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**The Haagen-Smit Symposium**

# AB 1493:
# California Motor Vehicle Greenhouse Gas Reduction

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California Air Resources Board
April 6, 2004



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## Development of Staff Recommendation

- AB 1493 Requirements
- Timeline
- Elements of Staff Assessment
- Next Steps



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## AB 1493 Requirements

- Adopt regulations by January 1, 2005
  - Maximum feasible reduction of GHG from new motor vehicles
    - $CO_2$, $CH_4$, $N_2O$, HFC
  - Economical to owner/operator
- Regulations apply to 2009 and later model years



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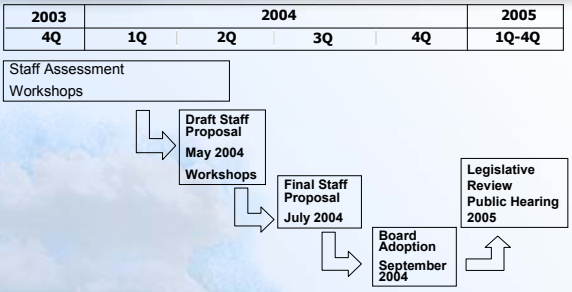
## Timeline

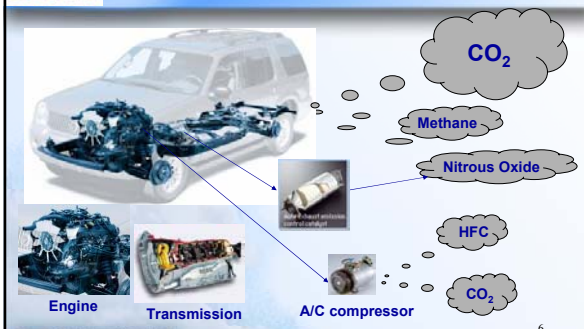


## Elements of Staff Assessment

- Technology Evaluation
- Standard Development
- Environmental Impacts
- Cost Effectiveness
- Economic Impacts
- Community Impacts



## Technology Evaluation






## Technology Evaluation

- Information sources
  - NESCCAF analysis
  - Additional staff analysis
- Staff technology assessment document
  - Released last week
- Technology workshop
  - April 20, El Monte



## Technology Evaluation

- 5 vehicle types
  - Small car, large car
  - Small truck, large truck (includes SUVs)
  - Minivan
- Many technologies
  - Off the shelf and emerging
  - Engine, transmission, air conditioning, accessories, alternative fuels

## Technology Evaluation

- Identify baseline emissions in 2009
- Define beneficial technology packages for each vehicle type
  - Near, mid and longer term availability
- Model GHG reductions
  - Looking carefully at combined effect
- Estimate cost and lifecycle cost



## Key Findings--Near Term 2009

- At least one off-the-shelf or near term package in each vehicle class gives
  - CO2 reduction of 16-22 percent compared to 2009 baseline
  - Retail price increase: Savings to ~$300
  - Payback of less than 5 years
- Best packages generally include
  - Turbocharging w/ engine downsize
  - Variable valve timing
  - Improved transmissions
  - Improved electric accessories



## Key Findings--Mid Term 2013-2015

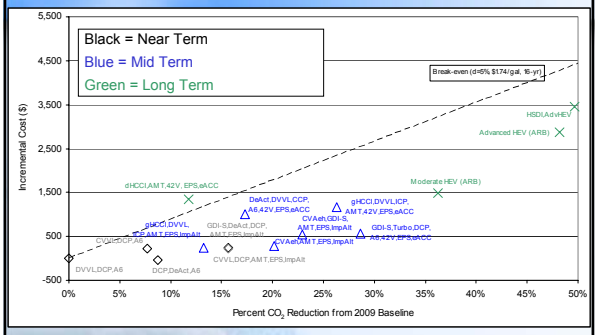
- Substantially larger $CO_2$ reductions possible
  - Up to 30 percent reduction from 2009 baseline
  - Retail price increase: Typically $500 to <$1000
  - Payback of less than 10 years
- Promising technologies
  - Gasoline direct injection
  - Camless valve actuation
  - 42 volt ISG
  - Improved transmissions



## Key Findings--Longer Term 2015-

- Larger $CO_2$ reductions possible
  - 35-45% reduction from 2009 baseline
  - Retail price increase: $1000-3000
  - Payback 5 to >16 years
- Promising technologies
  - Advanced HEVs
  - HEVs available now, but not universal

