

# What's Next for Plug-In Vehicles?

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**The Networked EV  
San Francisco, CA**

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**For updated PDF of presentations:  
[www.calcars.org/downloads](http://www.calcars.org/downloads)**



***And How Could Plug-Ins Grow  
Fast Enough to Get Vehicles  
50% OFF FOSSIL FUELS — in 20 Years?***



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**THE CALIFORNIA CARS INITIATIVE**

[www.calcars.org](http://www.calcars.org)

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

## Nonprofit startup CalCars' helps spark a campaign

Technology  
(demos)

Advocacy  
(buyers)



2004



2006



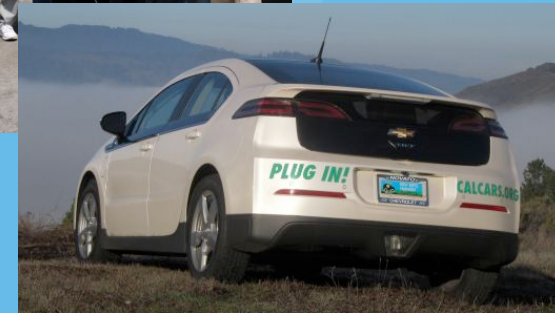
2007



2008



2010



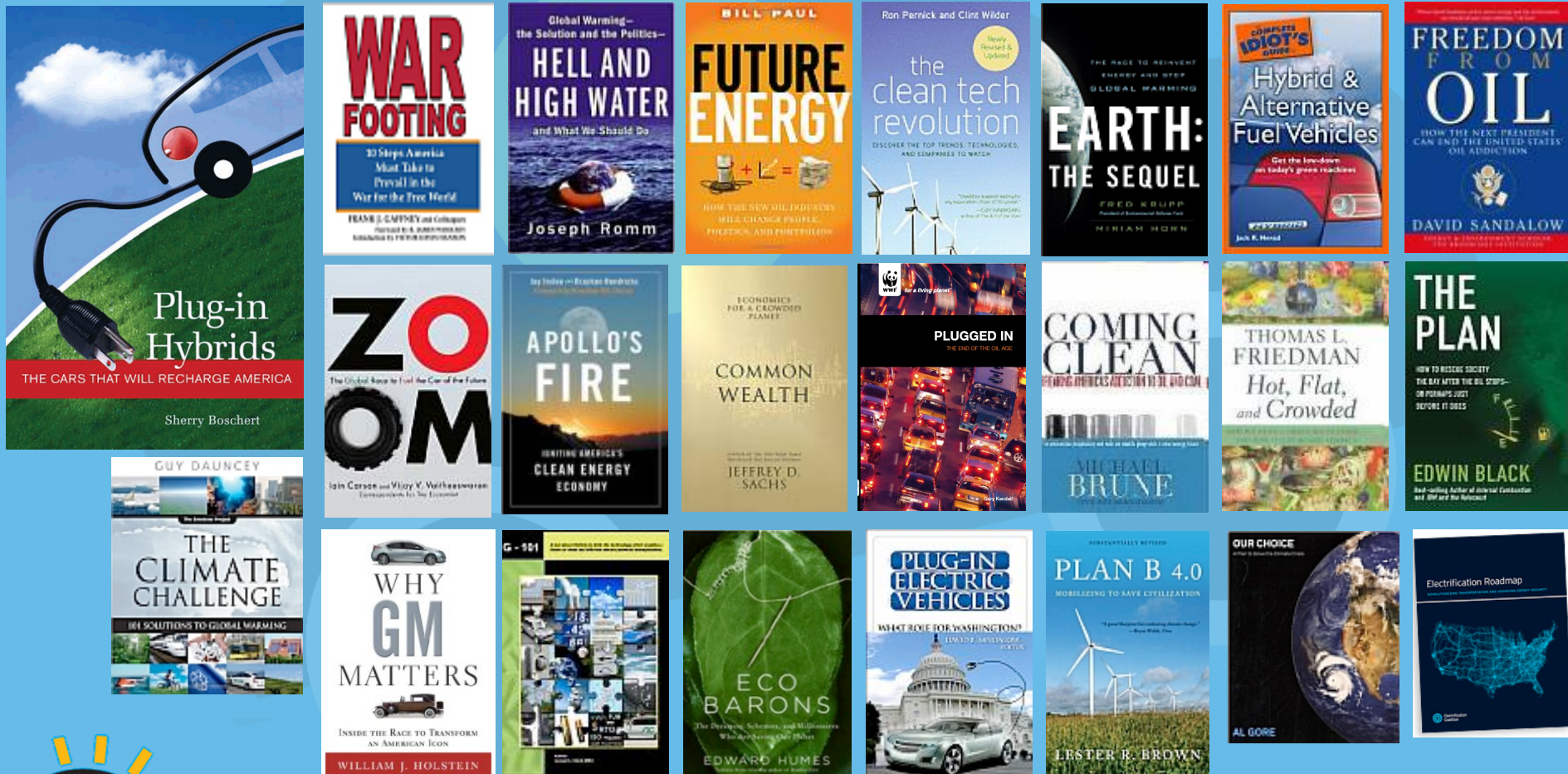
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Link for info and to order at [CalCars.org](http://CalCars.org) home page

