California Climate Change Initiatives

Tom Cackette
California Air Resources Board
November 3, 2003
The World Is Warming

Sources: Intergovernmental Panel for Climate Change (IPCC) Report:
Summary for Policy Makers, Climate Change 2001:
The Scientific Basis National Climatic Data Center Website
Industrial Era Has Changed The Atmosphere

- CO₂, CH₄, N₂O are:
  - Climate change gases
  - Increasing due to human activity

*Source:* IPCC Report: Summary for Policy Makers; Climate Change 2001: The Scientific Basis
Transportation - Largest Source of CO₂

California

- Transportation: 58%
- Home: 9%
- Industry: 13%
- Electricity: 16%
- Business: 4%
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
Our Principal Reservoir - The Sierra Snow Pack - is Shrinking

Warmer Winters Have:
- Reduced snow pack
- Led to earlier snow melt
- Decreased spring runoff by 10%
- Affected water supply

Sacramento River Runoff (1910-2000) - April to July as a Percent of Total Runoff

Source: California Environmental Protection Agency, Environmental Protection Indicators for California, 2001
Sea Level is Rising Along California’s Coast

- Sea level has risen 7” in 150 years
- Levee stability and salt water intrusion concerns
- IPCC projects 4-12” sea level rise by 2050
- Present Delta system may not be viable with 8-12” sea level rise

San Francisco Yearly Mean Sea Level (1855-2000)

Source: California Environmental Protection Agency, Environmental Protection Indicators for California, 2001
Hotter Days Lead to Higher Emissions and More Smog

10 warmest years of the last century all occurred within the last 15 years.

Los Angeles Ozone Levels (1995-1998)

Source: California Environmental Protection Agency
California Climate Change Activities--Highlights

- California Climate Action Registry
- Western States Governor’s agreement
- West Coast Regional Carbon Sequestration Partnership
- AB 1493--Control of greenhouse gas emissions from motor vehicles
California Climate Action Registry

- Non-profit voluntary registry of 6 Kyoto gases
- Standardized GHG reporting
  - General and industry specific reporting protocols
  - Certification protocol
  - CARROT: Climate Action Registry Reporting Online Tool
- Workshops and policy seminars
- www.climateregistry.org
Western States Agreement

- Policy statement by Governors of California, Oregon and Washington
- Regional cooperation
  - Combined fleet purchase of low GHG vehicles
  - Reduced use of diesel generators at ports
  - Emission-free truck stops on I-5 corridor
  - Improved efficiency standards
  - Coordinated inventories, reporting, research
West Coast Regional Carbon Sequestration Partnership

- Led by California Energy Commission
- Identify, characterize, and locate CO2 sources in the region
- Determine long-term capture and sequestration mechanisms
- Regional strategy to meet near- and long-term needs
AB 1493 - Reducing GHG from Motor Vehicles

- Adopt regulations that achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles
  - Adopt by January 1, 2005
  - Affect 2009 and later model years
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
## Process Overview

<table>
<thead>
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<th>2002</th>
<th>2003</th>
<th>2004</th>
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<td>2Q</td>
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### Technical Assessment
(Individual tasks)
Staff findings/Workshops/Board update

- **Staff Proposal**
  - Draft report
  - Workshop

- **Board Adoption**
  - Staff report
  - Board hearing
Staff Technical Assessment

- State-of-the-art modeling of vehicle technologies, costs, and GHG reductions
- Environmental and economic analysis
- Implications of different regulatory approaches
- Alternative compliance methods
Regulatory Approach

- Address CO2, CH₄, N₂O and refrigerant emissions, but not criteria pollutants
- Express on CO2-equivalent basis
- Performance standard (not technology-specific)
- Allow trading
Goals

- Real and significant emission reductions
- No restriction of product offerings
- Reward manufacturers that are already using advanced technology
- Equity across manufacturers
CO₂ Emissions Vary

Hummer H2
- 828 gpm CO₂

Toyota Prius
- 159 gpm CO₂
# Technologies to Reduce Climate Change Emissions

<table>
<thead>
<tr>
<th>Engine Technology</th>
<th>CCE Reduction, %</th>
<th>Current models using technology</th>
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<tr>
<td>Variable valve timing and lift</td>
<td>3-8</td>
<td>BMW, Honda</td>
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<tr>
<td>Cylinder deactivation</td>
<td>3-6</td>
<td>Cadillac</td>
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<tr>
<td>Smaller engine w/ supercharger</td>
<td>5-7</td>
<td>Mercedes</td>
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<tr>
<td>Throttleless engine</td>
<td>3-6</td>
<td>BMW</td>
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<tr>
<td>Camless valve control</td>
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<tr>
<td>Catalysis of N(_2)O, CH(_4)</td>
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## More Technologies to Reduce Climate Change Emissions

<table>
<thead>
<tr>
<th>Drivetrain &amp; Vehicle Technology</th>
<th>CCE Reduction, %</th>
<th>Current models using technology</th>
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<tbody>
<tr>
<td>5 speed automatic</td>
<td>2-3</td>
<td>Ford Explorer</td>
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<tr>
<td>CVT</td>
<td>4-8</td>
<td>Saturn VUE (SUV)</td>
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<tr>
<td>Auto shifting manual</td>
<td>3-5</td>
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<tr>
<td>Advanced CVT</td>
<td>4-8</td>
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<tr>
<td>Better aerodynamics</td>
<td>1-2</td>
<td>Mercedes E class</td>
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<tr>
<td>Integrated starter generator</td>
<td>5-10</td>
<td>Toyota Prius</td>
</tr>
</tbody>
</table>
Progress Being Made

Clean Cars of the Future to Dominate Tokyo Show...
Automotive News.com, 10/23/03

Sturman Industries and AVL Demonstrate Camless Engine Benefits...
Sturman Industries Press Release, 10/28/02

Ford Motor Will Sell Three 6-Speed Transmissions...
Automotive News 8/11/03

GM and Toyota Turn Up the Heat on Hybrids...
Automotive News 1/06/03

ZF and Ford Set Date for CVT Production...
Automotive News 1/20/03

Improved Engineering Boosts Automaker Use of CVT...
Automotive News 4/28/03
Potential GHG Reductions From Near-Term Measures

- **ACEEE**: ~32%
  - Low resistance tires, low emission accessories, ISG, CVT

- **NRC Path 2**: ~27%
  - Variable valve timing and lifting, CVT, multi-valve OHC, electric power steering

- **EEA**: ~26%
  - Composite aluminum and high strength steel bodies, electric power steering, cylinder deactivation, advanced torque converter
"This is the first law in America to substantively address the greatest environmental challenge of the 21st century. In time, every state - and hopefully every country - will act to protect future generations from the threat of global warming. For California, that time is now.”

Governor Gray Davis

“Over 30% of carbon dioxide emissions come from automobiles and as temperatures rise, our air quality worsens. California's landmark legislation to cut greenhouse gases is now law, and I will work to implement it and to win the expected challenges in court along the way.”

Governor-Elect Arnold Schwarzenegger