# Example--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) | 315 | -9.3% | $640 | 0% | $0 |
| | DCP,A6 | 305 | -12.2% | $479 | 3.2% | -$115 |
| | DCP,CVT,EPS,ImpAlt | 304 | -12.5% | $708 | -3.6% | $68 |
| | CVVL,DCP,A6 | 291 | -16.2% | $864 | -7.7% | $224 |
| | DCP,DeAct,A6 | 288 | -17.2% | $662 | -5.7% | $22 |
| | DCP,Turbo,A6,EPS,ImpAlt | 280 | -19.4% | $266 | -8.7% | -$267 |
| | CVVL,DCP,AMT,EPS,ImpAlt | 266 | -23.4% | $873 | -15.6% | $233 |
| | GDI-S,DeAct,DCP,AMT,EPS, ImpAlt | 266 | -23.5% | $931 | -15.7% | $291 |
| | GDI-S,DCP,Turbo,AMT,EPS, ImpAlt | 252 | -27.4% | $369 | -20.0% | -$194 |
| Mid Term 2013-2015 | gHCCI,DVVL,ICP,AMT,EPS,ImpAlt | 273 | -21.3% | $880 | -13.3 | $240 |
| | DeAct,DVVL,CCP,A6,ISG,EPS, eACC | 261 | -25.0% | $1721 | -17.3% | $1081 |
| | CVAeh,AMT,EPS,ImpAlt | 252 | -27.6% | $929 | -20.2% | $289 |
| | CVAeh,GDI-S,AMT,EPS,ImpAlt | 243 | -30.0% | $1188 | -22.9 | $548 |
| | gHCCI,DVVL,ICP,AMT,ISG,EPS, eACC | 232 | -33.1% | $1796 | -26.3% | $1156 |
| | GDI-S,Turbo,DCP,A6,ISG,EPS, eACC | 225 | -35.3% | $1196 | -28.7% | $556 |
| Long Term 2015- | dHCCI,AMT,ISG,EPS,eACC | 278 | -19.9% | $1978 | -11.8% | $1338 |
| | ModHEV | 201 | -41.7% | $1479 | -36.2% | $839 |
| | AdvHEV | 163 | -52.6% | $2863 | -48.2% | $2223 |
| | HSDI,AdvHEV | 159 | -54.3% | $4088 | -49.6% | $3448 |

# Standard Development

- Define maximum feasible and cost-effective reductions for each vehicle type
  - Feasible--capable of being successfully accomplished within the time provided, taking into account environmental, economic, social and technological factors
  - Cost effective--economical to an owner or operator, taking into account the full life-cycle costs of a vehicle

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# Standard Development

- Translate vehicle-level results into standards applicable to manufacturer fleet
  - Performance-based (will not require specific technologies)
  - "Bubble" all on-vehicle climate change pollutants and sources ($CO_2$ equiv. gram/mi.)
  - Consider differences in upstream emissions for alternative fuel vehicles

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## Possible Approaches: Standard Development

- Single fleet average emission standard for all manufacturers
- Separate fleet average emission standards for different vehicle categories
  - LEV categories (PC, LDT)
  - Size-based
  - Weight-based



## Alternative Compliance

- AB 1493 requires regulations to allow alternative methods of compliance

  But...
- Must not dilute the requirements or emission benefits of regulations
- The goal is to improve the vehicles themselves



## Preliminary Staff Approach

- Allow averaging, banking, trading
- Allow aggregation across pollutants
- Apply standard criteria for emission credit trading
  - Emission reductions must be real, quantifiable, surplus, enforceable, permanent



## Preliminary Staff Approach

- Additional limitations on generation and use of credits
  - Must be sponsored by auto manufacturer
  - Must involve light duty vehicles or alternative fuels
  - Cap on use of credits
  - No increase in criteria pollutant or toxic air contaminant emissions

## Credit For Early Action

- Regulations must grant credit for reductions achieved prior to operative date
- Staff approach still under development



## Environmental Impacts

- Emission impacts (EMFAC)
  - Climate change emissions
  - Criteria pollutant emissions
- Multimedia impacts



## Economic Impacts

- Potential impacts on state economy
  - Job creation
  - Business creation, elimination or expansion
  - California business competitiveness
  - Auto workers and affiliated businesses
  - Cost to state and local agencies
- EDRAM modeling



## Community Impacts

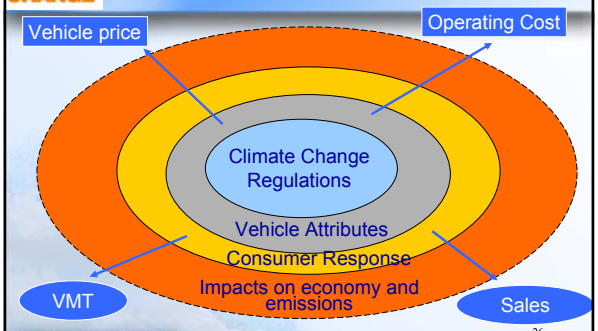
- Potential impact on minority and low-income communities
  - Environmental impacts
  - Economic impacts on community
  - Ability to maintain and attract businesses

## Other Considerations

- Manufacturer response
  - e.g model availability
- Consumer response
  - Vehicle sales (price elasticity)
  - VMT (rebound effect)
- Societal benefits



## Consumer Response






## Next Steps

- April 20 Technology workshop
- May Release draft staff report
- June Workshops on draft staff report
- August 6 Release final staff report
- Sept. 23 Board hearing



## AB 1493 List Serve

- Provides subscribers with automatic email notification
  - Notice of workshops and meetings
  - Posting of documents on ARB website
- To subscribe, go to ARB website and follow prompts
  - www.arb.ca.gov/listserv/cc/cc.htm