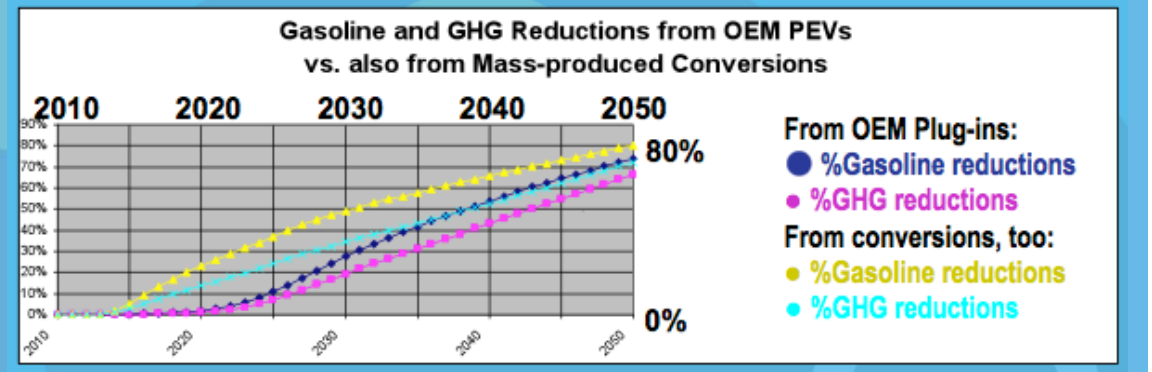
Plug-in Vehicles & Petroleum's Future

September 27, 2010

Felix Kramer, Founder
The California Cars Initiative
info@calcars.org



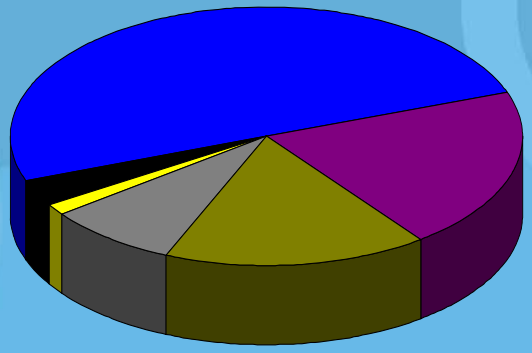
For updated PDF of presentations:
www.calcars.org/downloads

What would it take to get transportation 50% OFF FOSSIL FUELS — in 20 years?

Electricity isn't just different—it's better than oil

1. ECONOMICS: <u>CHEAPER</u> -- electric miles at a quarter the cost

2. CLIMATE: <u>CLEANER</u> -- 50% less CO2, even on our half-coal national power grid



3. ENERGY SECURITY: <u>DOMESTIC</u> -- Only 1.5% of electricity comes from oil in US

Nonprofit Startup: CalCars' successes & challenges

Technology (demos)

Advocacy (buyers)

2004

2006

2009

A coalition between the tree-huggers, the do-gooders, the sod-busters, the cheap hawks, and the evangelicals.
– former CIA Director James Woolsey

More @ CalCars Photos pages

Google's Brin + Page

Plug-in drivers with GM's Volt Engineer Tony Posawatz

Every carmaker interested; races to be first; timetables

(trackers: CalCars.org, PlugInAmerica.org, PlugInCars.com)

selling in China

Volt 2010; Converj next; Ampera; blended PHEV SUV?

BRIGHT AUTOMOTIVE

HYUNDAI

TOYOTA

mid-2012

HONDA

2012

Karma 2010, Nina 2012

FISKER

Ford

2012

PERSU mobility

SUZUKI

JAGUAR

VOLVO

MITSUBISHI MOTORS

~2005 prototypes

Audi

SAIC

if & when:

