California's Motor Vehicle Greenhouse Gas Emissions Regulation

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California Air Resources Board

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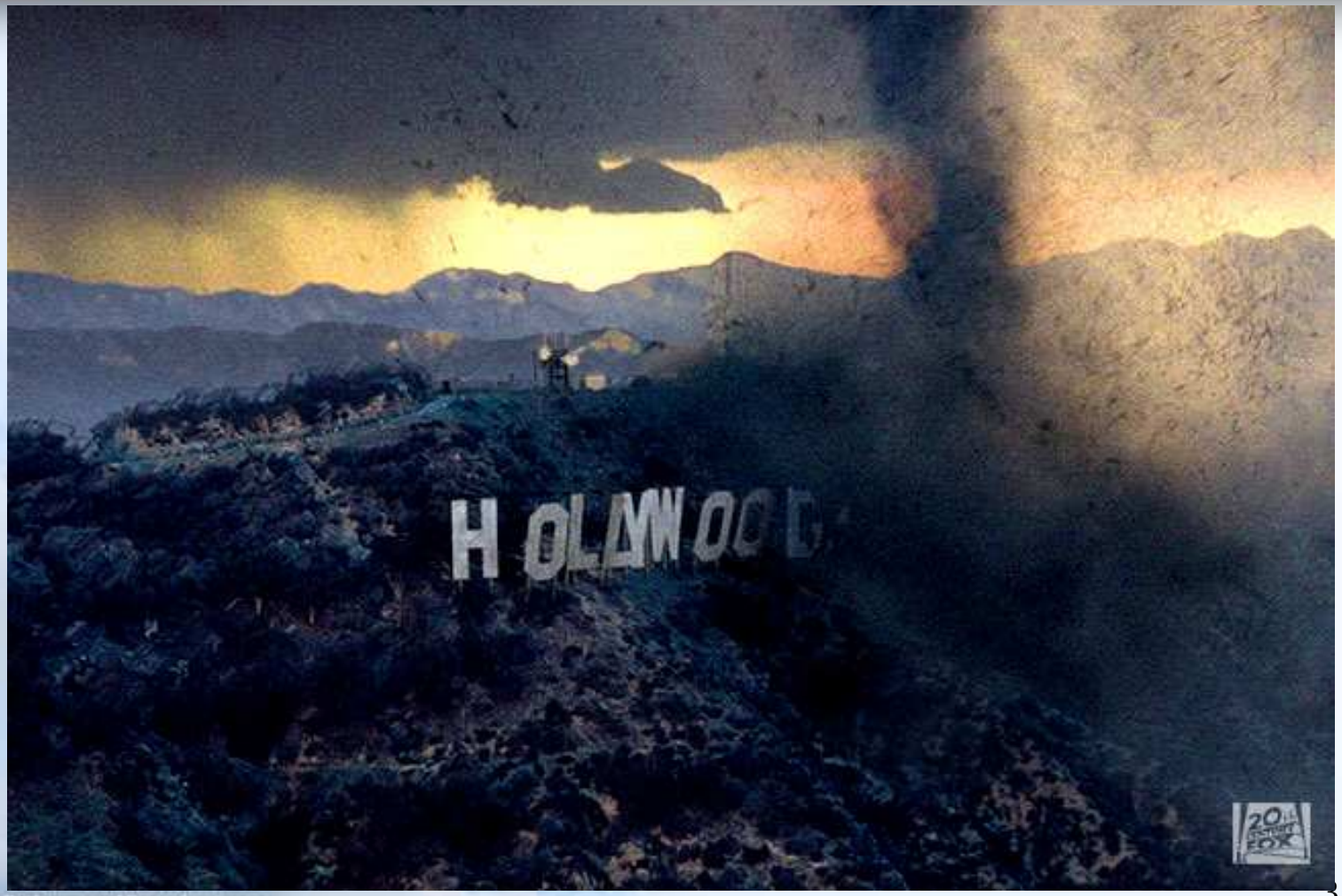
Overview

- Climate change and California
- Statutory requirements
- Development of the greenhouse gas regulation
- Overall regulatory approach
- Regulatory treatment of vehicle air conditioning (AC) system emissions

Climate Change and California



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 bloom have advanced by 1 to 3 weeks since 1975

