Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles

September 23, 2004

California Environmental Protection Agency
AIR RESOURCES BOARD

Overview

- Highlights
- Background
- Technology assessment and standard development
- Environmental and economic impacts
- Issues
- Conclusion and recommendation

Highlights

- Many feasible technologies
- Vehicle availability retained
- Significant greenhouse gas reduction
  - Fleetwide -17% in 2020, -27% in 2030
- Positive effect on smog forming pollutants
- Economical to consumer
- Good for California economy

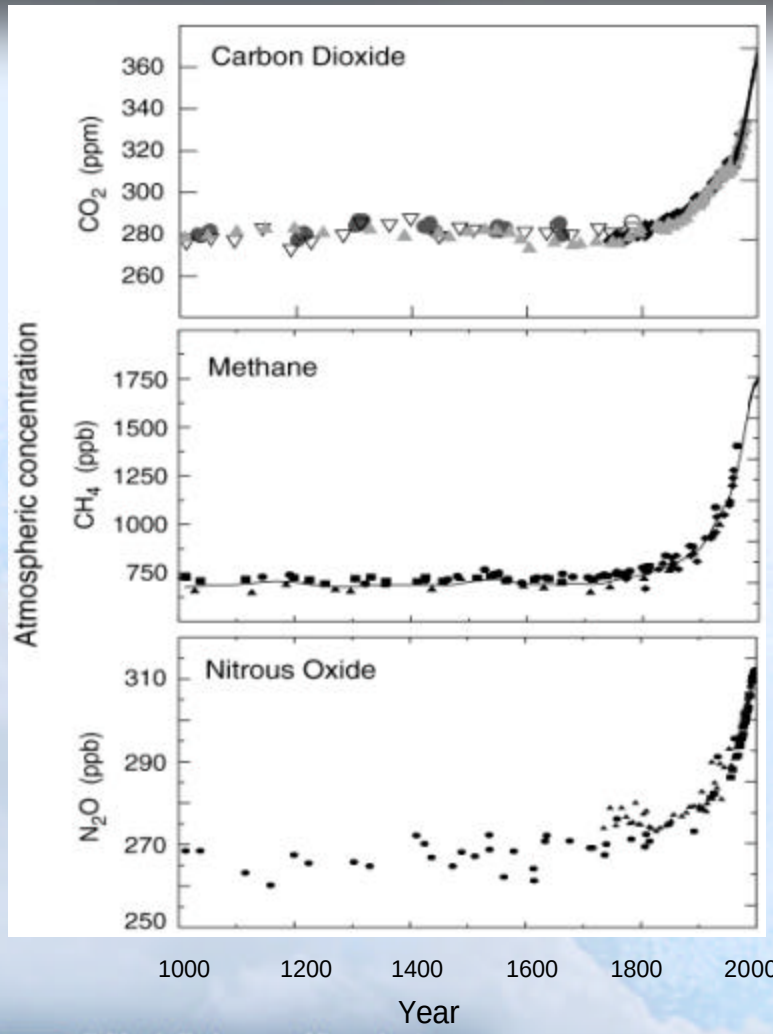
Background

- Climate change science
- History of California initiatives
- Public support for action
- Rule development process

Summary of Climate Change Science

- Climate change is linked to human activities
- California is already experiencing climate change
- Climate change has a broad spectrum of effects on California
- Severe future California impacts are projected

Industrial Era Has Changed the Atmosphere



- Carbon dioxide, methane, nitrous oxide, particulate matter, and other pollutants cause global warming
- IPCC has concluded that increases in these gases are a result of human activities

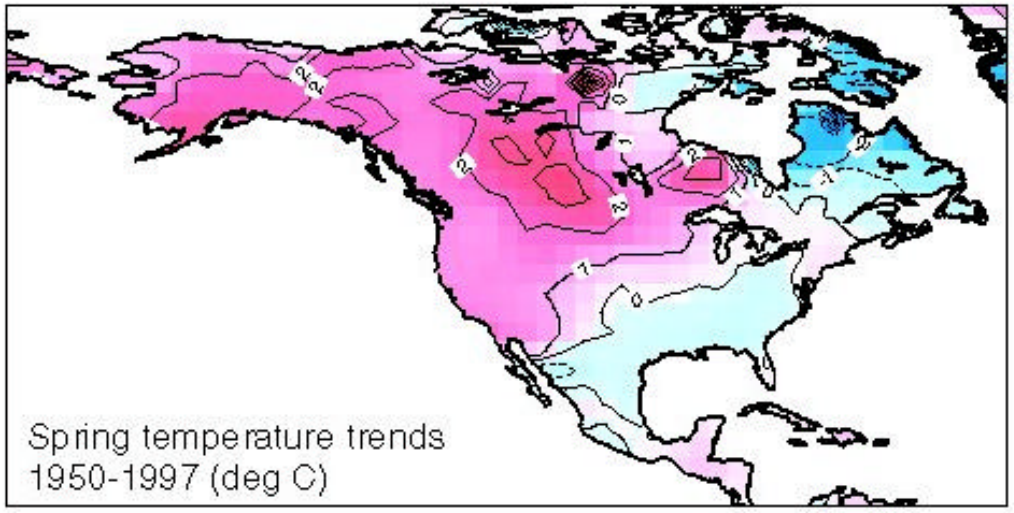
*Source:*IPCC Report: Summary for Policy Makers, Climate Change 2001: The Scientific Basis

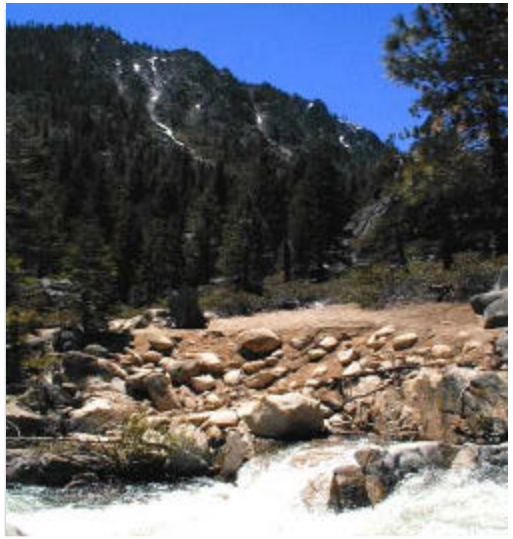
California Is Already Experiencing Climate Change

- Over the Past 100 Years:
  - Average temperatures 0.7 ^{o}F higher
  - Sea levels rose 3 to 8 inches
  - Spring run-off decreased by 12 percent
  - Snowmelt and spring blooms have advanced by 1 to 3 weeks (since 1975)

Earlier Spring Since Mid-1970's

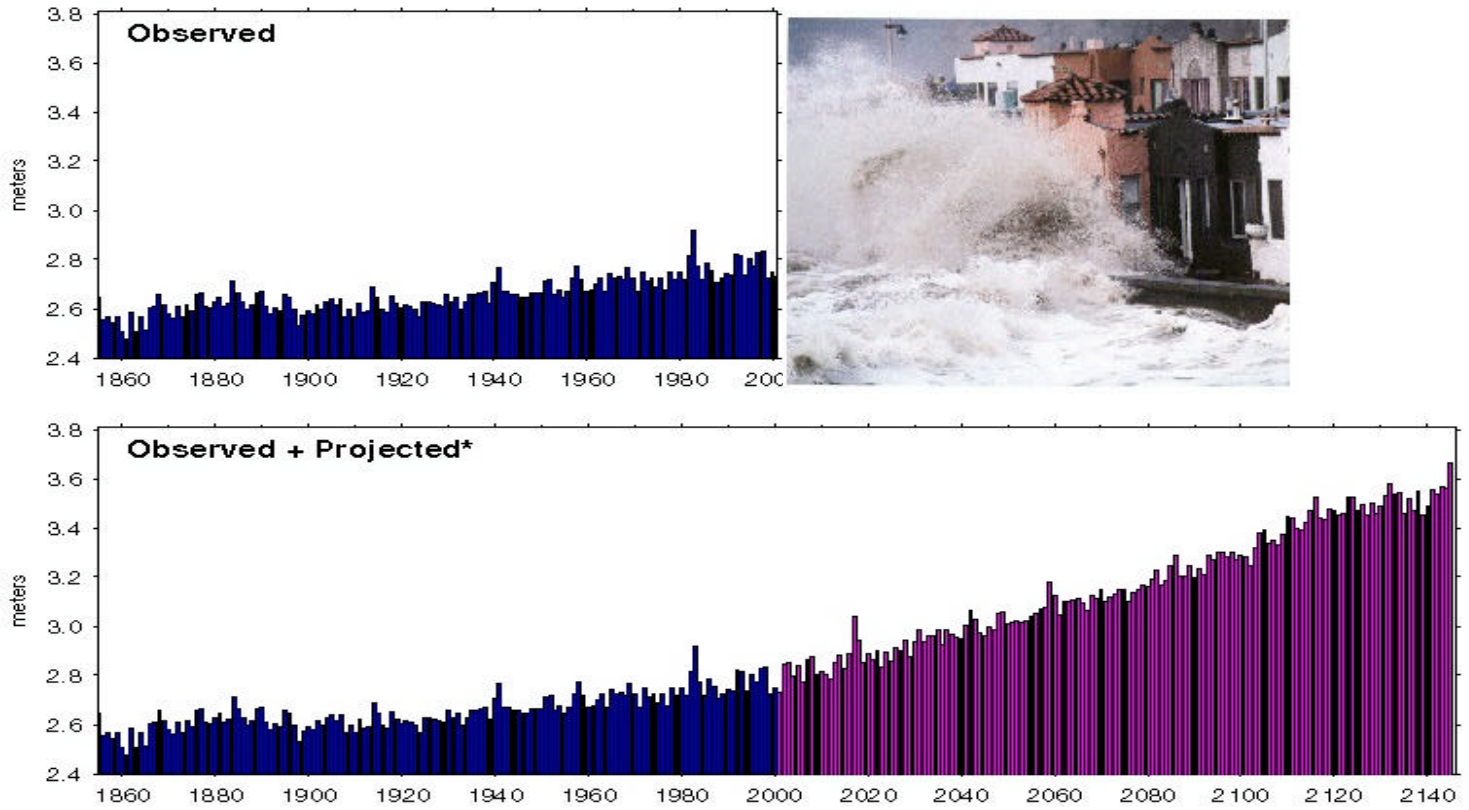
Snowmelt and plant blooms have advanced 1-3 weeks





