

Beyond New Plug-Ins: Fixing Gas Guzzlers

September 30, 2009

PHEV'09

Montreal, Quebec

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



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

**2008: First preview of a new industry
*Ali Emadi, Felix Kramer,
Andy Grove, Andy Frank***



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Nonprofit Startup: CalCars' successes & challenges

- **2004: “no technical/business case for PHEVs—and no one wants to plug in.”**
- We always saw conversions as a strategy to build support & awareness:
 - Hybrid retrofits previewed validated, mass-produced PHEVs.
 - Education and coalitions crossed multiple constituencies and ideologies.
 - Open-source exchange germinated conversion company ecosystem.
 - Public and influencers pressured industry and government.

Technology
(demos)

Advocacy
(buyers)



2004



2006



2009



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Conversions: line extensions: new: back to retrofits!



BOLD MOVES

MODELS



Escape XLT

\$22,895*



Escape Hybrid
FWD

\$26,215*



Escape Hybrid
4WD

\$27,820*



Escape Plug-In
Hybrid

\$30,000+ 

*... & from
GROUND-UP
NEW DESIGNS:*

Chevy
"Volt"



Bright
"Idea"



... Next: GAS-GUZZLER CONVERSIONS!



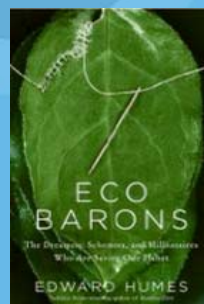
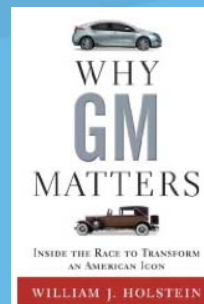
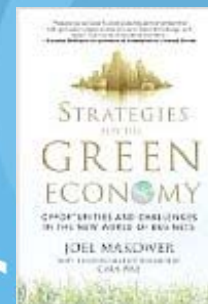
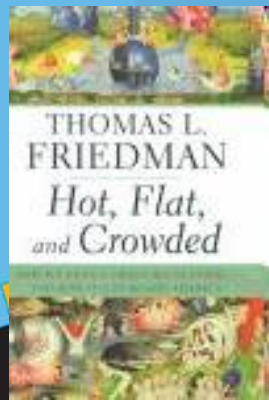
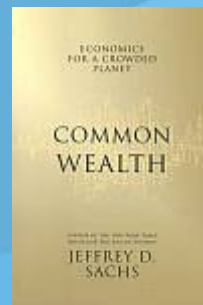
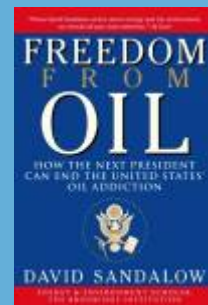
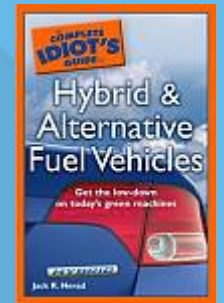
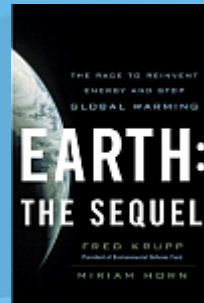
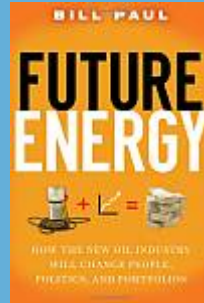
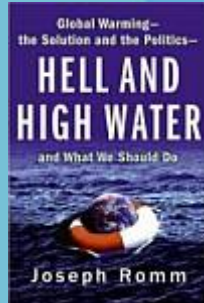
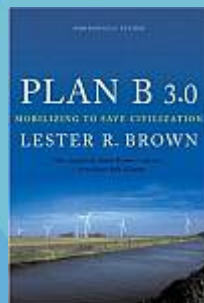
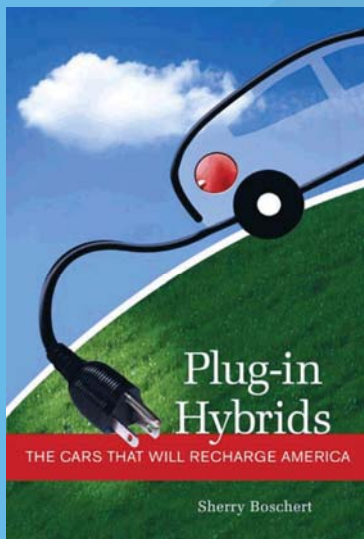
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Link for info and to order at CalCars.org home page