Climate Change in CA
Next 100 Years

- **Temperature increase 7 to 10 ºF**
  - Heat stress related deaths
- **Sea level rise 11 to 16 inches**
  - Property damage
  - Saltwater contamination of fresh water supply
- **Sierra snow pack reduced 73 to 89 percent**
  - Winter/spring flooding
  - Not enough irrigation water in summer

Statutory Requirements

Enabling Legislation AB 1493 (Pavley)

- Signed by Governor - 2002
- Requires reduction of greenhouse gas emissions
  - New passenger vehicles sold in California
  - 2009+ models
  - Maximum feasible reduction
  - Cost beneficial to consumer

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

Clear Public Support

"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**

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Current Status

- Regulation approved: September 2004
  - Post-hearing administrative process complete Summer 2005
- Legislative oversight hearing: February 2005
- Automaker litigation in state and federal court

Development of the Greenhouse Gas Regulation

Strong Technical Basis for Regulation

- International Vehicle Technology Symposium
- Comprehensive technical and economic studies
  - Technology evaluation by auto industry consultants
  - Economic modeling by UC professors
- Independent academic peer review

Vehicle GHG Sources

CO_2

Methane

Nitrous Oxide

Engine

Transmission

A/C compressor

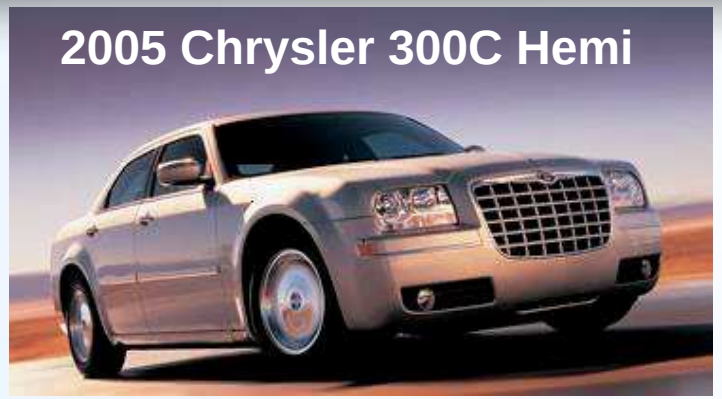
HFCs

CO_2

Available Technologies
to Reduce Greenhouse Gas Emissions

Cylinder Deactivation

6%[1]



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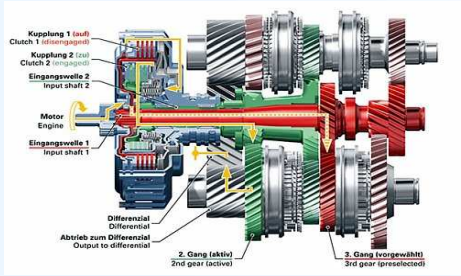

Automated Manual Transmission

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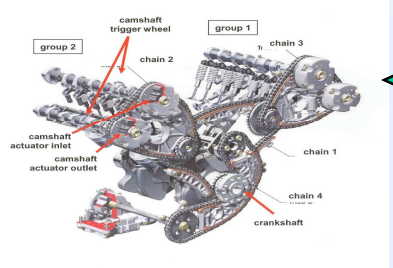
[1] % CO_2 reduction, large car

Available Technologies
to Reduce Greenhouse Gas Emissions

Gasoline Direct Injection
w/dual cam phasers



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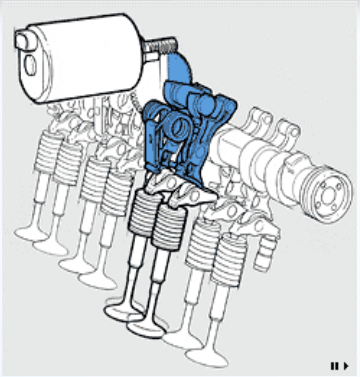

BMW Valvetronic
(continuously variable valve timing & lift)

