

Transportation... Its Electrifying

**Ed Kjaer
Director, Electric Transportation
Southern California Edison
February 1, 2006**

Question.

**What has the potential to completely
change the way we think about
energy security, energy storage,
energy efficiency, gas stations and
transportation?**

Answer.

...The Electric Grid

The Transportation “Energy” Scene

1990's

2000-----2010

2015 >

ZEV Mandate

2nd Iraq War

Rise of terrorism

1st. Iraq war

9/11

Growing State/Fed Air Qual. Regs.

Comprehension of
China/India's impact on oil

Global oil reserve revisions

National Energy Security concerns

Global warming concern grows

Rise in patriotism

Changing Automotive Buyers

Driving Transportation To Reduce...

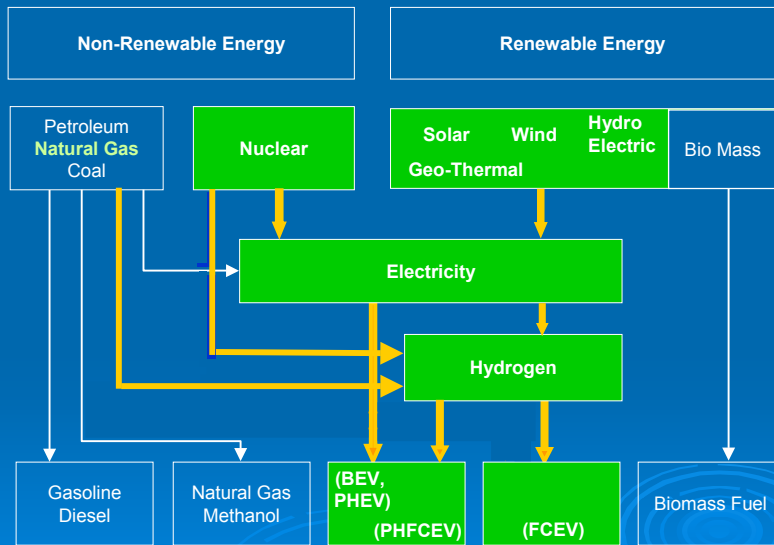
Petroleum
Reduction/Diversity
(95% one Fuel, 60% Imported)

Electro-drive
-One
Solution

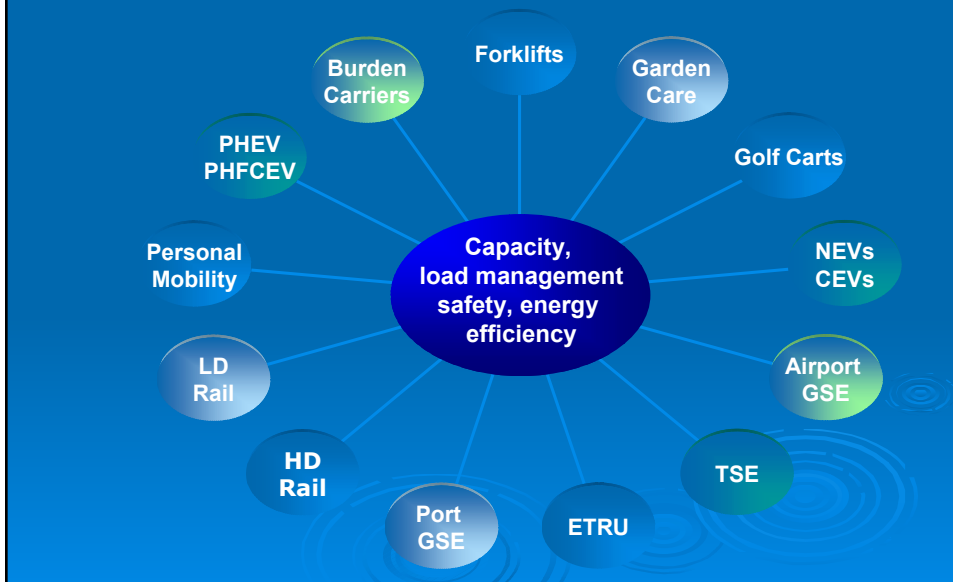
Air Pollution
Largest Source; 65% of all
Criteria Pollutants