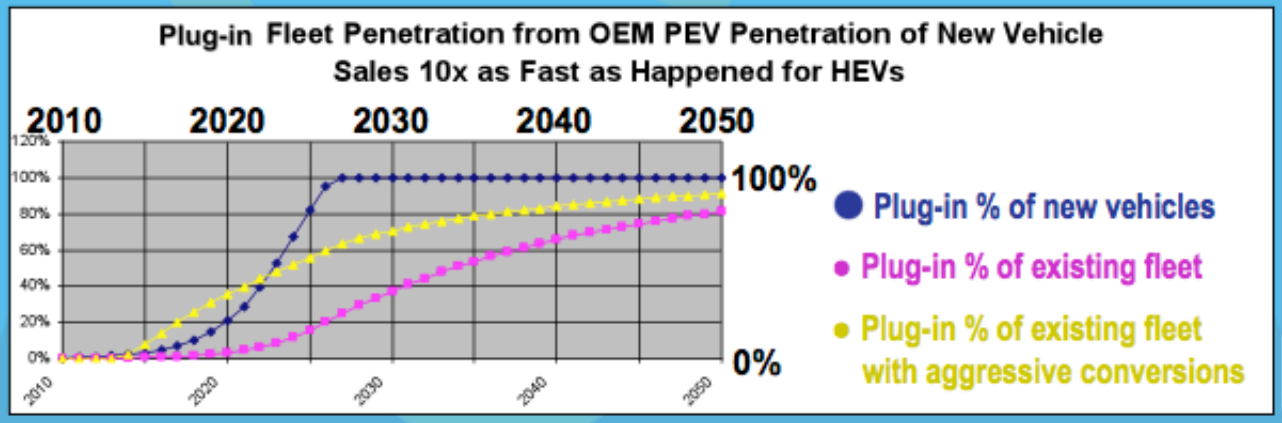
CHRYSLER

RENAULT

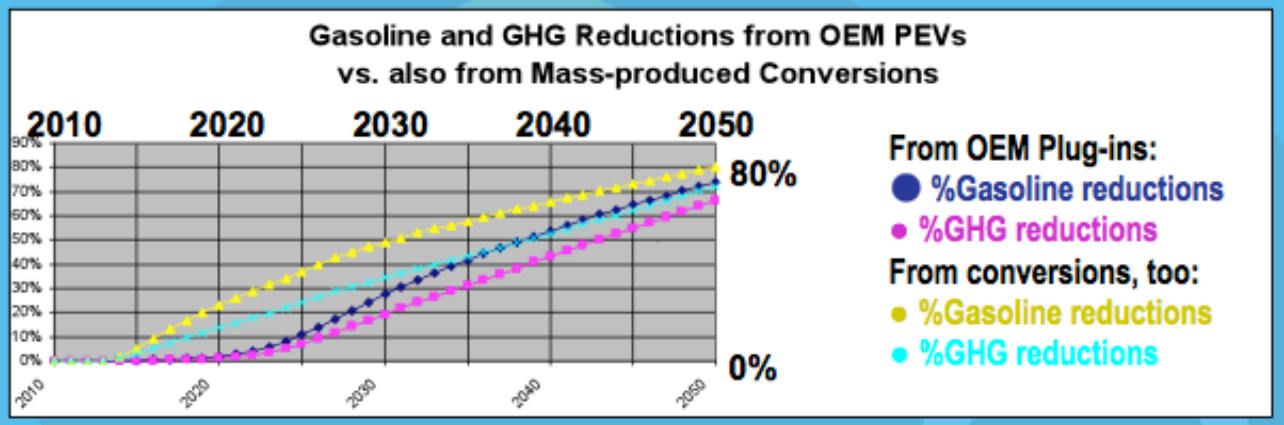
NISSAN

CalCars
THE CALIFORNIA CARS INITIATIVE

For impacts, retrofits many of 250M vehicles



Virtually all near- and mid-term oil consumption benefits come from retrofits for a 10-20 years.



Maximum long-term CO2 reduction requires a combination of new vehicles, retrofits, and sustainable biofuels.