6%

8%

Turbocharger
w/ engine downsize

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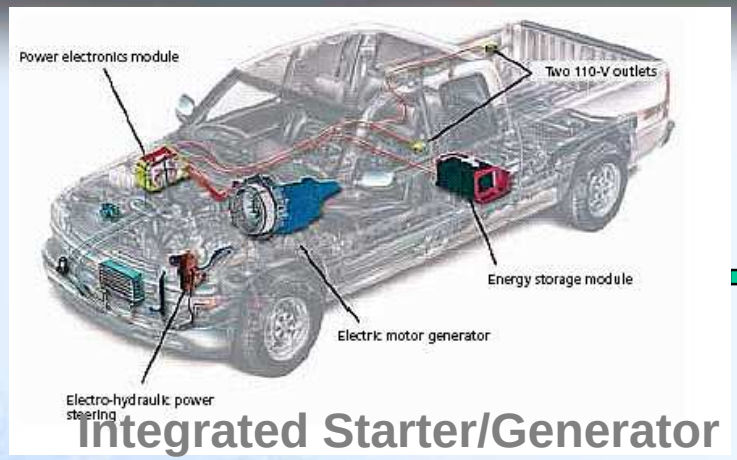
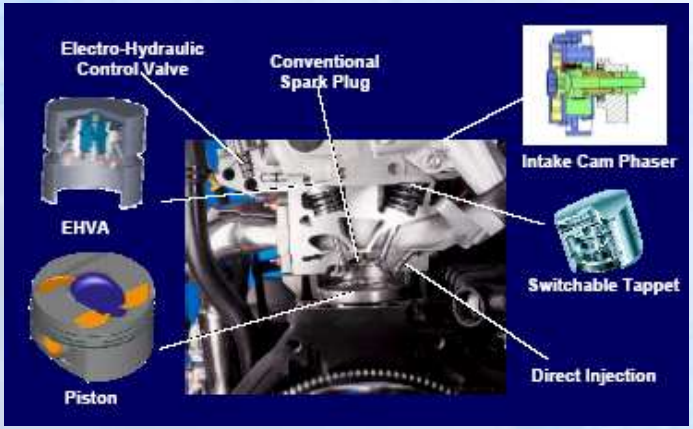
Emerging Technologies
to Reduce Greenhouse Gas Emissions



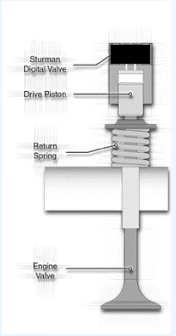
Integrated Starter/Generator

4%



6%

Homogeneous Combustion Compression Ignition



16%

Camless valve actuation

Other Available Technologies

- Electric power steering
- Improved alternator
- Low loss water and oil pumps
- Better aerodynamics
- More efficient, low-leak air conditioning

Regulatory Approach

Two Emission Categories (as in LEV II)

- PC/LDT1
  - Passenger cars, small trucks and SUVs
- LDT2
  - Large trucks and SUVs

Regulated Pollutants and Sources

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

Standards Designed So All Models Can Comply

- Standards set to be feasible for manufacturer with heaviest fleet
  - Ensures all manufacturers can comply without altering their fleet mix
- Even the largest SUVs able to comply
- Consumer choice maintained
  - All models remain available to consumers

