



South Coast Air Quality Management District

Technology Advancement Office
Plug-In Hybrid Vehicle Program

Lisa H. Mirisola



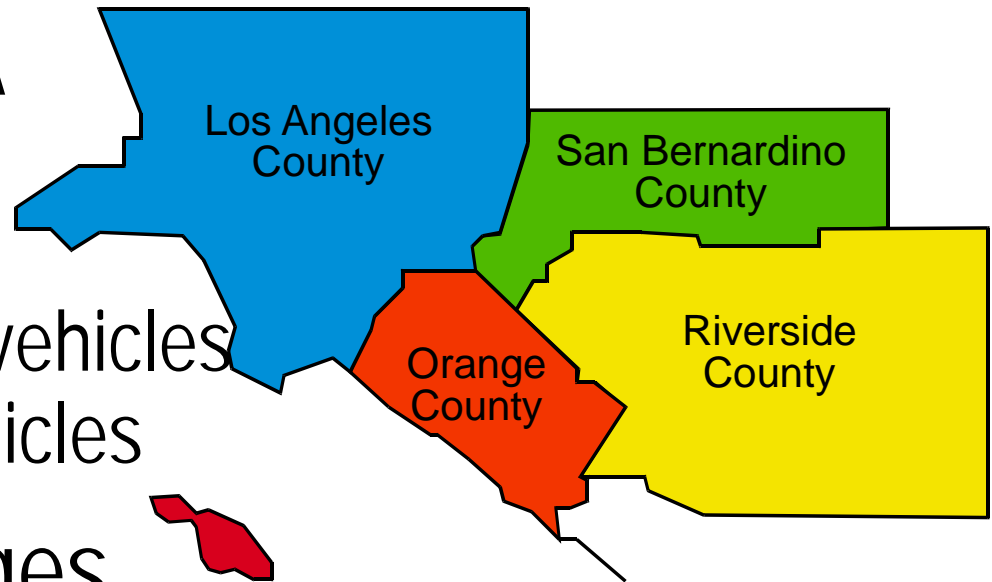
US EPA
State Clean Energy-Environment Technical Forum
Plug-In Hybrid Electric Vehicles (PHEV)

March 15, 2007

AQMD Background

- Greater South Coast Air Basin

- 4-county region in CA
- 11,000 sq. miles
- 16 million people
- 261 thousand diesel vehicles
- 9 million gasoline vehicles