2005-2009: 27+ book; dozens since (+movies!)



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*Wikipedia: "modern production plug-in vehicles"*

Every carmaker on board (below as of 2010)

*Trackers: PlugInAmerica.org, PlugInCars.com, Wikipedia*



*if & when?*



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# Victory! How often do our dreams come true?



***Professor Andy Frank's 40-year quest fulfilled;***

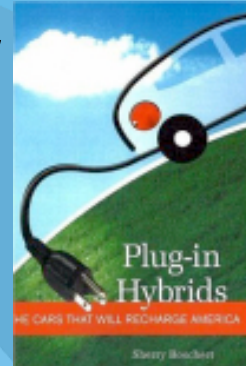
***CalCars & plug-in advocates' 10-year campaign brings plug-ins to dealers — much more to do to ensure success***



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***Read the story of the campaign's early years***



***World's 1<sup>st</sup> household with Volt & Leaf (briefly, a three-plug-in fleet)***



# What will help get to one million PEVs by 2015?

## **Smart strategies by OEMs to promote PEVs**

- Less sniping and gossiping about who will win/which is better
- Best marketing and PR comes from early adopters
- GM and Nissan participation in National Plug-In Day

## **Cooperation between OEMs and advocates to evolve PEVs**

- Great cars but primitive interfaces and usability
- Talk to, work with owner groups and users working to “improve” cars

## **Essential continuing role by all levels of government**

- Combat misinformation and disinformation
- Smart use of tax credits and infrastructure support
- Wild card: low price of natural gas/oil affects all renewable solutions



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# How to stay plugged in to an evolving market

## Trade associations, advocates, networkers (besides CalCars.org)

- PlugInAmerica.org (national)
- ElectricAuto.org (chapters)
- ElectricDrive.org (EDTA trade association)
- SierraClub.org/ev (national & chapters)
- ProjectGetReady.org & local utility programs

## Key information sources

- NEWS: • EVWorld.com • PlugInCars.com • AutoblogGreen.com  
• GreenCarCongress.com • Autoobserver.com/green (Edmunds)
- USERS: • GM-Volt.com • MyNissanLeaf.net • soon others
- BIG PICTURE: • ClimateProgress.org • Rocky Mountain Inst. rmi.org



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# Next: “Big Fix” to retrofit millions of vehicles



*Pioneer proponents for a new global industry in 2008: Ali Emadi (HEVT), Felix Kramer (CalCars), Andy Grove (Intel), Andy Frank (Efficient Drivetrains)*



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# Fossil fuels = security & climate change challenge

