- Necessary to model complete systems:
  $1 + 1 \neq 2$
  - Synergies
  - Avoids double counting
- Vehicle Performance
  - Better than 2002 model vehicles
  - Held constant at 2009 levels

Technological Feasibility: AVL "Cruise" Model

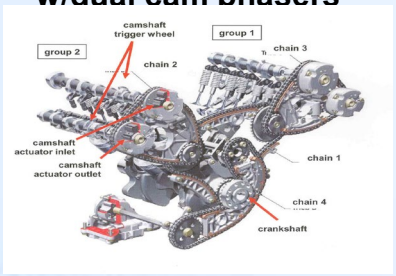


Technological Feasibility: Technology Selection

- Determined benefit of 37 individual components
- Combined into 79 technology packages for modeling
  - 5 vehicle classes
  - Small car, large car, minivan, small truck/SUV, and large truck/SUV
- Technology packages designated as near- or mid-term
  - Near-term: available 2009-2012
  - Mid-term: available 2013-2016

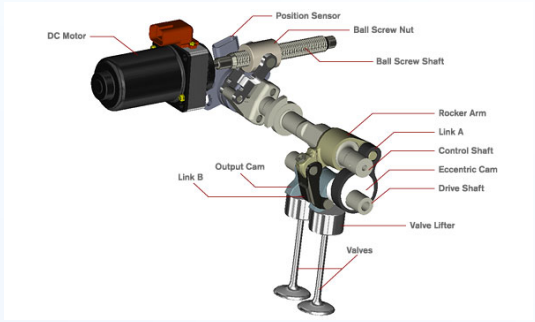
Technological Feasibility (near-term)

Gasoline Direct Injection w/dual cam phasers



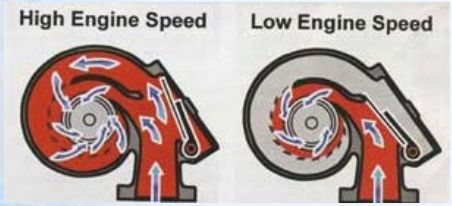
VW

VW Jetta



Nissan continuously variable valve timing & Lift (VVEL)

2007 Acura RDX



Honda Variable Flow Turbocharger

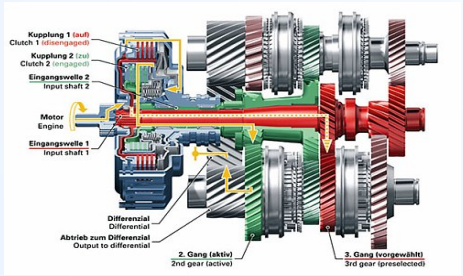
Nissan G37

Technological Feasibility (near-term)

Cylinder Deactivation

Chrysler 300C Hemi

VW Jetta



Automated Manual Transmission

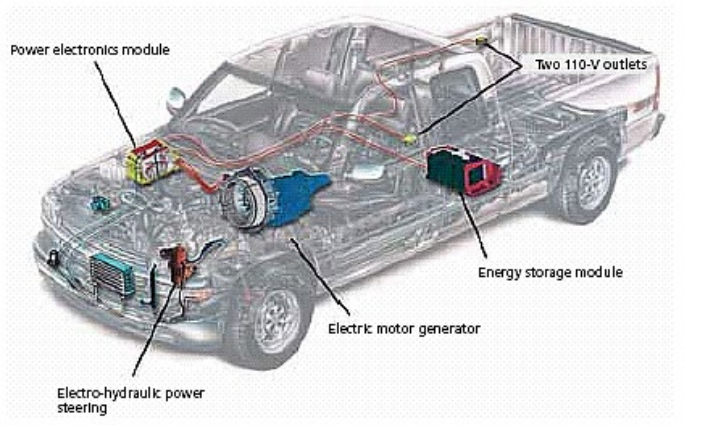
Technological Feasibility: Components and Systems

Technology	Manufacturers using or have announced plans to use technology
Gasoline Direct Injection (GDI)	GM, Ford, DC, Toyota, BMW, Nissan
GDI & Turbocharging	GM, Ford, VW, BMW, Mazda, Nissan
Valve Control	All
6-speed automatic & automated manual, CVT	GM, Ford, DC, VW, Toyota, Nissan, Mazda
Electric Power Steering, Electrohydraulic Power Steering	GM, Honda, Toyota
Cylinder Deactivation	GM, DC, Honda