California Sea Level Rise

San Francisco Mean Sea Level: Past, Present and Future?

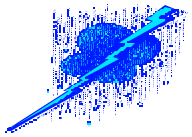


* Projected data (2001-2145) = inverse time version of Observed Sea Level with a trend approx. twice the observed trend during 20th century

Potential Climate Change Impacts on California

Climate Changes

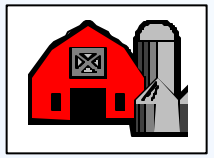
Temperature Increase



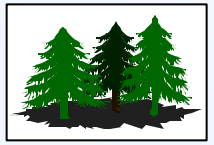
Precipitation Patterns and Extremes

Sea Level Rise

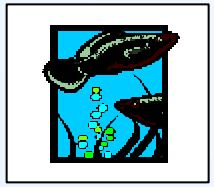
Health
Air Quality - Respiratory Illness
Weather-related Mortality
Infectious and Tropical Diseases



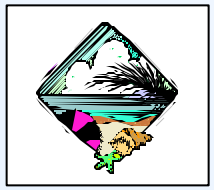
Agriculture
Crop Yields
Irrigation Demands



Forests
Forest Composition
Geographic Range of Forests
Forest Health and Productivity



Water Resources
Water Supply
Water Quality
Competition for Water



Coastal Areas
Erosion of Beaches
Inundation of Coastal Wetlands
Additional Costs to Protect
Coastal Communities

Species and Natural Areas
Loss of Habitat and Species

Source: Anne Grambsch, 1998

Health Effects of Climate Change

Climate change and variability

>

- Temperature rise
- Sea level rise
- Hydrologic extremes

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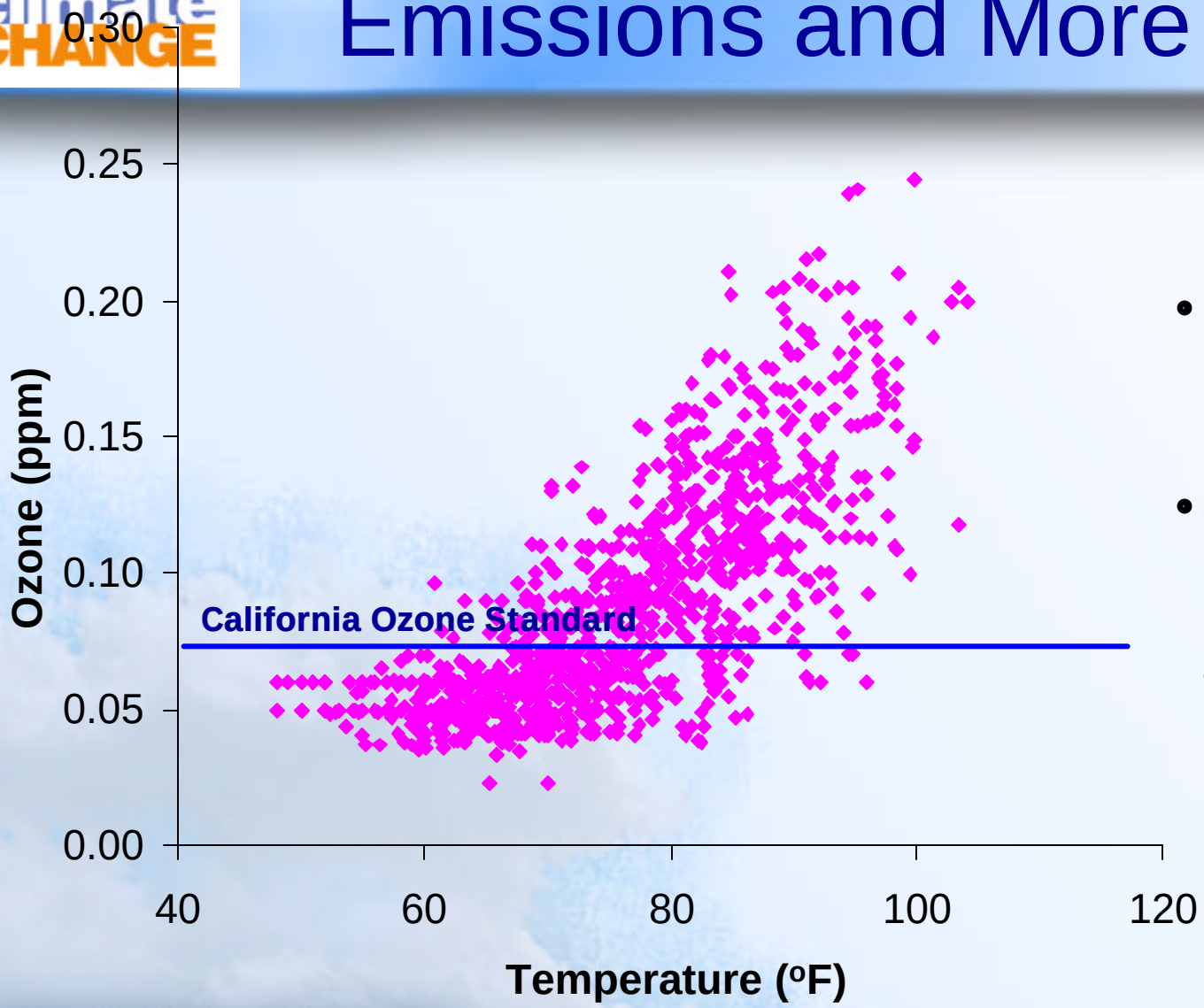
- Heat stress
- Lung disease
- Vector-borne
- Water-borne
- Malnutrition
- Emerging diseases

Hotter Days Lead to Higher Emissions and More Smog



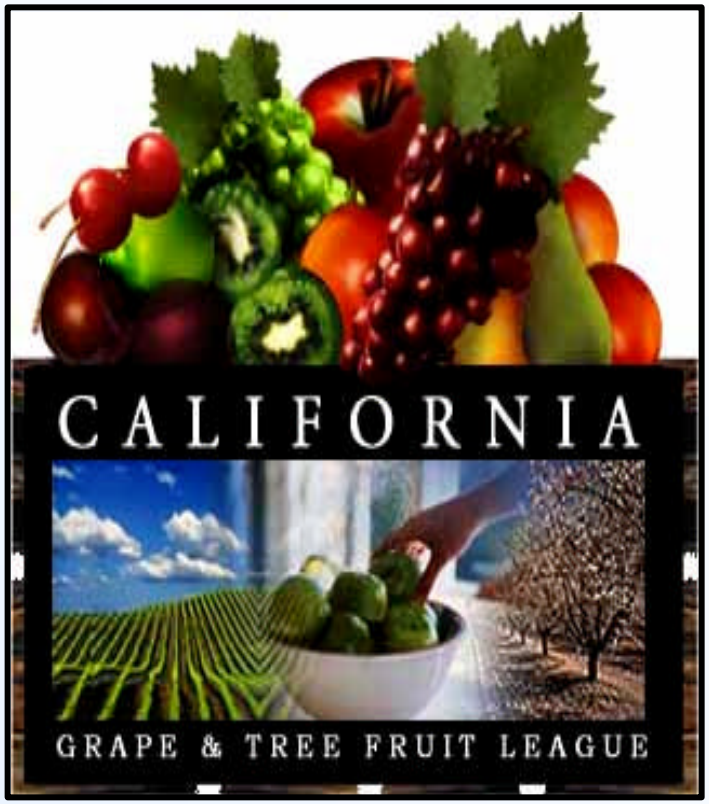
- Los Angeles Ozone Levels (1995-1998)
- 10 warmest years of the last century all occurred within the last 15 years.