- “Energy Independence” impossible on a global fuel on which we spend over a \$billion a day.
- Results: deep drilling, tar sands, and petro-dictatorships.
- To stabilize CO<sub>2</sub> even at 450 ppm, which most scientists believe is above many tipping points, the IPCC recommends 20% GHG reductions from 1990 levels by 2020, 80% by 2050
- Transportation's share of GHG emissions
  - 20% globally
  - 30% in the U.S.
  - 40% in California
  - 50% in metro CA



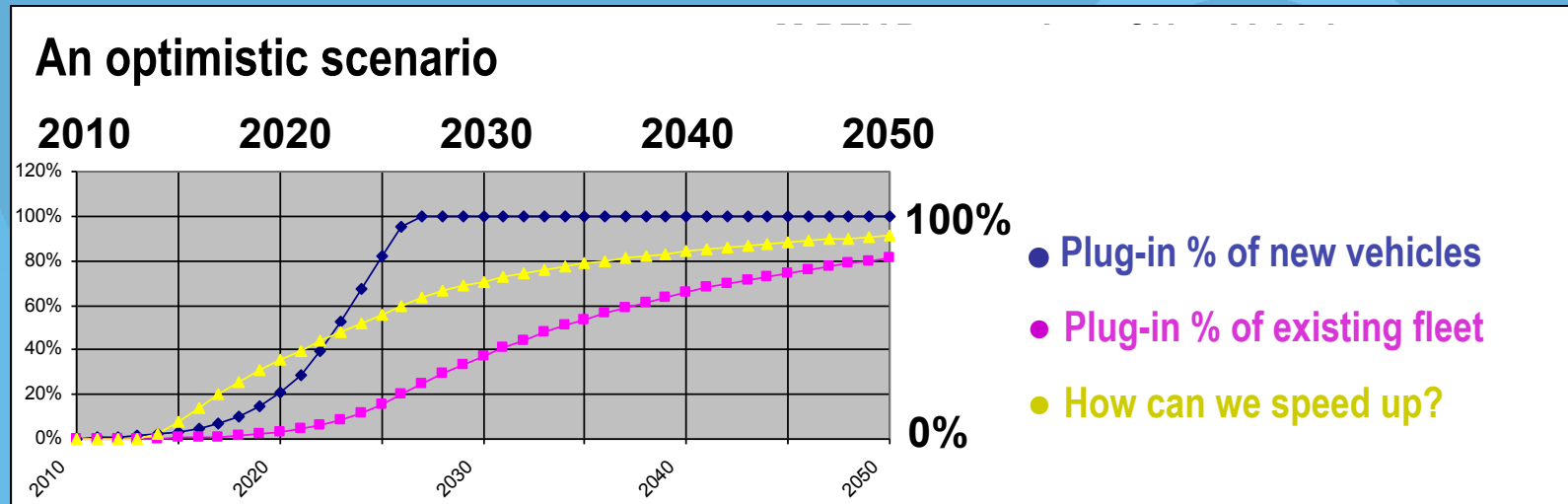
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# We can't get there just with new vehicles

- Even at **10x** hybrids' 10-year penetration rate, by 2020, PEVs will only:
  - Total 21% of new vehicles; 79% will *still* be *new* ICEs, each guzzling gas for *another* 15+ years!
  - Total 3% of the fleet
  - Reduce oil consumption by 2% and carbon emissions by 1%