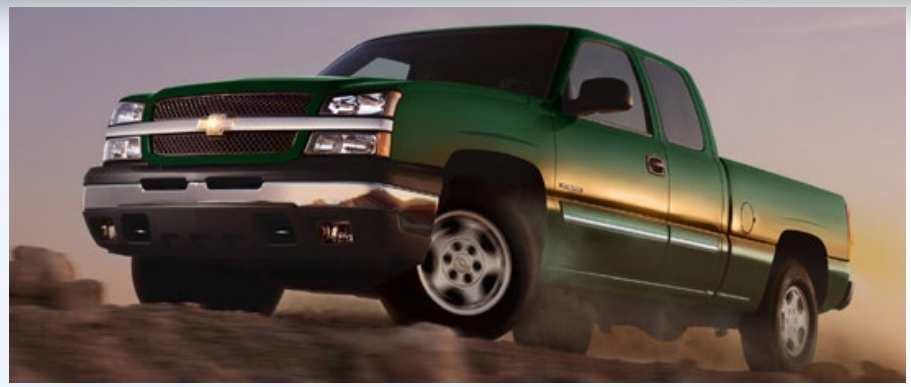
Technological Feasibility (Near-Term)

Category	Vehicle Class	Technology Package	% GHG Reduction
PC/LDT1	Small Car	DVVL, DCP, AMT, EPS, ImpAlt	19.9
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	26.4
	Large Car	GDI-S, DeAct, DCP, AMT, EPS, ImpAlt	23.2
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	27.2
LDT2	Small Truck	DeAct, DVVL, CCP, AMT, EPS, ImpAlt	26.2
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	28.4
	Large Truck	DeAct, DVVL, CCP, AMT, EHPS, ImpAlt	18.4
		DeAct, DVVL, CCP, AMT, EHPS, ImpAlt	22.6

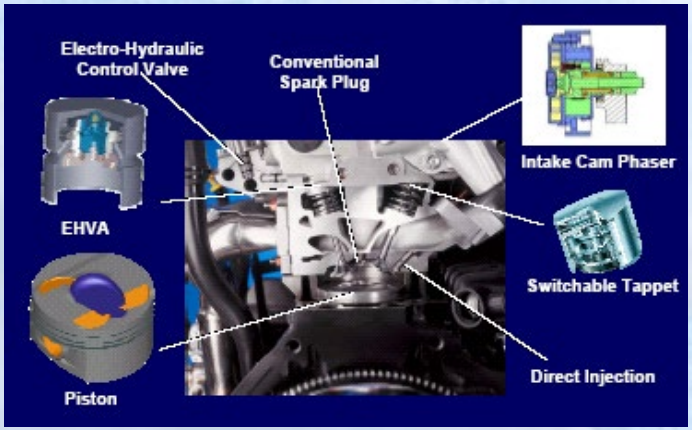
Technological Feasibility (Mid-term)



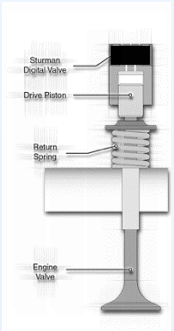
Integrated Starter/Generator



2006 Chevrolet Silverado



AVL Homogeneous Charge Compression Ignition



Sturman camless valve actuation

California certified 2007 MB Bluetec

Technological Feasibility (Mid-term)

- Announced plans for mid-term technologies: HCCI
  - *Designing an HCCI (homogeneous charge compression ignition) gasoline engine to work over a wide rpm and load range has been an enormous engineering challenge, but **General Motors** believes it finally knows how, and will introduce a demonstration vehicle next year (2008).”*
  - ***Ford** is also developing HCCI and says it could meet production in as little as five years.*
  - ***Nissan**: “Introducing gasoline engine comparable to current diesel engines (CO2 approx. -20%) for further reduction of CO2 from FY2010, global”*

Sources: Automotive Engineering International, February 2007
http://www.nissan-global.com/EN/NEWS/2006/_STORY/061211-01-e.html

Technological Feasibility (Mid-term)