Source: Air Resources Board, 2000

Source: California Environmental Protection Agency

Effects on Agriculture

Grape vineyard in Napa Valley



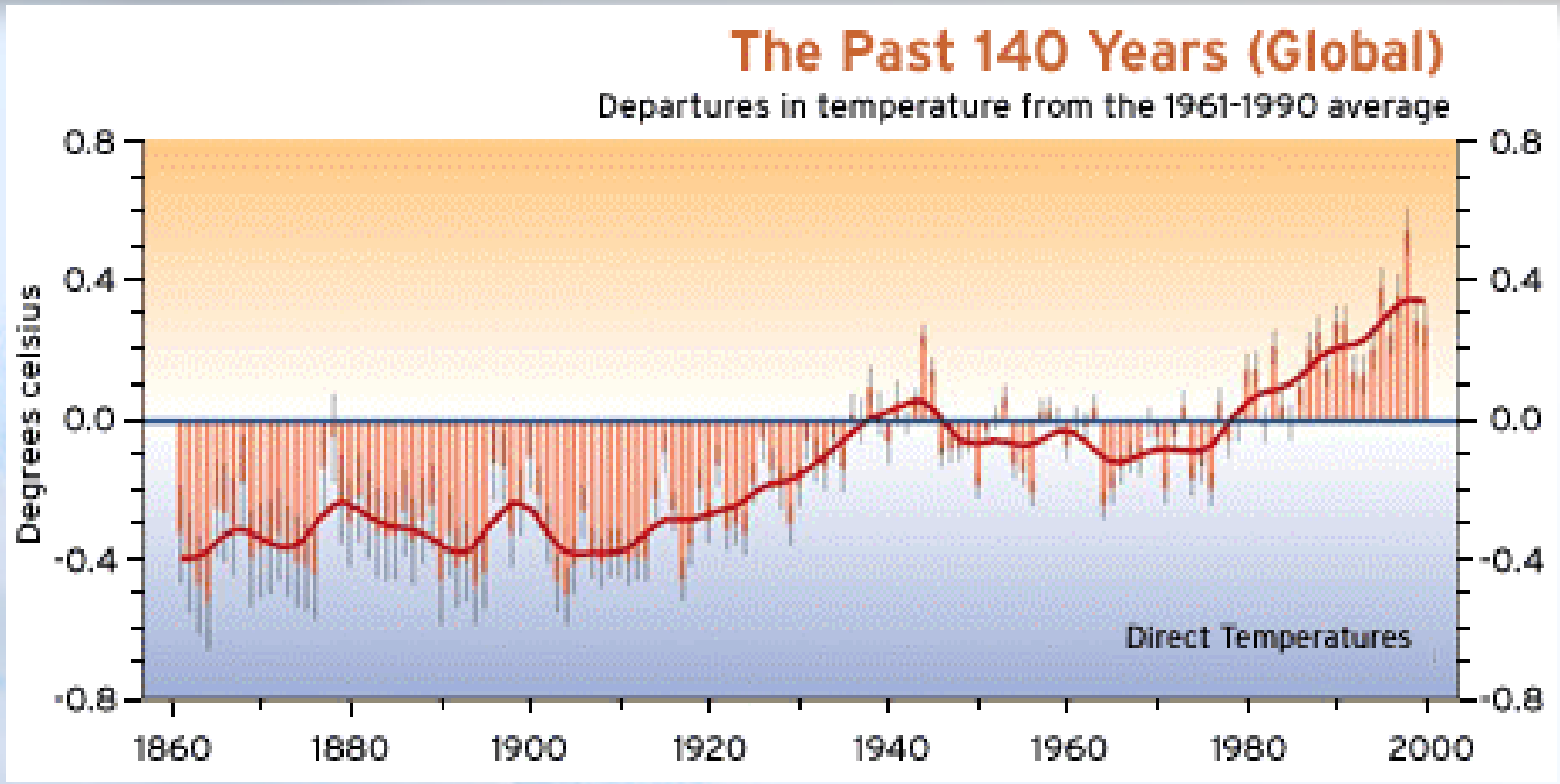
Climate Change Projections for California--Next 100 Years

- With aggressive control policies
  - Average temperature increase 4 to 6 ^{o}F
  - Sea level rise 8 to 11 inches
  - Sierra snowpack decreased 29 to 72 percent
- With business as usual
  - Average temperature increase 7 to 10 ^{o}F
  - Sea level rise 11 to 16 inches
  - Sierra snowpack reduced 73 to 89 percent

Abrupt Climate Change

- Earth's climate system is capable of sudden shifts
- Half of the North Atlantic's warming since the last ice age occur in one decade

Abrupt Climate Change



Abrupt Climate Change

History of California Initiatives

- State assessment of trends and impacts dating back to 1988
- Numerous studies and reports
- California Climate Action Registry
- West Coast Governors' Global Warming Initiative
- California Hydrogen Highway Network

California Motor Vehicle Regulations

- Longstanding California programs to control motor vehicle emissions
- Low Emission Vehicle program (LEV II) highly successful in controlling smog-forming emissions
- Now being expanded to include regulation of greenhouse gases

Clear Public Support for Action

"What about the state law that requires all automakers to further reduce the emissions of greenhouse gases from new cars in California by 2009? Do you support or oppose this law?"

2004:	81% support
2003:	80% support
2002:	81% support

AB 1493 Requirements

AB 1493 Requirements

- Adopt regulations by January 1, 2005
  - Maximum feasible and cost-effective reduction of greenhouse gases from new motor vehicles
- Report to Legislature and Governor by January 1, 2005
- Regulations may not take effect prior to January 1, 2006 (legislative review)
- Regulations apply to 2009+ model years

Regulations Must Provide...

- Maximum flexibility
- Credit for early automaker action
- Alternative means of compliance

Regulations Shall Not Require...

- Fees or taxes on vehicle, fuel or VMT
- Ban on sale of any vehicle category
- Reduction in vehicle weight
- Limitation on or reduction of speed limit
- Limitation on or reduction of VMT

Rule Development Process

Timeline

2003	2004				2005
1Q-4Q	1Q	2Q	3Q	4Q	1Q-4Q

Technology Symposium, Draft documents, Workshops

Draft Staff Proposal

Workshops

Final Staff Proposal

Board Meeting

Legislative Review

Extensive Public Process

• September 26, 2002	Board Meeting
• December 3, 2002	Workshop (Emission Inventory)
• March 11-13, 2003	Vehicle Technology Symposium
• September 18, 2003	Workshop (Standards, Economics)
• October 14, 2003	Workshop (Alternative Compliance)
• November 20, 2003	Board Meeting (Update)
• February 18, 2004	Workshop (Environmental Justice)
• April 20, 2004	Workshop (Technology Assessment)
• July 6, 2004	Workshop (Environmental Justice)
• July 7, 2004	Workshop (Draft Staff Report)
• July 8, 2004	Workshop (Environmental Justice)
• July 13, 2004	Workshop (Environmental Justice)
• Ongoing	Attend local EJ community meetings

Requirements of State Law

- ARB rulemaking process subject to Administrative Procedures Act
- Rule adoption requires compliance with CEQA
- Staff report and response to comments fulfills ARB environmental documentation responsibilities under CEQA

Peer Review

Scientific Analysis Submitted for Peer Review

- Submitted staff report/supporting documents for peer review
- Reviewers identified by UC Office of the President
- Reviewers are distinguished in their field

Peer Reviewers

- **Robert F. Sawyer**, Ph.D.
  Professor in the Graduate School, Department of Mechanical Engineering, UC Berkeley

- **Joseph Norbeck**, Ph.D.
  Yeager Families Professor of Engineering, Director, Center for Environmental Research and Technology, Bourns College of Engineering, UC Riverside

- **Imran Currim**, Ph.D.,
  Professor of Marketing, Graduate School of Management, UC Irvine

- **Michael Hanemann**, Ph.D.
  Chancellor's Professor of Agricultural and Resource Economics and Goldman School of Public Policy, UC Berkeley

- **Christopher R. Knittel**, Ph.D.
  Assistant Professor of Economics, UC Davis

- **Michael J. Prather**, Ph.D.
  Fred Kavli Chair and Professor, Department of Earth System Science, UC Irvine