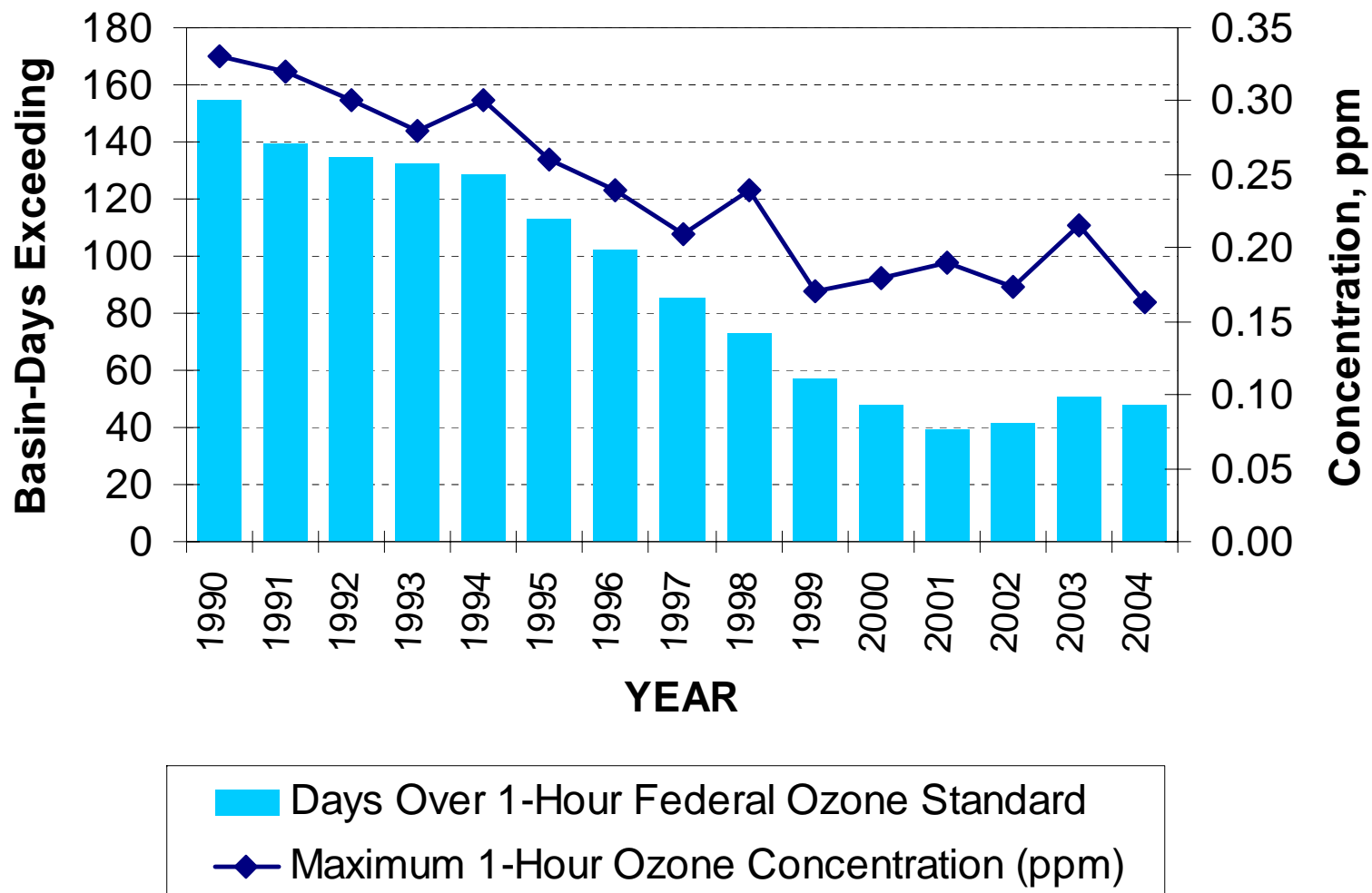


- Attainment challenges

- Further NO_x and PM reductions needed to meet health standards

Ozone, 1990-2004

3-Year Average Basin-Days Exceeding 1-Hour Standard



Tools for Cleaning up Our Air

- Air Quality Management Plan
- Regulate stationary sources & public fleet activities
- Co fund Technology Demonstrations
- Provide incentives and emission credits to voluntarily use cleaner products
- Rely on state and federal regulations to set emission standards for mobile sources

Advanced Technology Approach

- Technology Advancement Office began in 1988
- Portfolio of possible solutions
- Applications with different “payback” timing
 - Short-term, mid-term, and long-term
 - 100+ projects on-going
- Leverage federal, state and private efforts
 - Infrastructure and utilization
- Government’s role is to accelerate technologies through demonstrations to overcome *status quo*

Advanced Technologies

Near-Term

- Aftertreatment
- Emulsified Diesel
- HD Natural Gas Engines
- Natural Gas Fueling Infrastructure
- Advanced Diesel Engines
- Hybrid Vehicles (Plug-in & Hydraulic)
- Gas to Liquid Fuel
- Renewables/Biofuels
- H2 Technologies & Refueling
- Fuel Cell Vehicles



Longer-Term

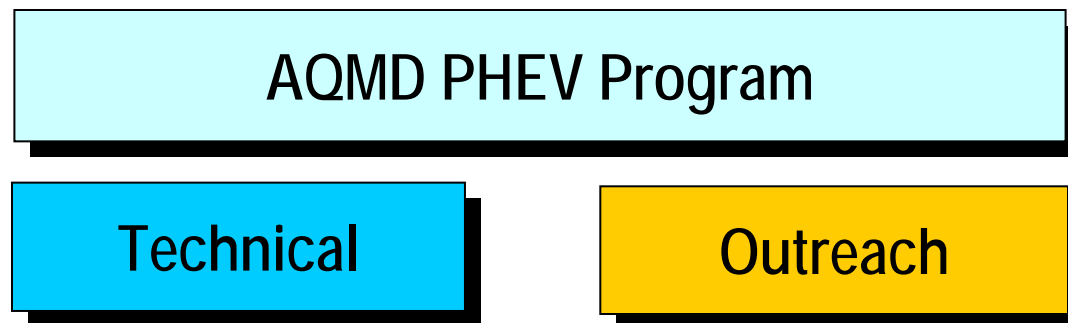
Plug-In Hybrid Projects 1998-2005

- UC Davis entries – US DOE Future Car & Future Truck “Battery Dominant” Hybrids
- EPRI Attributes & Commercialization HEV studies
- Southern California Edison Plug-in hybrid microturbine utility truck