Global Warming
Largest Source From
Transportation; Over 40%

...And Converging With Electricity Grid



And Its More Than Just Our Cars... Today and Tomorrow



Increasingly, Agencies Focusing On Electrification To Reduce Petroleum, GHGs, Emissions

The California electric grid:

- About 20 – 30 % cost of petroleum (gallon equivalent)
- Expands use of renewable energy-
- Utilizes excess off-peak capacity
- 100% domestic based, virtually 100% petroleum free, multiple feed stocks
- Reduces urban air pollution (ZEV miles)
- Reduces GHG by 65% (from natural gas) and 100% (from renewables)
- Power Plants only getting cleaner over time (regulations, technology)

Near Term Solutions: Port Electrification

- **Ship Emissions**
 - One ship = 4 tons pollutants at the dock
 - 16 ships arrive at port each day
- **Potential Solution- “Cold Ironing”**
 - Navy has used it a long time
 - Commercial applications in Europe & LA
 - Ground support- cranes, Heavy Duty HEVs, etc



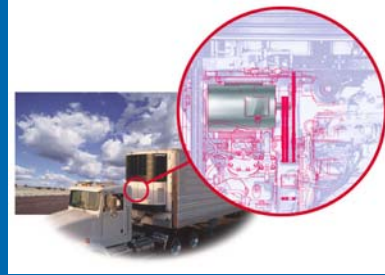
Near Term Solutions: Truck Stop Electrification

- **About 67,000 sleeper cabs in CA**
- **Potential Solution: TSE**
 - Off-board HVAC & electricity
 - Shore power (120v/240v) with onboard HVAC
- **New CARB rule allows TSE as compliance option**
- **Cost-Effective to reduce main engine or diesel APU fuel consumption**

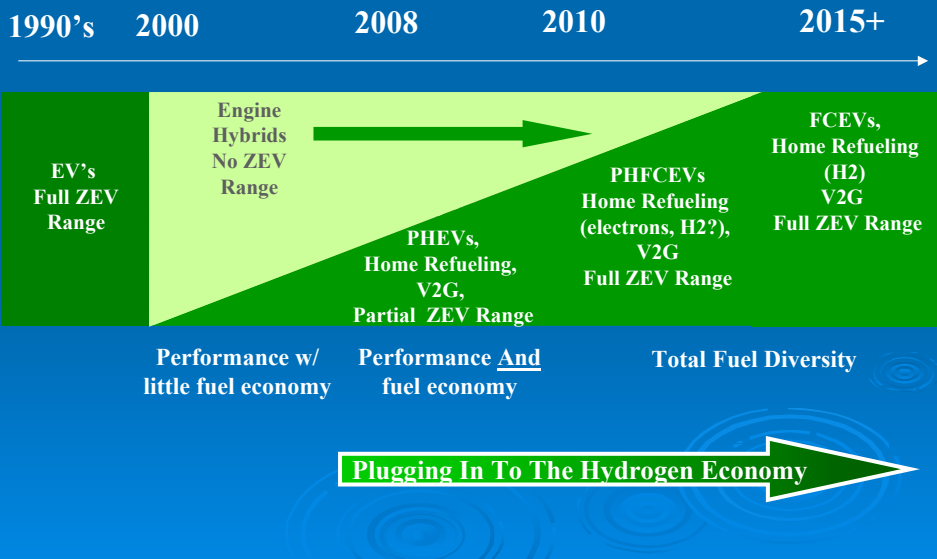


Near Term Solutions: Electric Transport Refrigeration Units

- About 4,000 – 7000 e-TRUs in California
- e-TRUs plug in at warehouse or port , use diesel on road
- Existing CARB rule allows electric as compliance option



Mid Term Solutions: Plug-In hybrids



How is SCE Addressing Growing Transportation Electrification?