Peer Review Findings

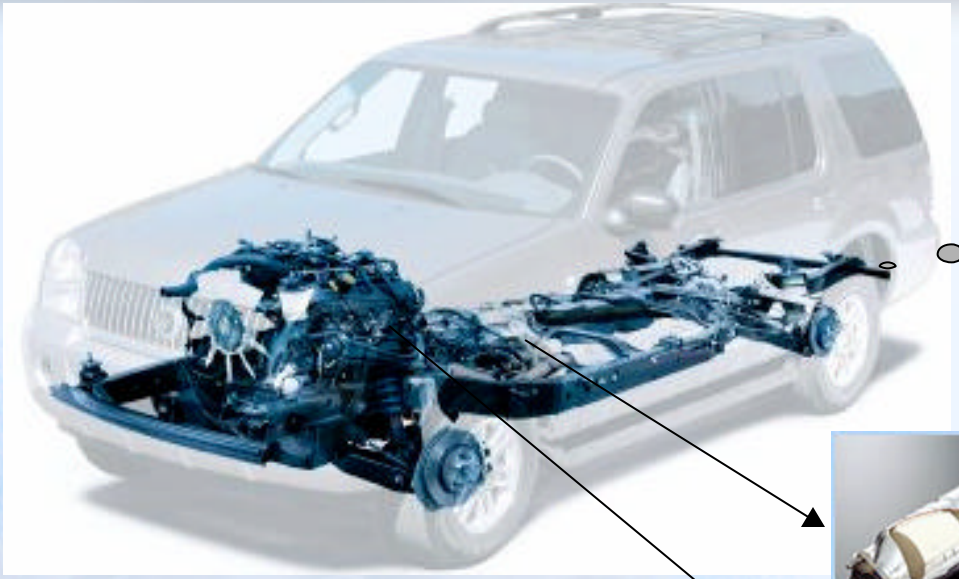
- Comments/suggestions for improvement
- Staff report revised to reflect comments
- Sound/rational staff analysis and recommendations
- Peer reviewer comments and staff responses available on web

Technology Assessment and Standard Development

Technology Assessment and Standard Development

- Technology assessment
- Setting the standard
- Technology cost
- Alternative fuel vehicles
- Early credits and alternative compliance

Vehicle GHG Sources



CO_2

Methane

Nitrous Oxide

Engine

Transmission

A/C compressor

HFCs

CO_2

International Vehicle Technology Symposium

- International experts on vehicle climate change emission reduction technologies participated
- Numerous technology areas were covered
  - Engine and drivetrain modifications
  - Modifications to air conditioning systems
  - Alternative fuel vehicles
  - Alternatives to reduce methane and nitrous oxide emissions

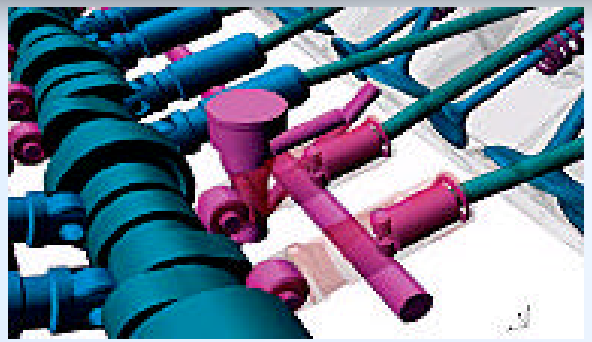
ARB Technical Review

- Staff investigated technologies that can reduce greenhouse gas emissions from motor vehicles in 2009 and beyond
- Relied on and participated in comprehensive technical study initiated by the Northeast States Center for a Clean Air Future (NESCCAF)

Technologies to Meet Proposed Emission Standards - Near-Term

- Available technologies that could be widely used by 2012
  - Gasoline direct injection - stoichiometric
  - Variable valve timing & lift
  - Turbocharging or cylinder deactivation
  - 6 speed automatic and automated manual transmission
  - Electric power steering
  - Improved alternator
  - More efficient, low-leak air conditioning

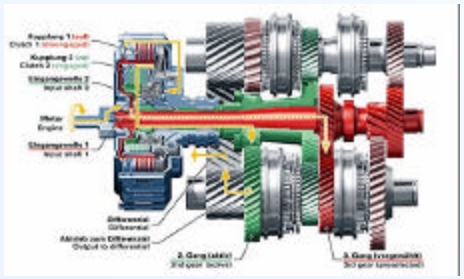
Near-Term Technologies



Cylinder Deactivation

2005 Chrysler 300C Hemi

Audi TT
3.2 V6



Automated Manual Transmission
Audi TT

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Near-Term Technologies

Acura RSX

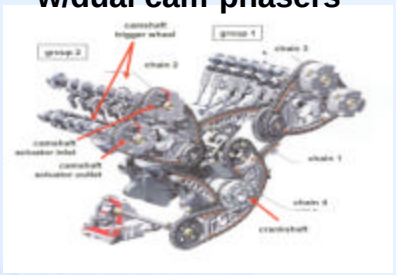
Variable valve timing & lift

Honda Accord

Toyota Matrix

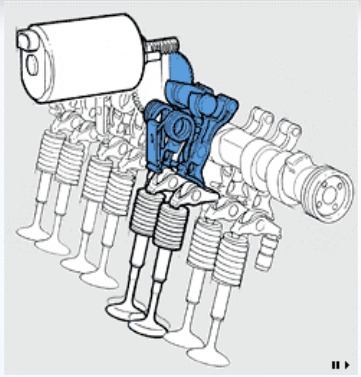
Near-Term Technologies

Gasoline Direct Injection w/dual cam phasers



Audi

2005 Audi A4



BMW Valvetronic
(continuously variable valve timing & lift)

BMW 5 Series

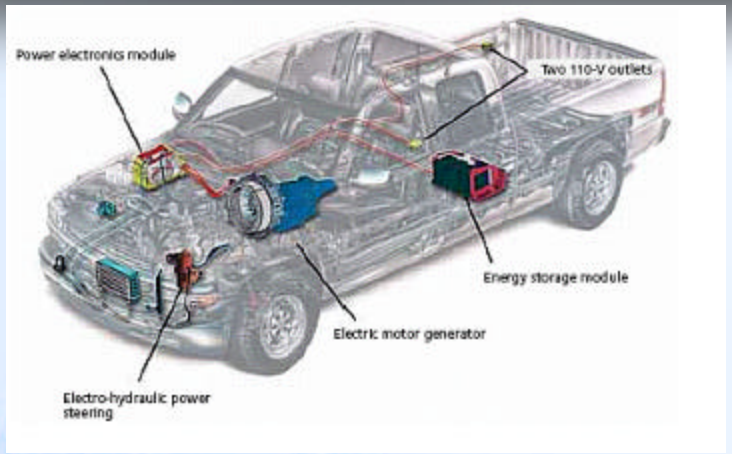
Volvo S60

Turbocharger

Technologies to Meet Proposed Emission Standards - Mid-Term

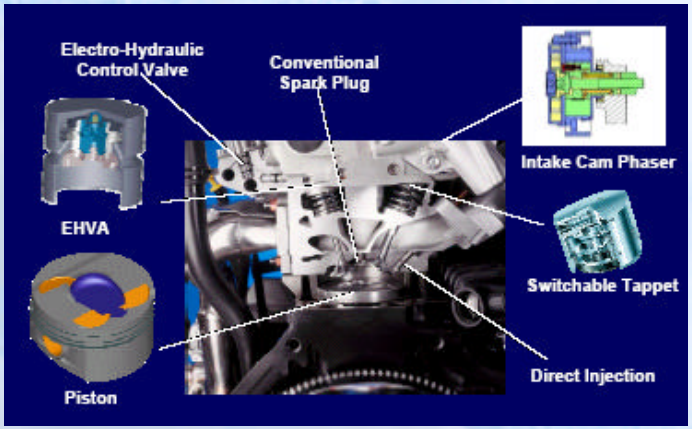
- Additional technologies that could be widely used by 2016
  - Integrated Starter/Generator
  - Camless valve actuation
  - Gasoline homogeneous charge compression ignition
  - More efficient, low-leak R-152a air conditioning system