Develop Research Program to Address Critical Issues

- March 4, 2006, Board directed staff to expand PHEV activities
- April 7, 2006, Board approved staff recommendation for expanded program
 - PHEV Technology Plan
 - PHEV Outreach Plan



Timeline of Recent Efforts

- May 2006 – Board Expanded Efforts
- June 2006 – Informational Briefing
- July 2006 – Forum & Technical Roundtable
- September 2006 – ARB ZEV Symposium
- September 2006 – Plug-In CA Initiative
- November 2006 – Thirty Vehicle RFP
- Draft AQMP Control Measure and ARB ZEV reg
- Ride and Drives & Outreach ongoing

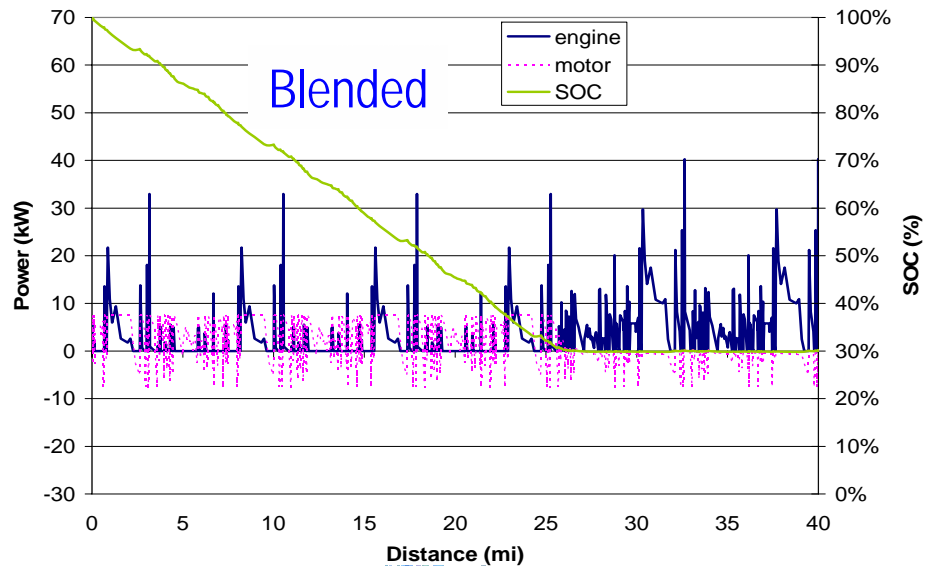
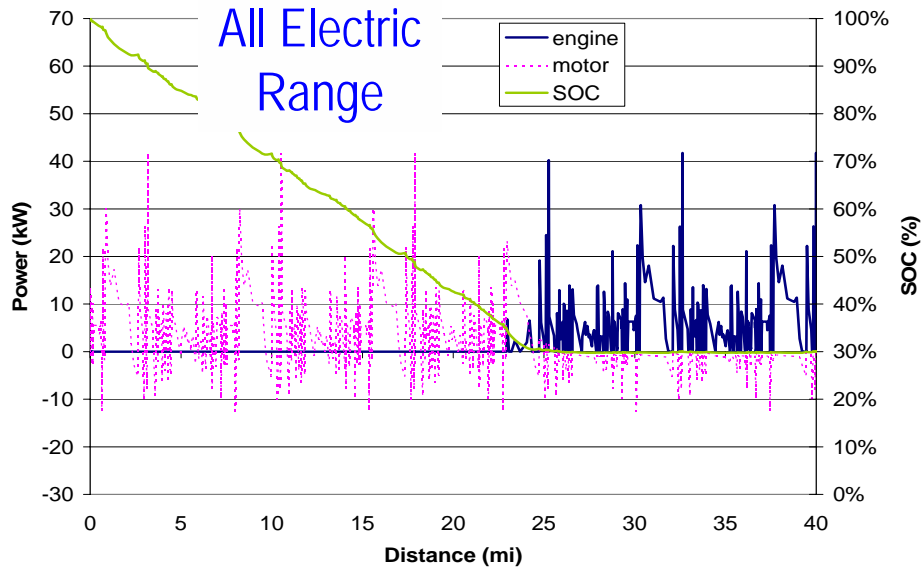
Plug-in Hybrid Electric Vehicle Forum & Technical Roundtable Wednesday, July 12, 2006



- All-day meeting
- Presentations and discussion by experts
- 2nd in the series of technical roundtables
- Webcast & presentations posted