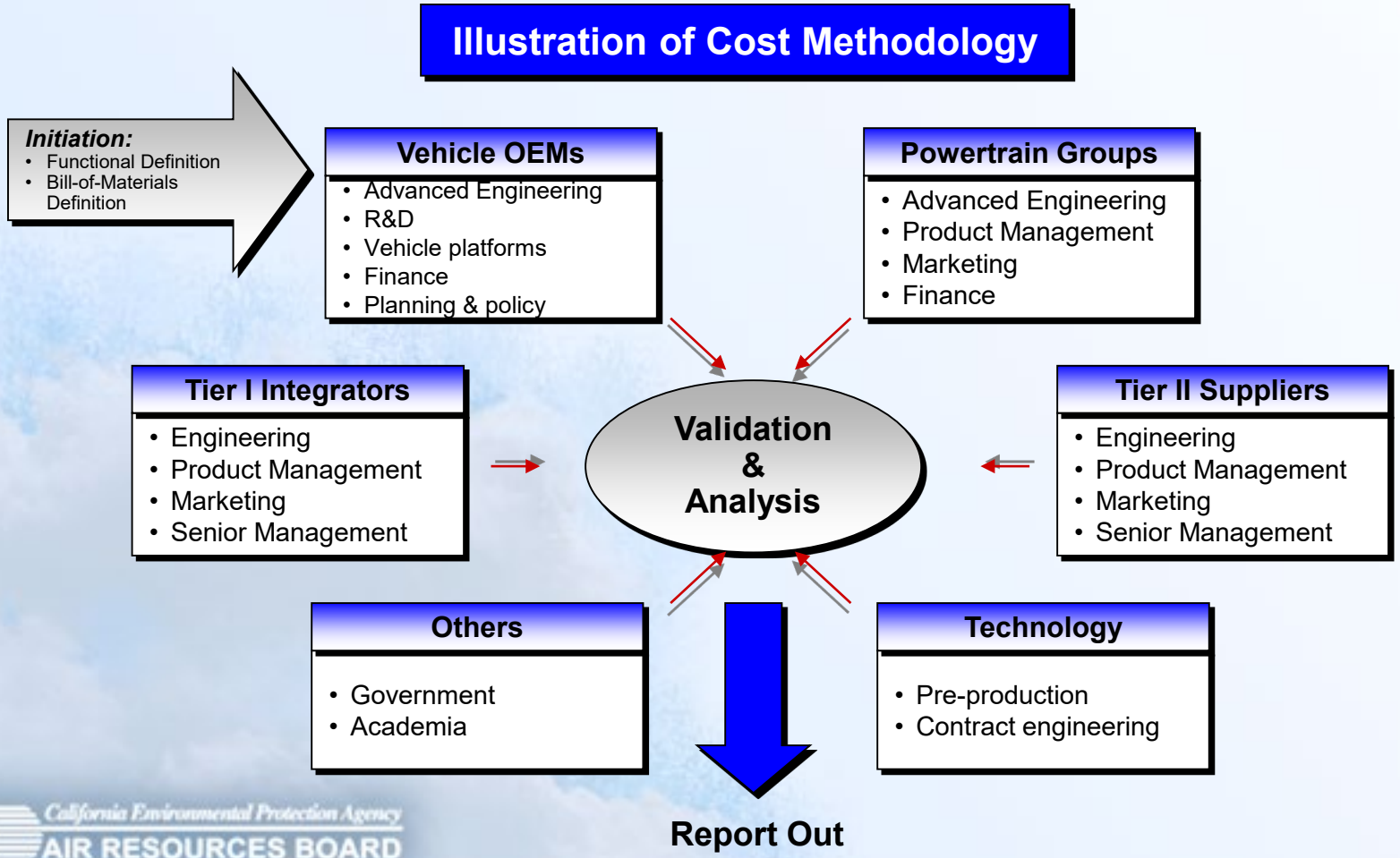
- More announced plans for mid-term technologies:
  - *"We will have an engine (camless) on the market by 2010 or 2011", says Martin Haub, **Valeo** board member for r&d. … "working with several global automakers" on camless engines.*
  - *Multiple announcements of diesel introduction (50state) by 2009/10. (**BMW, DC, VW, Nissan, Honda**)*