Mid-Term Technologies

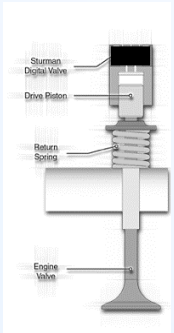


Integrated Starter/Generator

2005 Chevrolet Silverado



AVL Homogeneous Combustion Compression Ignition



Sturman camless valve actuation

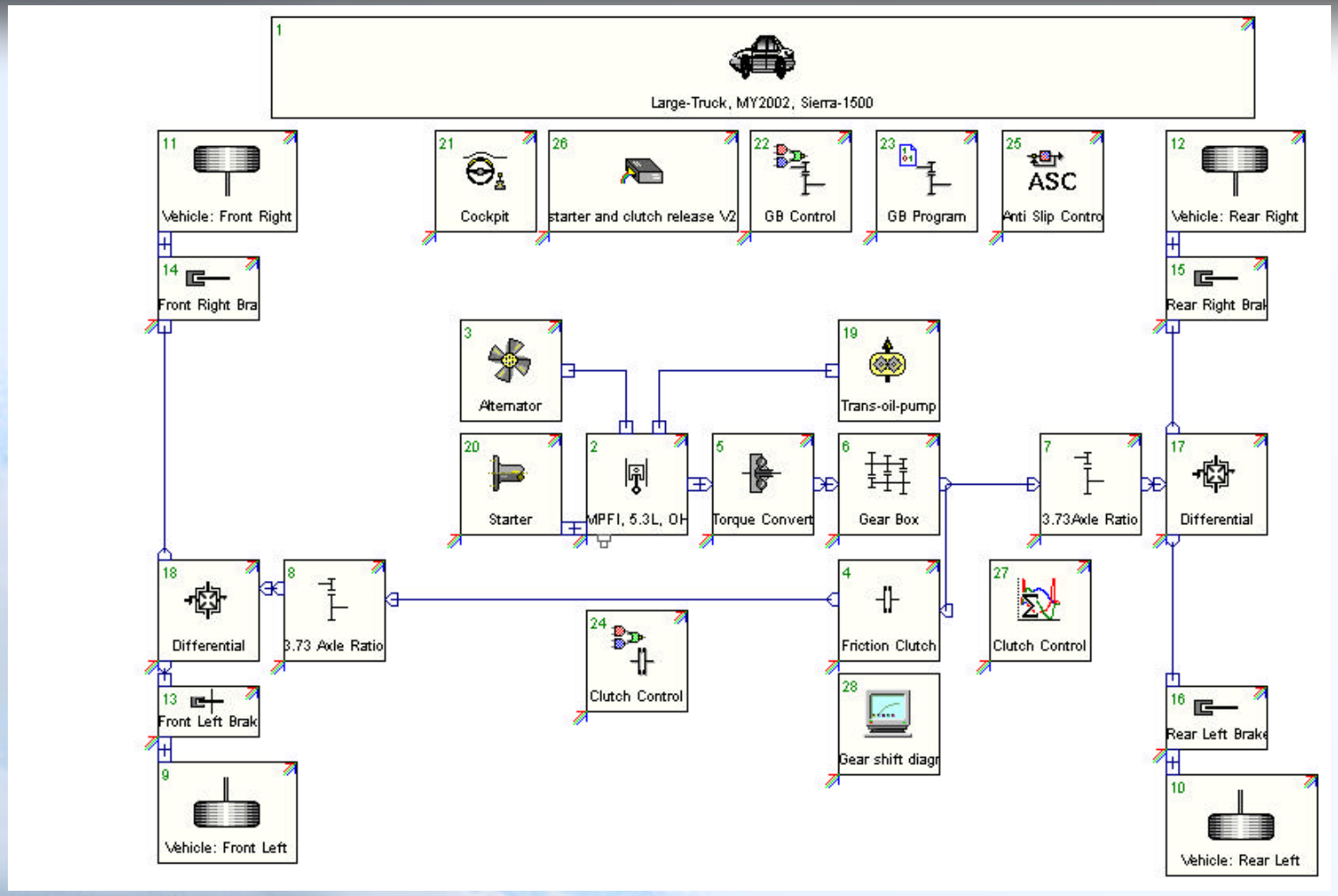
Other Technologies Evaluated But Not Necessary

- Technologies available but not necessary to meet proposed standards
  - Alternative fuel engines
  - Mild or strong gasoline hybrid electric vehicles
  - Weight reduction
  - Diesel
- All are alternative approaches to reduce CO_2

Vehicle Computer Simulation

- 1 + 1 ≠ 2
  - Computer modeling required to properly account for benefits of combining technologies
  - Different technologies may address the same engine losses
- Projected 2009 vehicle performance maintained for all model runs
  - better than 2002 model vehicles

Vehicle Computer Simulation
(AVL CRUISE Model for Large Truck)



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Technology Package Selection

- Seventy nine technology packages modeled over five vehicle classes
  - Small car, large car, minivan, small truck/SUV, and large truck/SUV
- Technology packages designated as near- or mid-term according to potential for high production volume
  - Near-term available for 2009-2012 phase-in
  - Mid-term available for 2013-2016 phase-in

Setting the Standard

Two Emission Categories

- Two categories (as in LEV II)
  - PC/LDT1
    - Passenger cars, small trucks and SUVs
  - LDT2
    - Large trucks and SUVs
- Exemption for work trucks
- Credit trading between categories permitted
- Less stringent requirements for small volume manufacturers

Setting Emission Standards

- Staff selected the 2-3 near- and mid-term technology packages with the most benefit at reasonable cost

Standards Designed So All Models Can Comply

- Standards set relative to manufacturer in the worst starting position
  - Manufacturer with heaviest vehicles
  - Ensures all manufacturers can comply without altering their fleet mix
- Even the largest SUVs able to comply
- Consumer choice maintained

Technologies Evaluated
(Large Car)

Large Car	Combined Technology Packages	CO_2 (g/mi)	Potential CO_2 reduction from 2002 baseline	Retail Price Equivalent 2002	Potential CO_2 reduction from 2009 baseline	Retail Price Equivalent 2009
Near Term 2009-2012	DVVL,DCP,A6 (2009 baseline)	323	-6.6%	$427	0%	$0
	DCP,A6	304	-12.1%	$479	5.9%	$52
	DCP,CVT,EPS,ImpAlt	303	-12.3%	$709	-6.2%	$282
	CVVL,DCP,A6	290	-16.1%	$864	-10.2%	$437
	DCP,DeAct,A6	286	-17.1%	$662	-11.2%	$235
	DCP,Turbo,A6,EPS,ImpAlt	279	-19.3%	$266	-13.7%	-$161
	CVVL,DCP,AMT,EPS,ImpAlt	265	-23.4%	$874	-18.0%	$447
	GDI-S,DeAct,DCP,AMT,EPS, ImpAlt	**265**	**-24.2%**	**$931**	**-18.0%**	**$504**
	GDI-S,DCP,Turbo,AMT,EPS, ImpAlt	**251**	**-27.4%**	**$370**	**-22.3%**	**-$57**
Mid Term 2013-2016	gHCCI,DVVL,ICP,AMT,EPS,ImpAlt	272	-20.3%	$831	-15.7%	$454
	DeAct,DVVL,CCP,A6,ISG,EPS, eACC	259	-24.9%	$1879	-19.6%	$1452
	ehCVA,AMT,EPS,ImpAlt	250	-27.5%	$930	-22.4%	$503
	ehCVA,GDI-S,AMT,EPS,ImpAlt	**242**	**-30.0%**	**$1189**	**-25.1%**	**$762**
	gHCCI,DVVL,ICP,AMT,ISG,EPS, eACC	**231**	**-33.1%**	**$2002**	**-28.4%**	**$1575**
	GDI-S,Turbo,DCP,A6,ISG,EPS, eACC	**224**	**-35.3%**	**$1576**	**-30.5%**	**$1149**
Long Term 2016-	gHCCI,AMT,ISG,EPS,eACC	247	-28.6%	$2163	-23.5%	$1736
	ModHEV	188	-45.5%	$1758	-41.7%	$1331
	AdvHEV	161	-53.4%	$3539	-50.1%	$3112
	HSDI,AdvHEV	161	-53.4%	$5695	-50.1%	$5268

Pollutants Included

- 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")