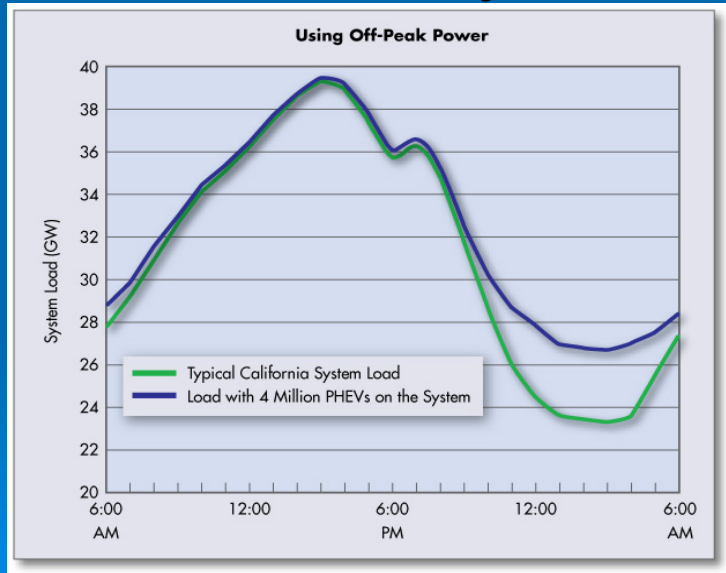
- Operation of the nationally recognized Electric Vehicle Technical Center (EVTC) in Pomona, SoCal
- Operation of the nation's largest and most successful fleet of electric vehicles
- Extensive system impact, durability, reliability, safety testing of all forms of electro-drive
- Demonstrations of technologies in real world applications
- Load management, Demand Response, Energy Efficiency and education programs to reduce customer costs/ system impact

Issues To Consider

- Load Management- marginal transportation Load absorbing off peak capacity first
- Improving the energy efficiency of existing electro-drive
- Regulatory/legislative consistency- EAP2, IEPR, Governor's Strategic Growth Plan and Petroleum Reduction Strategy, Climate Action Team report, etc
- Participating in Moyer program- system complexity

Appendix

PHEV Load Predominately Off-Peak



Plugging In...A Growing Trend In Automobiles?

- *We are looking at a range of potential alternative fuel solutions to address the issues around eliminating our dependence on fossil fuels and global warming--and it **may include a plug-in hybrid**.* Gerhard Schmidt, Ford VP
- *We are watching [plug-in designs] with interest. It is **probably within the range of solutions** we would consider eventually as an alternative power plant design.* Toyota spokeswoman Cindy Knight

Plugging In...A Growing Trend In Automobiles?

- *Lieberman said he soon plans to introduce legislation to require 10 percent of new cars to be **hybrid electric plug-in** or alternative fuel vehicles by 2007.* ABRAM KATZ, Register Science Editor
- *We should have a **national program to promote plug-in hybrid** cars running on electricity and biofuels.* Robert F Kennedy Jr. NRDC
- *Conservative Senators have plug-in HEVs in their bill (S. 2025) including Hatch, Brownback, Coleman, Sessions, Lugar, Bayh, Salazar, Nelson, Lieberman, Obama*

There have been battery breakthroughs

- According to EPRI advanced batteries are currently available that meet the requirements of plug-in hybrids.
- This includes Nickel Metal Hydride and Lithium Ion
- The technical challenge is to reduce the cost of batteries through mass production, and integrate them into the vehicle, including the battery control systems
- In addition PHEVs with only 20 mile battery can use 120 volt existing infrastructure (home and work) and use a battery 20-30% the size of a pure EV battery.

Editorials and Press Coverage in Last Two Years on PHEVs

- **Editorials**
 - New York Times, Newsweek, Lou Dobbs - CNN, Tom Friedman, Max Boot, Former officials including George Shultz, James Woolsey, Frank Gaffney, Bud McFarlane, and many more.
- **New Coalitions** including Set America Free which includes "Hawks" and "Greens"
- **New Studies** including a new study from the bipartisan "National Commission on Energy Policy" and studies from CARB and CEC
- **Major media coverage** including LA Times, NY Times, Time Magazine, Business Week, IEEE Spectrum, Wall Street Journal, USA Today, Wired, Associated Press, Reuters, ABC, NBC, CBS, CNN, PBS, NPR and many more.

National interest is rising

- **Jan. 24, 2006: A year-long national campaign to get “Soft orders”, petitions, resolutions and local incentives for PHEVs was launched**
 - See www.pluginpartners.org
- **Founding partners include:**
 - 10 cities including LA, San Francisco, Denver, Seattle, Baltimore, Fort Worth, and led by Austin TX
 - Senator Hatch (R- Utah) and New York Gov. Pataki
 - 12 non-profits, 15 environmental groups, 3 national security groups, EEI and APPA, and over 140 small and large municipal utilities in 33 states