Sources: Autoweek, December 18, 2006

Technological Feasibility (Mid-Term)

Category	Vehicle Class	Technology Package	% GHG Reduction
PC/LDT1	Small Car	CVVL, DCP, AMT, ISG-SS, EPS, ImpAlt	25.7
		gHCCI, DVVL, AMT, ISG, EPS, eACC	29.9
	Large Car	ehCVA, GDI-S, AMT, EPS, ImpAlt	29.9
		gHCCI, DVVL, ICP, ISG, AMT, EPS, eACC	32.9
		GDI-S, Turbo, DCP, A6, ISG, EPS, eACC	35.1
LDT2	Small Truck	DeAct, DVVL, CCP, A6, ISG, EPS, eACC	29.0
		ehCVA, GDI-S, AMT, EPS, ImpAlt	30.5
		HSDI, AMT, EPS, ImpAlt	31.0
	Large Truck	ehCVA, GDI-S, AMT, EHPS, ImpAlt	25.5
		DeAct, DVVL, CCP, A6, ISG, EHPS, eACC	26.2

Technological Feasibility: Martec Cost Methodology



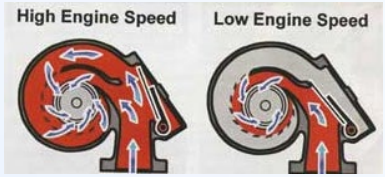
Retail Cost Methodology

- Used Martec estimated cost to manufacturer
  - Consistent with industry experts
- Adjusted several technologies for learning
  - Technical innovation typical for emerging technologies
- Mark-up to retail: 1.4
  - Used by many governments

Technological Feasibility: Cost

- Technical innovation typical for emerging technologies
  - **Honda** variable flow turbo
    - Variable-flow turbos aren't new, but Acura says its patented design, in which the exhaust gases are regulated before they enter the turbocharger rather than within, significantly improves long-term durability."

Variable geometry turbocharger



Honda variable flow turbocharger

  - **Nissan** VVEL
    - Nissan claims that, compared with BMW's Valvetronic, VVEL is 32 percent quicker to respond, 20 percent smaller, and uses 52 percent fewer parts per cylinder.

Cost of Compliance (Near-Term)

Category	Vehicle Class	Technology Package	Retail Price Equivalent (2009)
PC/LDT1	Small Car	DVVL, DCP, AMT, EPS, ImpAlt	$38
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	$812
	Large Car	GDI-S, DeAct, DCP, AMT, EPS, ImpAlt	$504
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	-$57
LDT2	Small Truck	DeAct, DVVL, CCP, AMT, EPS, ImpAlt	$245
		GDI-S, DCP, Turbo, AMT, EPS, ImpAlt	-$77
	Large Truck	DeAct, DVVL, CCP,A6, EPS, ImpAlt	$663
		DeAct, DVVL, CCP, AMT, EPS, ImpAlt	$551

Cost of Compliance (Mid-Term)

Category	Vehicle Class	Technology Package	Retail Price Equivalent (2009)
PC/LDT1	Small Car	CVVL, DCP, AMT, ISG-SS, EPS, ImpAlt	$714
		gHCCI, DVVL, AMT, ISG, EPS, eACC	$1459
	Large Car	ehCVA, GDI-S, AMT, EPS, ImpAlt	$762
		gHCCI, DVVL, ICP, ISG, AMT, EPS, eACC	$1575
		GDI-S, Turbo, DCP, A6, ISG, EPS, eACC	$1149
LDT2	Small Truck	DeAct, DVVL, CCP, A6, ISG, EPS, eACC	$1471
		ehCVA, GDI-S, AMT, EPS, ImpAlt	$742
		HSDI, AMT, EPS, ImpAlt	$1141
	Large Truck	ehCVA, GDI-S, AMT, EHPS, ImpAlt	$1583
		DeAct, DVVL, CCP, A6, ISG, EHPS, eACC	$1760

Technological Feasibility: Summary of Industry Criticism

- Engine/vehicle modeling flawed
  - Performance not held constant
    - Launch
    - Gradeability
    - 50-70 passing times
  - Premium vs regular fuel
- Cost too low
- Lead time too short
- Safety