Fleet Average Emission Standards

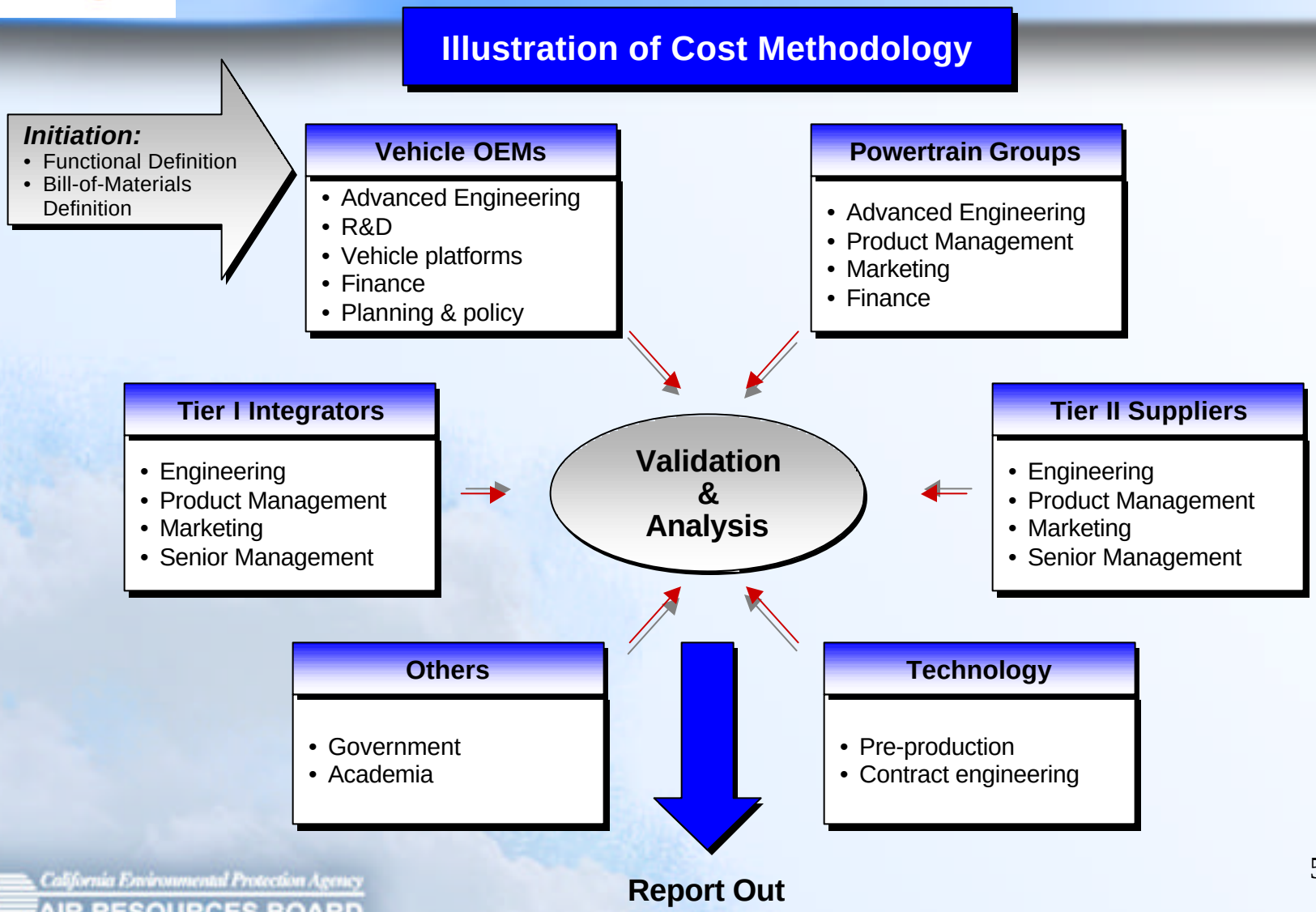
Tier	Year	CO_2-equivalent emission standards (g/mi)	
		PC/LDT1	LDT2
Near-term	2009	323	439
	2010	301	420
	2011	267	390
	2012	233	361
Mid-term	2013	227	355
	2014	222	350
	2015	213	341
	2016	205	332

~22% reduction in 2012

~30% reduction in 2016

Technology Costs

Cost Info Generated and Cross-Checked Through Ground-Up Research Effort



Average Price Increase of New Vehicles

	Retail Vehicle Price Increase	
	Passenger Cars Light Trucks/SUVs	Large Trucks/SUVs
Near Term 2012	$367	$277
Mid Term 2016	$1064	$1029

Net Savings for Vehicle Purchaser

	Near Term (2012)	Mid Term (2016)
Monthly Payment Increase	$7	$20
Monthly Operating Cost Savings	$18	$23
Monthly Net Savings	$11	$3

Summary

- Objective--determine maximum feasible and cost effective reduction
- Staff used same methodology used by industry to evaluate engine and vehicle technologies
- Our cost assessment also relies on an industry resource
- Cost-effective reductions of up to 30% have been demonstrated

Early Credits and Alternative Compliance

Early Reduction Credits

- Proposal seeks to:
  - Meet the intent of the Legislature
  - Ensure that credits comply with existing state and federal criteria
  - Reward early action taken

Proposed Approach

- Credits for 2000-2008 model years
- Each automaker's fleet average emissions compared to fully phased-in near-term standard for 2012
- Example: PC standard = 233 g/mi, credit granted only if manufacturer's emissions < 233
- Emission credits have limited life

Alternative Compliance

- Regulations must provide maximum flexibility, and allow alternative methods of compliance

  But...

- Use of alternatives must achieve equivalent or greater reductions

Proposed Approach

- Allow averaging, banking, trading
- Allow aggregation across pollutants
- Apply standard criteria for emission credit trading

Proposed Approach

- Additional limitations on generation and use of credits
  - Must take place in California
  - Must be sponsored by auto manufacturer
  - Must involve 2009 and later light duty vehicles, or increased use of alternative fuels in such vehicles
  - No increase in criteria pollutant or toxic air contaminant emissions

Treatment of Alternative Fuel Vehicles

Alternative Fuel Vehicle Assessment

- Impact on climate change emissions
- “Well-to-wheels” analysis
- Infrastructure and marketability issues not included

Alternative Fuels Considered

- Compressed Natural Gas
- Liquid Petroleum Gas
- Ethanol
- Electricity
  - Battery electric
  - Hybrid-electric (20-mile all-electric range)
- Hydrogen

Emission Credit for Alternative Fuel Vehicles

- Alternative fuel vehicles get full credit for emission benefits, including upstream
- Bi-fuel vehicles get credit for documented use of alternative fuel

Staff Proposal for Upstream Emissions

- Use upstream emissions from gasoline as baseline against which alternative fuels are compared
- Apply adjustment factor to alternative fuel exhaust emissions to compensate for differences in upstream emissions
- Vehicles with zero direct emissions use a default value

Fuel Cycle Adjustment

Fuel	Adjustment Factor
Gasoline	1.00
Compressed natural gas (CNG)	1.03
Liquid petroleum gas (LPG)	0.89
Ethanol (E85)	0.74
Fuels with no direct emissions	
Electricity	115 g/mile
Hydrogen - internal combustion	290 g/mile
Hydrogen - fuel cell	210 g/mile

California H_2 Highway Network

- Hydrogen Highway Network Executive Order requires renewables and GHG benefits
- Considering 2010 goal of 20% renewables
- Considering 2010 goal of 30% GHG reduction
- Energy Commission 20% Renewable Portfolio Standard (RPS)
- CA H_2 Highway Network blueprint plan and the RPS will result in lower greenhouse gas emissions from H_2 vehicles and electric vehicles

Alternative Fuel Vehicle Summary

- Alternative fuel vehicles available in limited quantities
- Substantial reductions in climate change emissions possible from wider use
- Incremental costs and fuel availability are hurdles to commercialization

Environmental and Economic Impacts

Analysis of Potential Economic Impacts

- Statewide analysis
- Low income and minority community impacts
- Supplemental analysis

Statewide Impacts

- Potential impacts on:
  - Business expansion/elimination
  - Employment
  - California business competitiveness
  - State and local government

Impacts on California Economy

- In 2020
  - Annualized costs of $1.2 billion
  - Annual savings of $5.3 billion
- In 2030
  - Annualized costs of $2.6 billion
  - Annual savings of $9.4 billion
- Net savings
  - About $4 saved for every $1 spent

Impacts on California Economy

- In 2020
  - $5 billion more income
  - 53,000 more jobs
- In 2030
  - $7 billion more income
  - 77,000 more jobs

Positive Impacts for California

- Increase in income
- Increase in jobs
- Increase in number of businesses
- Net savings to consumers
- No adverse impact on California competitiveness with other states
- Net savings to consumers and to state and local governments

Community Impacts

Community Impacts

- Communities particularly vulnerable to climate change
- Studies on the impacts of climate change on communities
- Community participation essential to a successful partnership and regulation

Community Outreach

Date	Organization/Meeting	Location
February 27, 2003	CLCV Education Fund Environmental Justice Forum	Los Angeles
July 22, 2003	Environmental Justice Coalition Meeting	Oakland
October 30, 2003	CLCV Education Fund Environmental Justice Forum	Los Angeles
February 18, 2004	ARB's EJ Focused Public Workshop	Los Angeles
May 13, 2004	Partnership for the Public Health, Environmental Justice Sub-Committee Meeting	North Richmond
May 20, 2004	Bluewater Network Environmental Justice Forum	San Francisco
June 10, 2004	3rd Street Celebration	North Richmond
June 17, 2004	Community Health Roundtable	Fresno
July 6, 2004	ARB's EJ Focused Public Workshop	Oakland
July 8, 2004	ARB's EJ Focused Public Workshop	Fresno
July 13, 2004	ARB's EJ Focused Public Workshop	Pacoima

Impacts on Low-Income Communities

- Business in low-income communities
- Low-income consumers

Positive Impacts on Businesses in Low-Income Communities

- Used San Diego as example
- Net increase in jobs and businesses
  - Reduction in future growth of gasoline station jobs and businesses
  - Offset by increased growth of jobs and businesses in other sectors
  - Overall increase in jobs and businesses