Next: Companies Can "Fix" Millions of Gas-Guzzlers

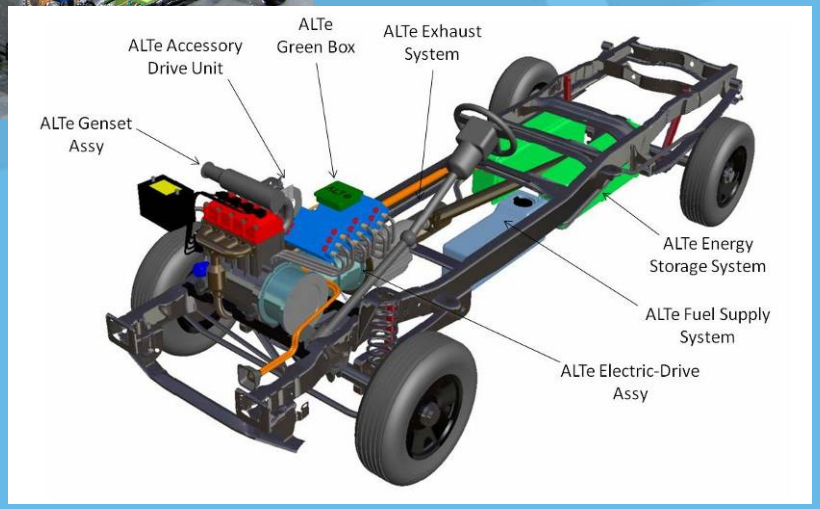
HEVT's Ali Emadi, CalCars' Felix Kramer, Intel's Andy Grove, Efficient Drivetrains' Andy Frank

ALTe, LLC

- Staffed by auto industry and Tesla alumni
- Modular approach for vehicles from 2,000 lb to 16,000 lb
- 80% - 200% better fuel economy
- $25,000 drivetrain replacement
- Customers/contracts/ nationwide installer network
- Aim: 90,000+/year powertrains annual volume
- Applied for $100M DoE ATVM Loan, closing equity investments

Engineering and mass producing Series PHEV and EV complete powertrain conversion kits and platforms

F-150 pickup and ParkingSpot van at June launch of new 185,000 sq.ft. Michigan facility



Rapid Electric Vehicle Technologies, Inc.

rapidelectricvehicles.com
Vancouver British Columbia

- Developing partnerships with Canadian dealers.
- All-electric and PHEVs starting with Ford trucks and SUVs.
- Contracts pending with public and private fleets.
- Seeking investment funding.

Hybrid Electric Vehicle Technologies, Inc.

World's First Plug-in Hybrid Electric Pickup Truck, *hevt.com* *Chicago IL*

- **Founder: IIT Prof. Ali Emadi, leading power electronics expert.**
- **40 million trucks/buses in U.S; 2 million added annually.**
- **F-150 prototype design scales to F-250, 350, school and transit buses.**
- **Simple payback: 2-5 years.**

- **Uniquely converting America's most popular pickup truck, the Ford F-150, to a plug-in hybrid; more than 15 months of testing.**
- **Up to 30 miles all-electric range; up to 40% MPG improvement as a hybrid (beyond all-electric range).**
- **Up to 90 tons of CO2 savings in 12 years; V2G capability; increased low-speed torque for better towing.**
- **ESTIMATED COST IN VOLUME PRODUCTION: $15,000 OR LESS.**
- **Seeking investment funding.**