Technological Feasibility: Launch Quality

- Industry issue: Modeled launch times slower
- Response: Solutions available w/ minor impact on CO_2 emissions
  - 6-speed automatic with torque converter instead of AMT
  - Lower first gear in transmission
  - Choose alternative packages

Technological Feasibility: Gradeability and Passing Times

- Industry issue: Modeling shows…
  - gradeability poorer
  - 50-70 mph passing times greater
- Response: Removing modeling constraint results in equal or better performance
  - AVL modeling locked transmission in top gear
  - Data show w/ downshifting allowed chosen technology packages have equal or better gradeability, and
  - Equal or better 50-70 passing times, too

Technological Feasibility: Premium Fuel

- Industry issue: Modeling assumes premium fuel
  - Industry questions GHG benefits of one principal technology package: Downsized GDI turbo
  - Industry expert says:
    - "….*there is no fuel economy benefit associated with engine downsizing through the use of turbocharging unless higher octane fuel is used*."
- Response:
  - AVL expert says: "…*GDI stoichiometric turbocharged simulation results would be representative of operation on 91 RON (regular) fuel*."

Sources: Sierra Report No. SR2004-09-04
AVL communication 10/6/2004

Technological Feasibility: Cost - Retail Price Equivalent

- Industry issue: Costs should be marked up 2X+
- Response:
  - ARB uses 1.4 factor
  - Consistent with LEV II, ANL and other agencies
  - USEPA used 1.26 for Tier 2
  - National Academy of Sciences used 1.4 for similar technologies
  - European Union used 1.44 for CO_2 abatement technologies

Technological Feasibility: Lead Time

- Industry issue: 12 year lead time needed
- Response:
  - Most technologies available now – beyond R&D
  - Product cycles far shorter than 12 years
  - Regular scheduled model updates include provisions for adding new technologies
  - Industry recognizes this.
    - GM 2006 Annual Report: *"We have a global structure with single-point leaders in product development." "The benefits of this approach include crisper product execution, shorter life cycles, better quality, lower costs.."*

Technological Feasibility: Safety -- Downsizing

- Industry issue: Safety concerns because of downsizing
- Response:
  - Weight reduction and downsizing – not included in technologies selected – not required
  - Significant weight reduction unlikely - too expensive
  - Honda/DRI studies show vehicle design more critical to safety than weight
  - Several small cars recently introduced with 4 and 5 star crash ratings

Van Auken, R.M., and J.W. Zellner. *A Further Assessment of the Effects of Vehicle Weight and Size Parameters on Fatality Risk in Model Year 1985-98 Passenger Cars and 1985-97 Light Trucks* (DRI-TR-03-01) Torrance: Dynamic Research, Inc., Jan. 2003.
Auken, R.M. and J.W. Zellner, Supplemental Results on the Independent Effects of Curb Weight, Wheelbase and Track on Fatality Risk in 1985-1998 Year Passenger Cars and 1985-1997 Model Year LTVs, May 20, 2005, at viii (finding that overall results "indicate that weight reduction tends to decrease fatalities, and that wheelbase and track reduction tends to increase fatalities)