Positive Impacts on Low-income Consumers

- Passenger Cars/Small Trucks
  - Price increase of 10-year old vehicle $245
  - Monthly payment increase of $8
  - Monthly operating cost savings of $14
  - Net monthly savings of $6

Supplemental Analysis

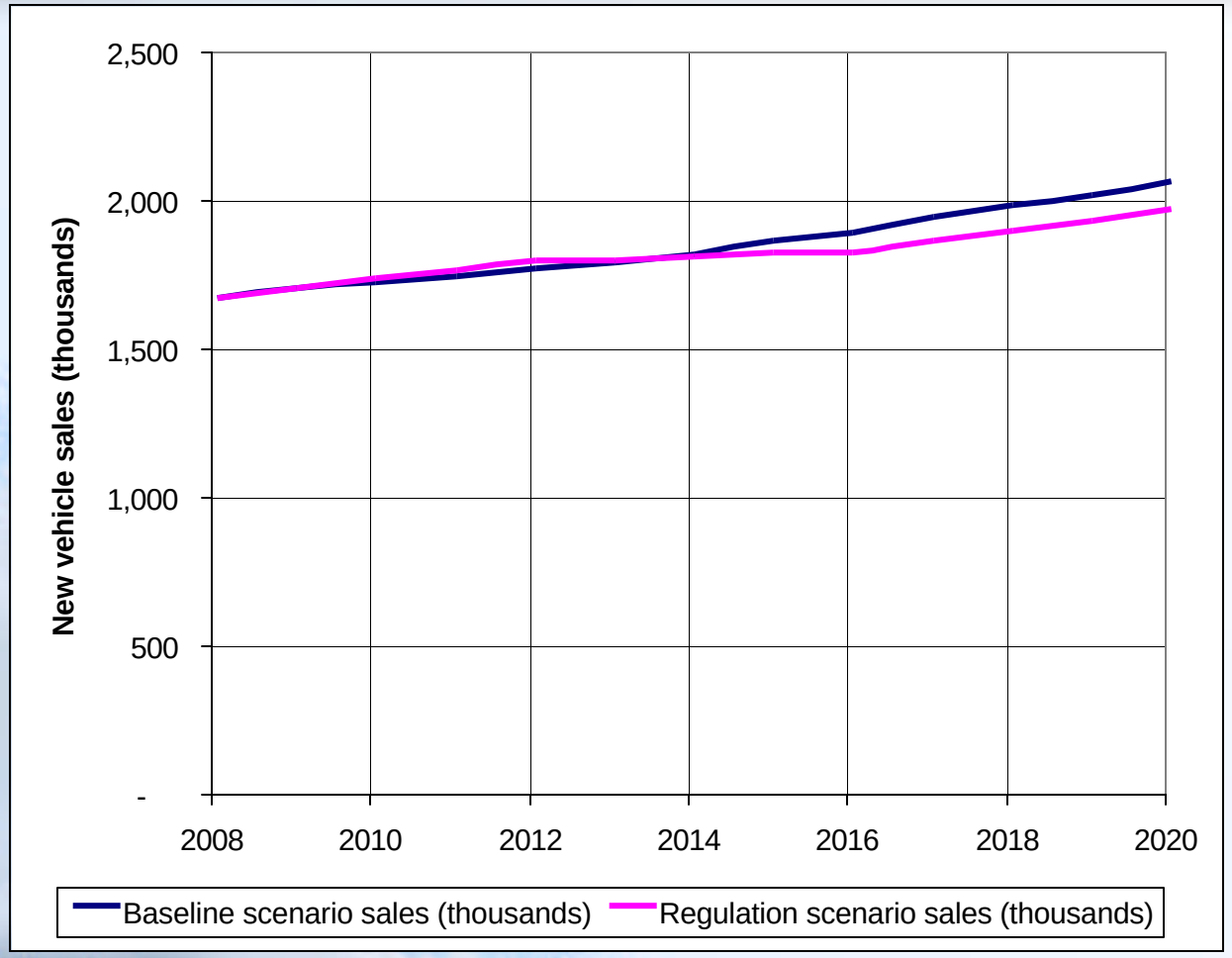
Supplemental Analysis

- Potential effects
  - Fleet turnover (impacts on sales)
  - Rebound effect (impacts on VMT)
- Not part of traditional analysis
- Useful to develop California-specific tools
- Bottom line--effects are small

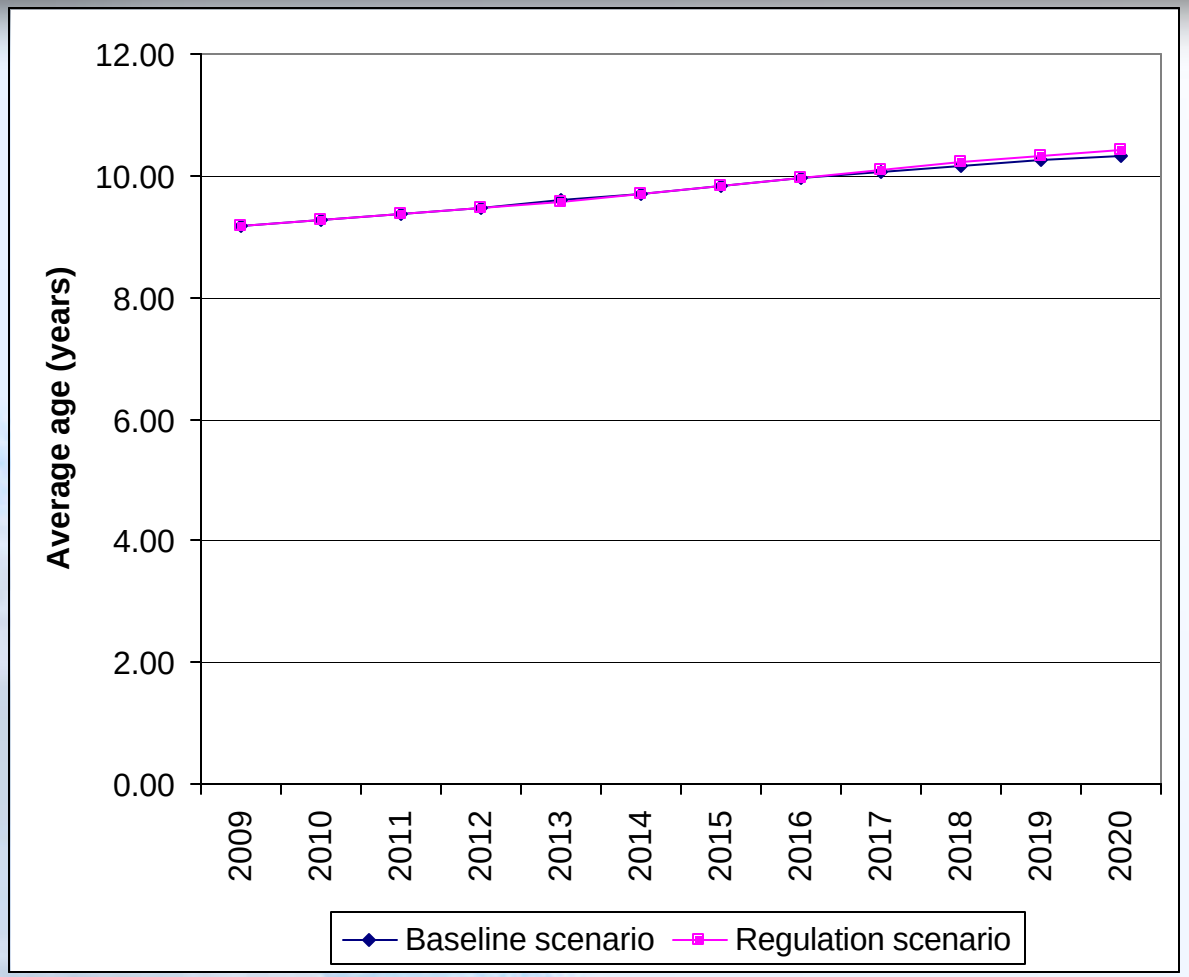
Assessing Fleet Turnover

- Consumer choice model
- Existing model from UC Davis
- Household vehicle purchase
- Inputs: vehicle attributes
- Outputs: vehicle sales, fleet size and age
- Regulation compared to baseline

Small Impact on Growth in Vehicle Sales



Small Impact on Age of Vehicle Fleet



Small Impact on Emissions
(Fleet Turnover Effect)

Pollutant	Impact (Tons Per Day)	Impact (Percent)
ROG	+ 1.52	+ 0.7
NOx	+ 0.95	+ 0.5
PM_{10}	- 0.04	- 0.1
CO_2	- 2,600	- 0.5

Rebound Effect
(Change in Vehicle Miles Traveled)