Different PHEV Modes



Emissions Benefits Need to be Measured

- Cold-starts determine emissions for LEV II SULEV passenger vehicles
- Clear benefits
 - Delivery applications
 - Energy diversity
 - GHG

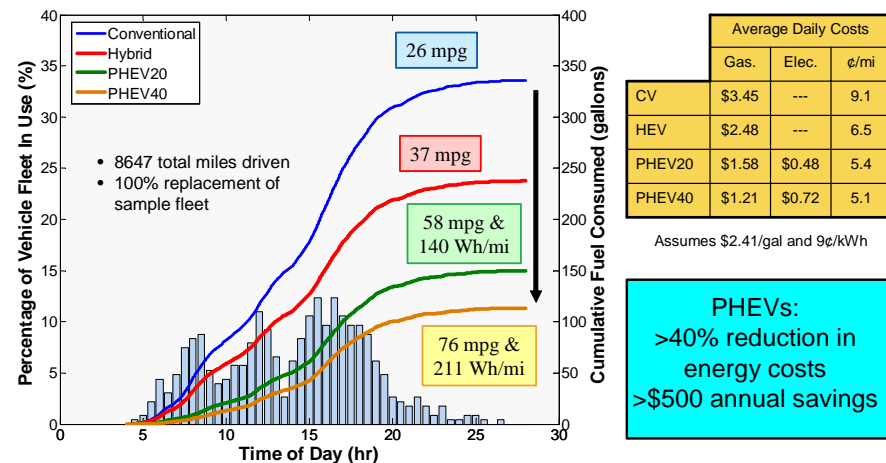


Early Demonstrations Beneficial

- Consensus that early demos desired
- Data input for modeling
- 100 – 200 vehicles
- DOE initiating roadmap in 2007
- AQMD and CARB opportunity

PHEVs Reduce Fuel Consumption By >50% On Real- World Driving Cycles

227 vehicles from St. Louis each modeled as a conventional, hybrid and PHEV



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NREL National Renewable Energy Laboratory

Roundtable Conclusions

- Lithium Ion battery technology most promising but cost is currently high
- Current hybrid architecture (charge sustaining) will work in “blended” strategy
– most likely initial product
- All electric range promises most air quality benefits but requires larger battery

Plug-In Hybrid Projects 2006+ Progress Overview

- PHEV Prius in demo (EnergyCS)
- PHEV Sprinter vans (EPRI-DaimlerChrysler)
- PHEV Jetta w/ Li batteries (AC Propulsion)
- PHEV Utility Boom Truck (EPRI – Eaton, Ford)
- Request Proposals for 30 PHEV



PHEV Prius (EnergyCS)

- AQMD demo 2 PHEV Prius
over 14,000 combined miles as PHEVs
- ARB emissions study
one PHEV, time limited, but SULEV capable
- Additional demos
CalCars, city of Santa Monica, Clean-Tech, SCE,
SMUD, PG&E/BAAQMD, Manitoba Hydro
- Up to 5 total for AQMD – current contract

PHEV Sprinter Van (EPRI-DaimlerChrysler)

- 2 prototype PHEV Sprinter vans in test at SCE
- Fleet operation of prototypes at SCE & AQMD
- Next phase – 5 next gen for AQMD
30 van demo in US & Europe
- Amended utility prototypes for passengers

PHEV Jetta w/ Li batteries (AC Propulsion)

- Li battery integration complete
vehicle ready for demo
- Shares battery strategy with Ebox
(low cost consumer 18650 cells)
- Series hybrid system
(increasing US OEM interest)
- In demo this year

PHEV Utility Boom Truck (EPRI – Eaton, Ford)

- Ford F550 Chassis, Eaton integration
- Add PHEV to Eaton hybrid electric dev
- Demos w/SCE, LADWP, PG&E



30 PHEV Project

- Timeline
 - RFP issued November 3, 2006
 - 5 proposals received & evaluated
 - \$2.7M approved from AQMD March 2, 2007
- Demos at up to 15 sites within AQMD
- 2 passenger vehicle platforms
 - 20 Quantum Escape PHEVs
 - 10 Hymotion Prius PHEVs

AQMD's Clean Air Choice Program

- Features the cleanest new retail passenger vehicles LEV II SULEV and cleaner
- Part of the AQMD website <http://www.cleanairchoices.org>.
- Out of 34 models listed for 2007
 - Nine gasoline hybrids
 - One natural gas
- Outreach Efforts with wrapped vehicles