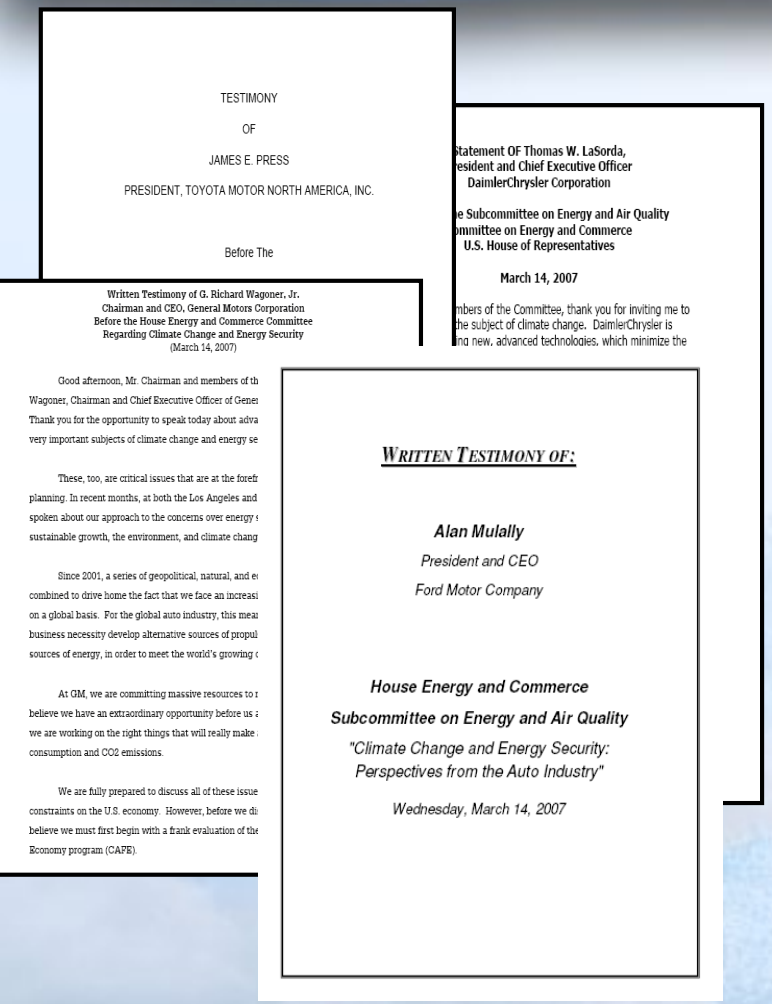
Technological Feasibility: Safety – Rebound Effect

- Industry issue: More driving results in more accidents
- Response:
  - Peer reviewed study found rebound effect in California small <3%.
  - Results in a 0.5% increase in VMT
  - Rising fuel prices likely to minimize effect further

Technological Feasibility: Safety – Fleet Turnover

- Industry issue: Higher costs of new vehicles will age the fleet, resulting in more older cars in operation.
- Response:
  - Peer reviewed consumer choice model reviewed
  - Fleet ages 33 days
  - Impact on smog emissions insignificant

Manufacturers' Public Statements



TESTIMONY

OF

JAMES E. PRESS

PRESIDENT, TOYOTA MOTOR NORTH AMERICA, INC.

Before The

Statement OF Thomas W. LaSorda,
esident and Chief Executive Officer
DaimlerChrysler Corporation

e Subcommittee on Energy and Air Quality
mmittee on Energy and Commerce
U.S. House of Representatives

March 14, 2007

Written Testimony of G. Richard Wagoner, Jr.
Chairman and CEO, General Motors Corporation
Before the House Energy and Commerce Committee
Regarding Climate Change and Energy Security
(March 14, 2007)

WRITTEN TESTIMONY OF:

Alan Mulally

President and CEO

Ford Motor Company

House Energy and Commerce

Subcommittee on Energy and Air Quality

"Climate Change and Energy Security:
Perspectives from the Auto Industry"

Wednesday, March 14, 2007

Manufacturers Know World is Changing:

- "Every day, our engineers are working to reduce greenhouse gases and petroleum consumption. We absolutely will be part of the solution and we will accelerate our efforts."

  DaimlerChrysler's Tom LaSorda

- "Toyota is committed to continued action to address climate change and promote greater energy diversity….I believe the time is right to enlist the immense talent and might of the auto industry to help solve some of the key issues of our time. As an industry we have an obligation to be part of the solution not the problem. "