- Rebound effect definition
- UC Irvine study
- California-specific estimates
- Rebound number for 2020 about 3%
- Similar results with travel demand models

Small Impact on Emissions
(Rebound Effect)

Pollutant	Impact (Tons Per Day)	Impact (Percent)
ROG	- 0.25	- 0.1
NOx	+ 0.58	+ 0.3
PM_{10}	+ 0.27	+ 0.6
CO_2	+ 2,400	+ 0.5

Effect of Higher Gasoline Price

- Staff analysis assumed $1.74/gallon
- At $2.30/gallon:
  - Operating cost savings higher
  - Reduces payback period
  - Greater positive impacts
    - Net savings on new vehicles almost doubles
    - New jobs at 72,000 vs. 53,000 in 2020

Positive Impacts on California
(Supplemental Analysis)

- Supplemental analysis does not change fundamental staff conclusions

Positive Economic Impacts
(Summary of Findings)

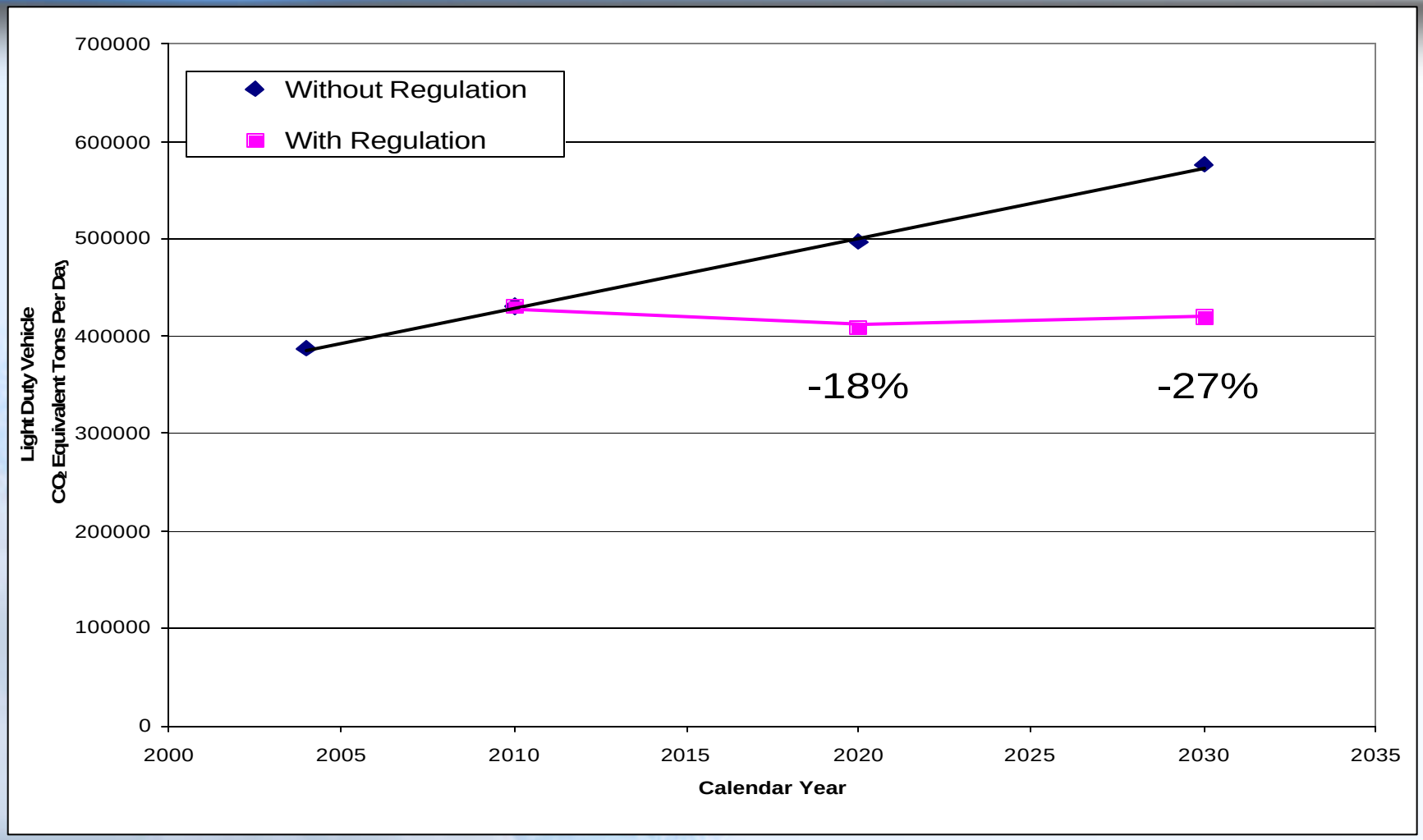
- Increase in jobs and income
- Net savings for consumers
- Positive impacts on the communities
- Increase in number of businesses
- No adverse impact on California competitiveness with other states
- Net savings for State and local governments

Evaluation of Environmental Impacts

Environmental Impacts

- Emissions inventory
- Emissions reductions
- Cost effectiveness
- Other environmental impacts

Regulation Reduces Climate Change Emissions



Cost Effectiveness

- Technology improvements reduce operating costs more than they increase vehicle costs

	2020	2030
Increased Vehicle Costs	$1.2 billion	$2.6 billion
Reduced Operating Costs (Savings)	$5.3 billion	$9.4 billion
Net Annual Savings	$4.0 billion	$6.8 billion

Regulation Reduces Climate Change Emissions

	2020 CO_2 Equivalent Benefits in Tons per Day
Vehicle Emission Reductions	88,000
Upstream Emission Reductions	27,000
Rebound	-2,400
Fleet Turnover	2,600
Net Reductions	115,200

Regulation Reduces Smog Forming Emissions

	2020 Benefits in Tons per Day	
	ROG+NOx	PM
Upstream Emission Reductions	6.0	0.8
Rebound	-0.3	-0.3
Fleet Turnover	-2.5	0.04
Net Reductions	3.2	0.5

Positive Environmental Impacts

- Improved air quality
- Improved water quality
- Lower energy demand

Issues

Issues

- Process
- General Concerns
- Regulatory Proposal

Process

- Time for review
  - Lengthy public process
  - Technology assessment April 1
  - Draft staff proposal June 14

Process (continued)

- Availability of supporting documentation
  - Documentation provided on ongoing basis
  - Specific issue--source code and survey data for CARBITS model
  - Model has been peer reviewed
  - Interested parties able to use model as provided

General Concerns

- Federal Statutes
  - Greenhouse gases as “pollutants”
  - EPCA preemption

General Concerns (continued)

- Effect of California Regulation
  - California regulation alone will not solve problem, but…
  - Proposal provides net benefit for California
  - California not acting in isolation
  - Other jurisdictions follow California lead
  - California doing its fair share

Regulatory Proposal Issues

- Vehicle availability
- Vehicle attributes
- Vehicle cost
- Competitive impacts
- Stringency of the standard
- Treatment of alternative fuels

Regulation (continued)

- Will the proposal restrict vehicle availability?
- No
  - Standard can be met by all manufacturers while maintaining today's fleet
  - Requires improved technology, not different vehicles

Regulation (continued)

- Will the proposal affect vehicle attributes?
- No
  - Speed, power, towing--same as 2009 baseline
  - Weight--no downsizing needed
  - Safety--not affected

Regulation (continued)

- Will regulated vehicles be too costly?
- No
  - Sales increase for near term standards
  - Possible slight sales decrease for mid term standards
  - Impacts are small because net savings to consumers

Regulation (continued)

- Will the proposal require excessive manufacturer investment?
- No
  - Ample lead time and phase in time
  - Manufacturers can build needed changes into production plans
  - Many components provided by suppliers

Regulation (continued)

- Will the proposal have unacceptable competitive impacts?
- No
  - Cost of control for PC/LDT1 similar for all
  - Cost for LDT2 varies by weight and model mix
  - Differences expected to decrease as more manufacturers emphasize LDT2 market

Regulation (continued)

- Should the standard be strengthened?
  - Phase in more quickly?
  - Require more technology?
- No
  - Staff proposal achieves maximum feasible reduction
  - Manufacturers face significant lead time and resource constraints
  - Proposal is consistent with redesign timing

Regulation (continued)

- Does the proposal adequately address alternative fuels?
- Yes
  - Alternative fuel vehicles get full credit for emission benefits, including upstream
  - Bi-fuel vehicles get credit for documented use of alternative fuel
  - Required fleetwide use of alternative fuel not economical to consumer

Conclusion and Staff Recommendation

Conclusion

- Complies with legislative mandate
- Good for public health and environment
  - Reduces GHG and smog forming emissions
- Good for California economy
  - Increases jobs and personal income
- Good for consumers
  - Preserves consumer choice
  - Net savings

Staff Recommendation

- Staff recommends that the Board adopt the staff proposal