Raser Technologies

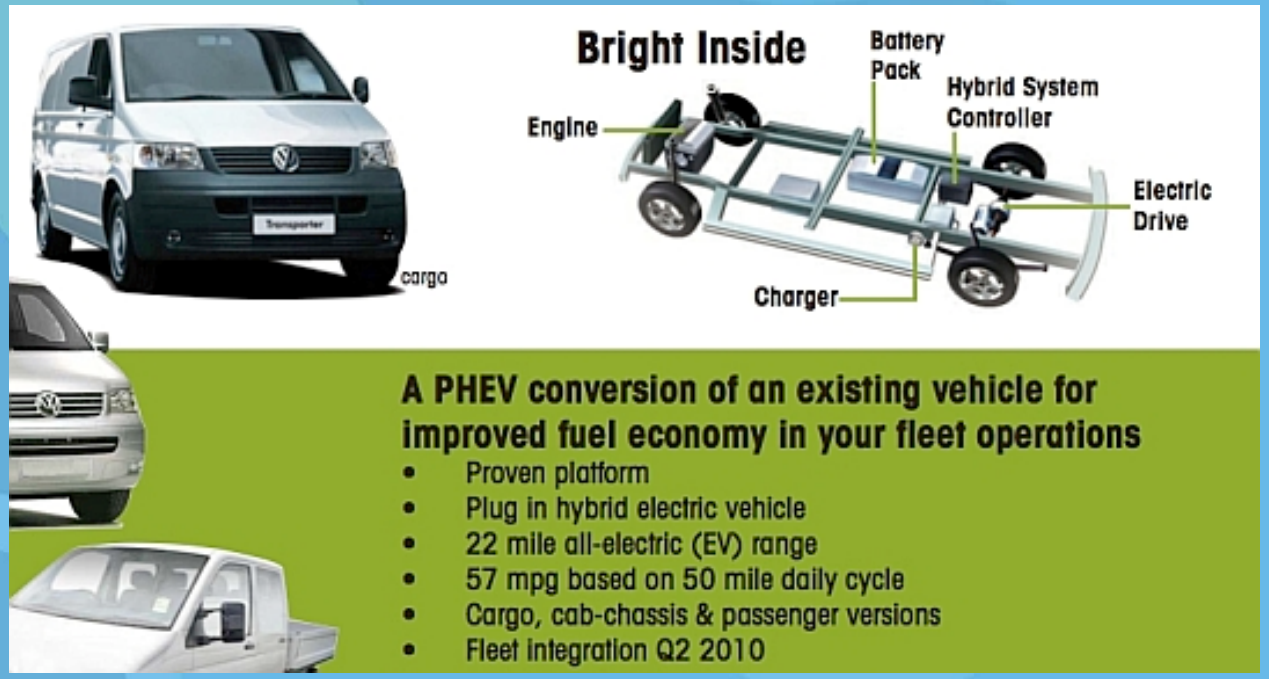
Rasertech.com.com
Provo, Utah

- **Retrofit Hummer H2**
- **Precedent: General Motors provided technical support/contact with engineers.**
- **40-mile range series PHEV developed with FEV**
- **Promotion for Raser's Traction Drive System; commercial plans unclear**

Bright Automotive

Brightautomotive.com
Anderson, Indiana

- **Interim demonstration of technologies in future Bright "IDEA."**
- **Platform is VW Transporter (world vehicle, not in U.S.)**
- **Company beginning first prototype.**
- **Future partnership with VW possible.**
- **Rocky Mountain. Inst. spinoff**



Efficient Drivetrains Inc.

efficientdrivetrains.com
San Francisco-Sacramento region

- CoFounder & CTO Prof. Andy Frank, UC Davis, inventor of modern PHEV.
- Working with car/truck OEMs, conversions, first-tier suppliers to embed innovative drivetrain system designs, components -- parallel, series, and retrofit technologies.

- Patent portfolio: hybrid fundamentals, continuously variable transmissions, energy management systems.
- Projects in U.S., Europe, and Asia : two-wheeler, V2.0 parallel PHEV drivetrain for light and medium duty, inline CVT, CVT integration, and controllers.
- 2008/2009 operations funded from customer revenues.
- Seeking $2-3M in expansion funding now.

Poulsen Hybrid, LLC

poulsenhybrid.com ***Shelton, CT***

$8,600 suggested retail price (before tax incentives) for complete Poulsen Hybrid System installed with 4.5 kWh Lithium-ion batteries, wheel motors and brackets.

- **Conversions for the most popular compact cars & SUVs.**
- **20-30 mile battery assisted range matches 70% of US daily commutes.**
- **Four-hour local installation.**
- **Business model scales to convert tens of thousands/year.**
- **Creates green authorized installer jobs in communities everywhere.**

What will it take to start now?

End Business As Usual (BAU):*

- Equalize tax incentives
- Drive Star — "built" environment /prize/ local jobs
- Carbon price NOT enough!
- Europe: $7/gallon; China $5

Smartest/best uses for resources/technologies/facilities

- Hydrocarbons "sequestered"
- Geothermal
- Switch sides: R&D, investments, contributions

www.calcars.org/ice-conversions.html

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08/20/10:	Media Coverage of Gas-Guzzler Conversion Companies Grows