  Toyota's James Press

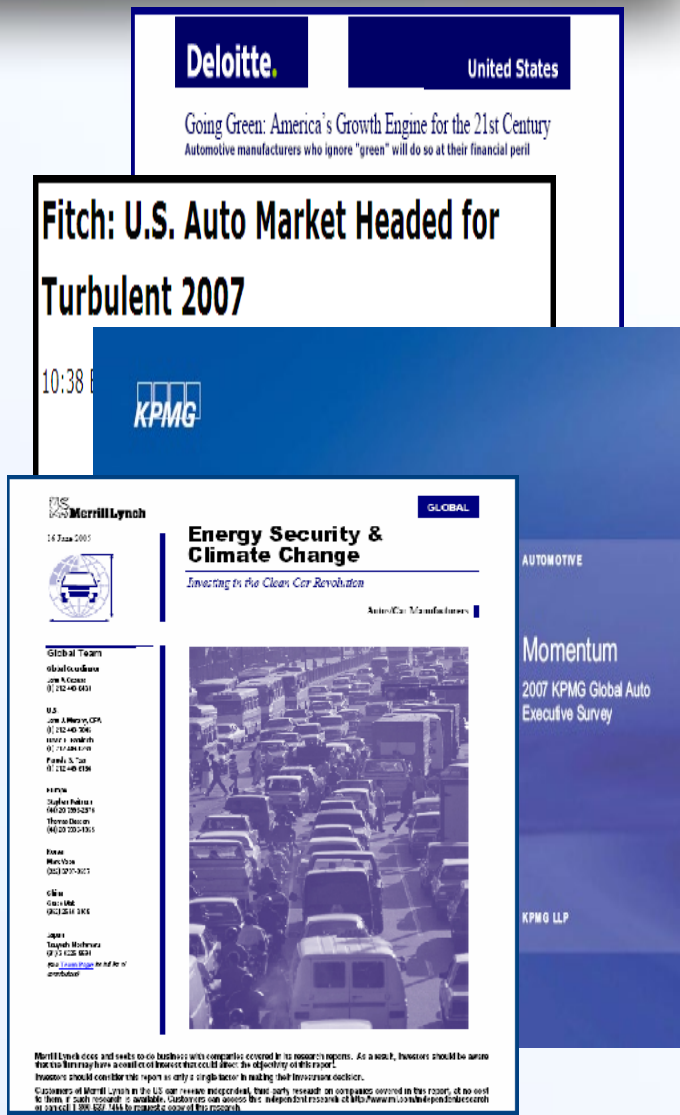
§202(a) Consistency: Technological Feasibility

- "As a hedge against potential scenario drivers, such as global warming or vanishing supplies of petroleum, companies that demonstrate the ability to add value through sustainability and contraction will be best suited for permanence."
  Deloitte, "Going Green:…" 1/11/07

- "Outside of pickups, Ford, GM and Chrysler will continue to suffer from product mix imbalances as they remain overexposed to the mid-size and large SUV markets. Demand in these segments continues to decline, …."
  Fitch: "U.S. Auto Market Headed for Turbulent 2007," 12/6/06

- "(In fact, four of five [auto] executives interviewed think fuel prices "will have a permanent significant impact on the kind of vehicles consumers buy."
  2007 KPMG Global Auto Executive Survey

- "The global need to address energy security concerns and the impact of climate change on the earth's environment is intensifying pressure on the auto industry to create vehicles with higher fuel economy and lower emissions…This is not tomorrow's story – it is playing out right now in the changing competitive strategies of major automakers."
  Merrill Lynch, Energy Security & Climate Change: *Investing in the Clean Car Revolution,* 6/16/05



Technological Feasibility: Conclusions

- Feasibility assessment of GHG reducing technologies sound
  - Technologies we assessed are used increasingly
  - Other GHG technologies (e.g. E85, HEVs, diesel) expanding
  - Industry criticism unfounded or minor
  - Doesn't affect conclusions
- Cost estimates remain sound
- Lead time adequate
- No safety issues
- ARB GHG emission standards are feasible and can be complied with as adopted

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

Outline

- Legal and Policy Framework for EPA Review
- Background and Overview
  - Global Warming Causes and Impacts
  - AB 1493 Motor Vehicle Greenhouse Gas Regulations
- Supplemental Questions from Notice
- Application
  - Protectiveness
  - Extraordinary and Compelling Conditions
  - Consistency with Section 202(a)
- Conclusion

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

Conclusion

- AB 1493 vehicles will look, cost, and perform like today's vehicles
- California's request meets the three permissible prongs of EPA's waiver analysis
- Neither the Supplemental Issues EPA noticed nor Constitutional concerns change that analysis
- *Mass v. EPA* decision strengthens that analysis and provides no excuse to delay deciding this request
- Law and policy require *more,* not less, deference to CA to regulate vehicular climate change emissions
- U.S. EPA must grant CA's request by October 24, 2007

California's Motor Vehicle Greenhouse Gas Emissions Regulations: Request for Clean Air Act §209(b) Waiver

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