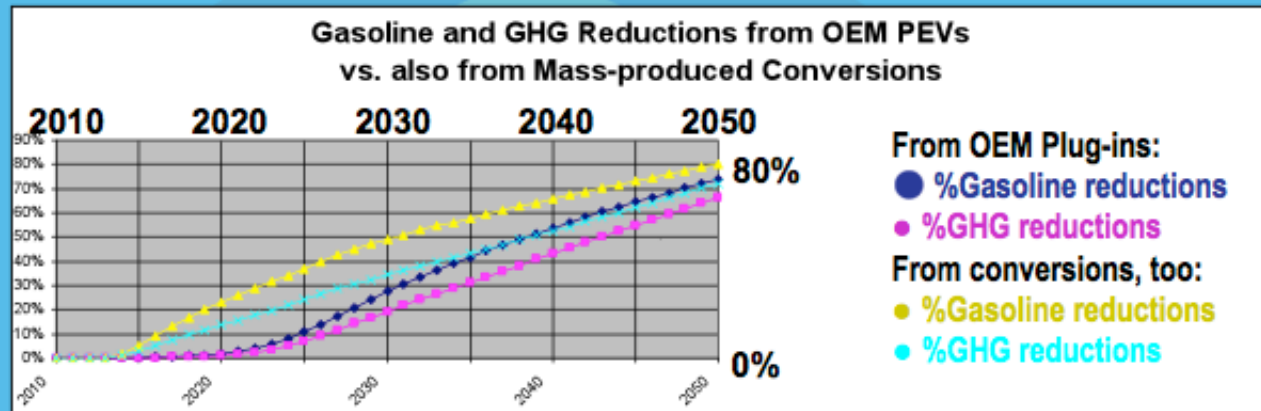
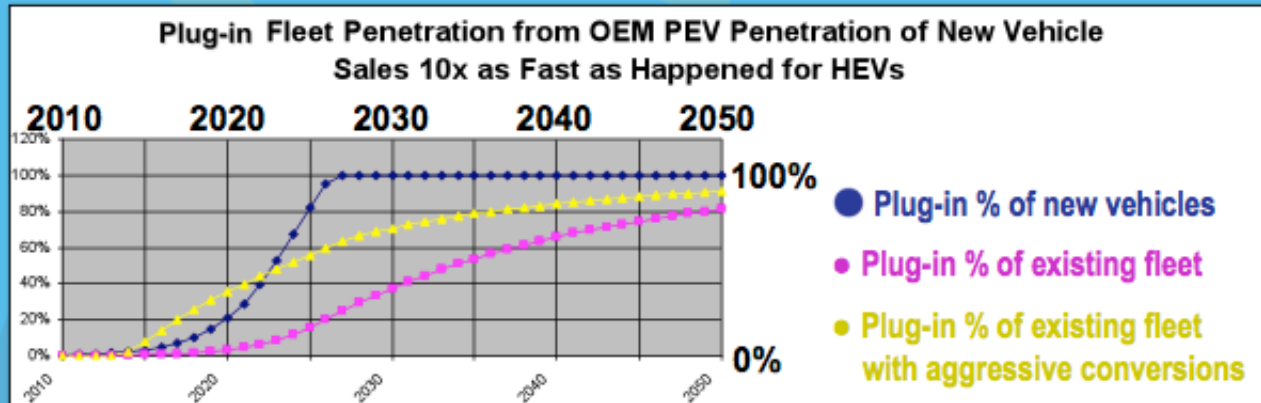


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# Go beyond new plug-ins to get 50% off oil by 2030



Virtually all near-and mid-term reductions come from retrofits for 10-20 years.

Maximum long-term CO<sub>2</sub> reduction requires combination of new vehicles, retrofits, and sustainable biofuels.



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### The low-hanging fruit: pickups, vans, buses, larger vehicles, those with defined drive cycles

- They use 50% of transportation fuel; generally have room for batteries
- Due to scale, conversion cost is lowest per gallon of fuel saved
- Vehicles with known, limited routes can become BEVs; others, PHEVs
- Conversions can extend the life of vehicles and be especially attractive to fleets that look at TCO (lifetime total cost of ownership)
- Conversions can be:
  - Custom designed, tested, and certified for the most popular vehicle models and types
  - Built in recently closed auto assembly plants
  - Installed by local dealers and repair shops, providing local jobs across the country



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### Three options for conversion vehicle architectures