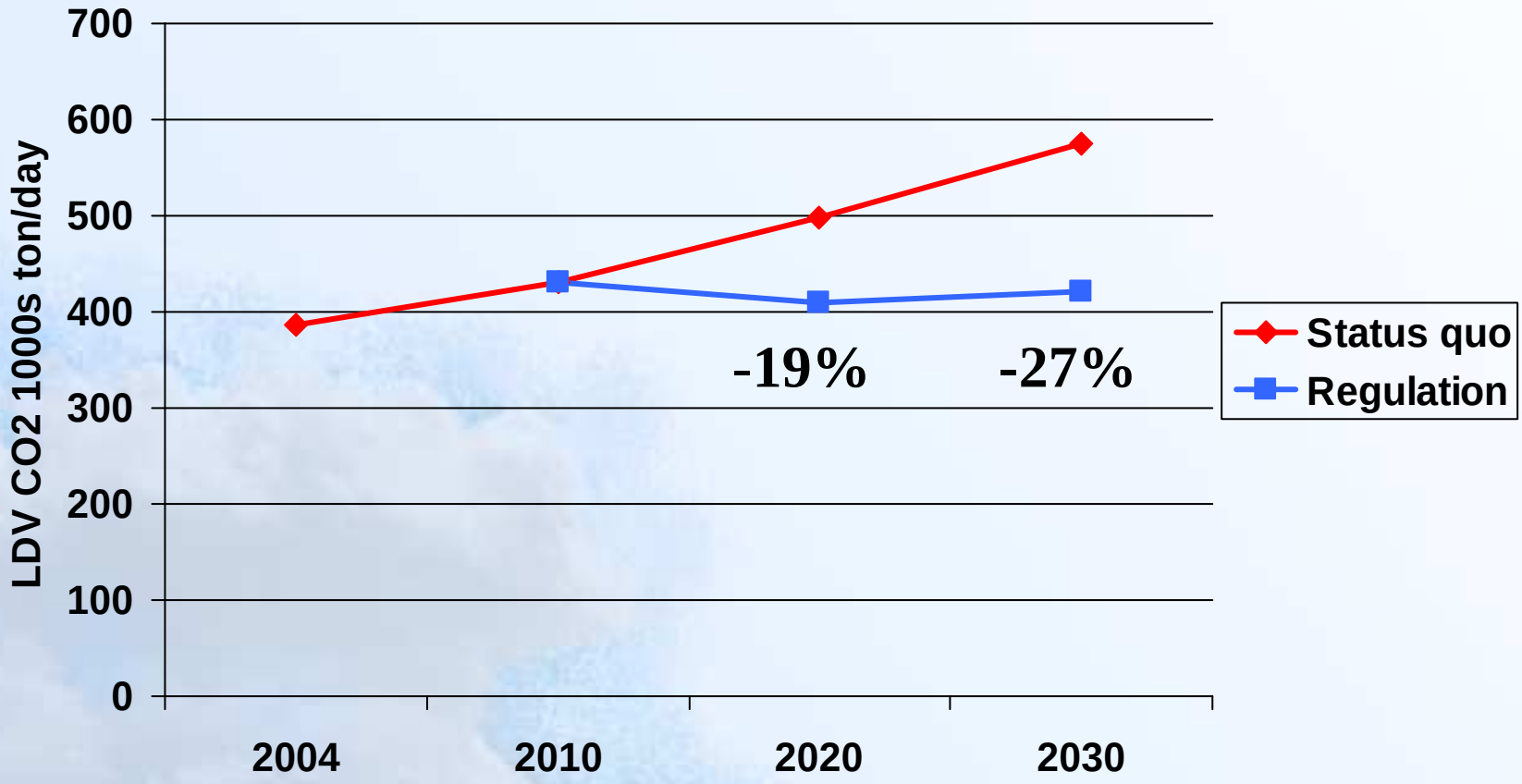
Fleet Average Emission Standards

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

Regulation Reduces CA Climate Change Emissions*



* Fleetwide

Average Price Increase of New, Low GHG Vehicles

Model Year	Retail Vehicle Price Increase	
	Passenger Cars Small Trucks/SUVs	Large Trucks/SUVs
2012 22% less GHG	**$367**	**$277**

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2012 22% less GHG	$367	$277
2016 30% less GHG	$1064	$1029

Net Savings for Vehicle Purchaser

	2012 Models	2016 Models
Monthly Payment Increase	$7	$20
Monthly Operating Cost Savings	$18	$23
Monthly Net Savings	**$11**	**$3**

Economic Impacts

- More jobs (53,000)
- Higher income ($5 billion/year)
- Positive impacts on low income communities
- Increase in number of businesses
- Slightly lower smog emissions (3 tpd)
- Vehicle sales (~4% lower after 2015)

Regulatory Treatment of AC Emissions

Regulatory Treatment of AC Emissions

- Regulation sets performance standard
  - No changes to AC are required
- However, standard assumes some AC emission reductions
  - Improved efficiency, low leak systems
  - Refrigerant substitution (mid-term)
  - AC reductions account for ~15% of total reduction needed to meet standard

Regulatory Treatment of AC Emissions (continued)

- If AC emissions are not reduced, manufacturers will need additional reductions from other technologies
- More detailed discussion of AC allowances and credits in later sessions

Conclusion

- Technologies available to reduce GHG
  - Improved MACs
- Net savings to consumer
- Economic benefits to state