- See website & white paper (we've started analyses for pick-up trucks):
  - Add PHEV components to the existing drivetrain: ~\$5k + battery
    - Cheapest but only 1/2-2/3 as effective as a new PHEV
    - 1/2-2/3 new-vehicle savings at 10-20% of the price (+ battery)
  - Replace the drivetrain with a PHEV/EREV version: ~\$10k + battery
    - Except for vehicle drag, can be as effective as a new vehicle, for 20-40% of the price (+ battery)
  - Replace the drivetrain with a BEV drivetrain: ~\$5k + a larger battery
    - Limited range, but, at 10-20% the price of a new vehicle (+ battery), effective e.g. for fleet vehicles with known routes
    - No ICE means lowest fuel and maintenance costs



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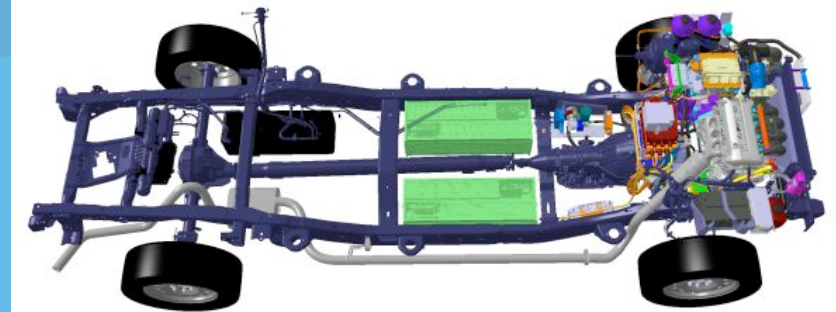


## ALTe, LLC: promising Michigan startup

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



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



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

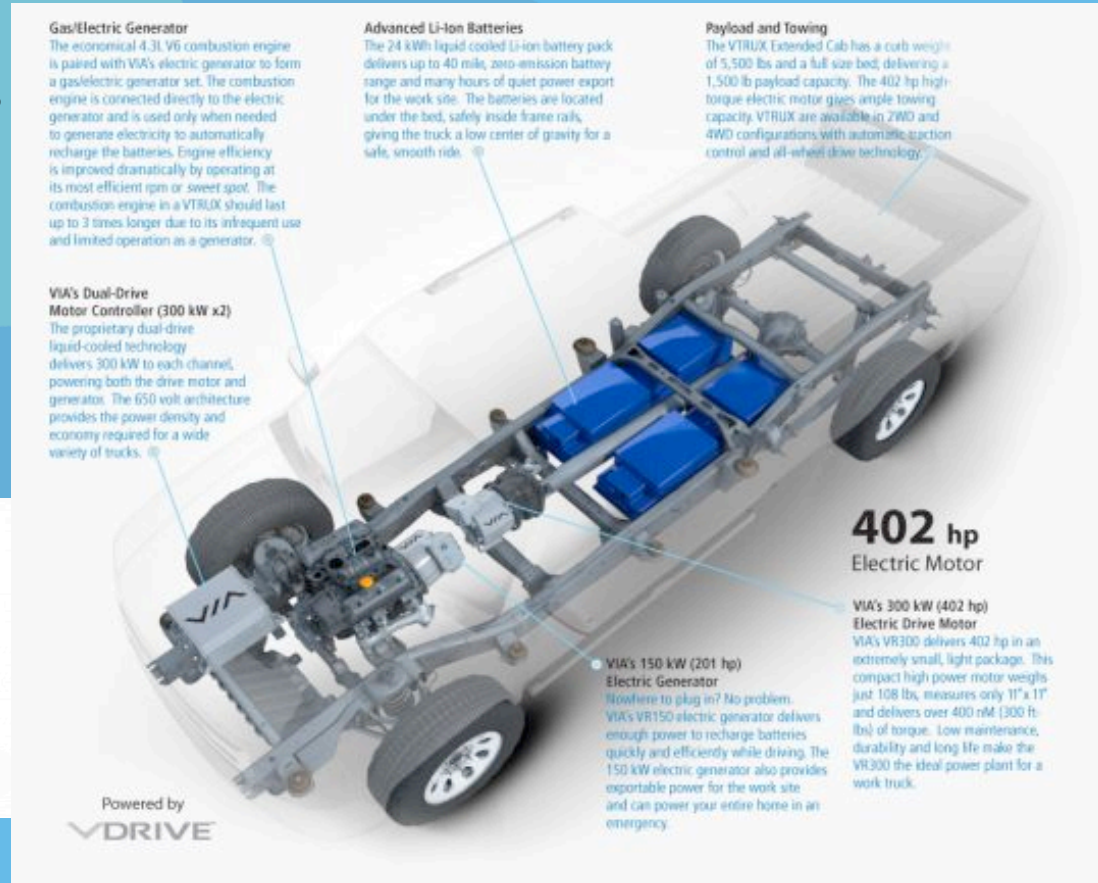


Info on these and other companies at [CalCars.org](http://CalCars.org) home page



## Via Motors in Utah working with OEMs

- Series PHEV powertrain for new “gliders” and late-model fleet vehicles
- Chief of Technology was Volt Chief Engineer; GM’s Bob Lutz involved
- Predecessor company worked with GM to convert a Hummer 3



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### Key themes: start now before a crisis

- “Good enough to get started” approach worked with hybrid conversions
- Fixing heavy gas guzzlers can produce 4x the fuel saving/100 miles driven vs. small passenger cars.
- Without ICE conversions, market penetration is too slow.
- Equalize tax incentives for conversions that match new car fuel displacement.
- Conversions preserve energy embedded in vehicles.
- Conversions jumpstart component industry; help small companies go from lab to real world demos and selling to large customers.
- Prizes and other strategies can identify & incentivize startups/experimenters.
- Spark giant new industry: local green retrofit jobs everywhere.



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## What will it take to start the Big Fix?

### **End Business As Usual (BAU): go beyond 1M by 2015:**

- Equalize tax incentives
- Drive Star — “built” environment /prize/ local jobs
- Carbon price NOT enough incentive!
- Even in Europe: \$7/gallon; China \$5, little understanding yet

### **Smartest/best uses for resources/technologies/facilities**

- Hydrocarbons “sequestered”
- Drill Now! for geothermal
- The petroleum industry isn't going away; what will it take to influence their spending on R&D, investments, contributions?



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## MORE from CalCars.org home page



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**About CalCars** | POPULAR: [Convert Big Gas-Guzzlers to Plug In \(24 slides\)](#) | [Endorse "Big Fix" Campaign](#)

**Plug-In Hybrids**

**Take Action**

**News and Events**

### Plug-In Hybrids Use Cheaper, Cleaner, Domestic Energy

**Quick Takes**

- [All about Gas-Guzzler Conversions](#)
- [Carmakers' Plans for New PHEVs](#)

**09/12/11:** [Wondering What CalCars Has Been Up To?](#)

**05/17/11:** [Plug-In Roundup #3: Policy Issues / ICE Conversions](#)

**05/17/11:** [Plug-In Roundup #2: Media & Marketing News](#)

**05/17/11:** [Plug-In Roundup #1: Vehicle News](#)

**04/07/11:** [ALTe Partners with Industry Giant Manheim: First Step to Create Gas-Guzzler Retrofit Industry](#)

**04/06/11:** [Volt/Leaf Sales; Sierra's GoElectric; Obama on Energy; SIRUSXM; PHEV Bus](#)

**03/11/11:** [Woolsey Backs Gas-Guzzler Retrofits; Cheaper Volt?; Ron's Bittersweet Volt Moment](#)

**02/25/11:** [Giant PHEV & EV News Roundup](#)

**02/24/11:** [New CalCars Video + Media on Volt & Leaf & Celebration](#)

**1/28/11:** [Lucky Family First to Get a Volt & a Leaf](#)

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