2005-2009: 23+ books highlight PHEVs



18+ carmakers interested; race to be first; few timetables
(see CalCars Carmakers page summary)



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*More @ CalCars
Photos pages*

For CalCars, after seven years, a challenging new campaign



*Gore;
Clinton*



*Plug-in drivers
with GM's
Tony Posawatz*



*Google's
Brin+Page,*

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



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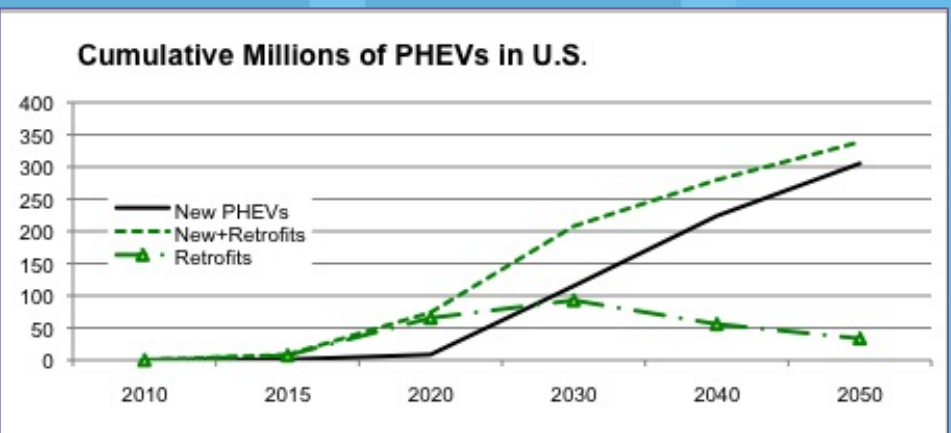
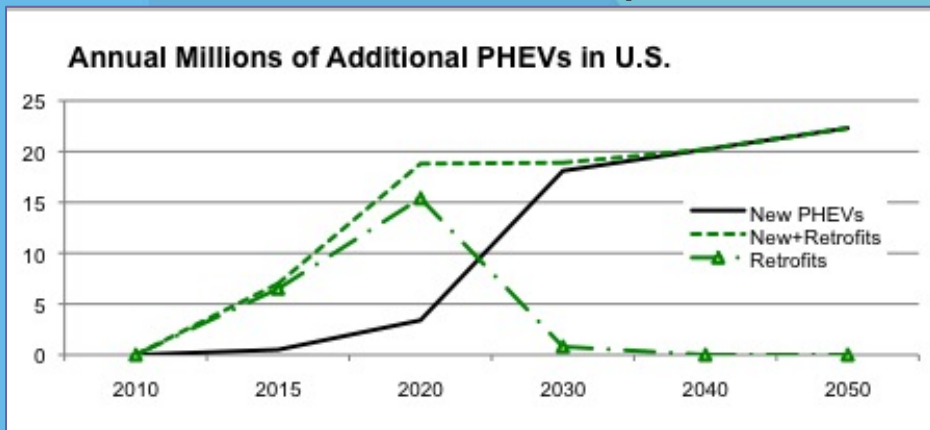
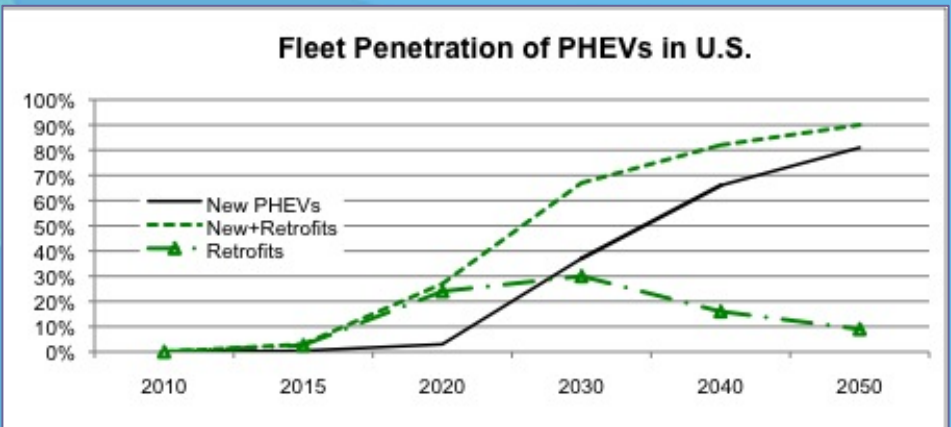
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It's all about penetrating a market of 250 million

New plug-ins, even at 10x faster rate than hybrids (21% vs. 2.2% in 10 years) won't be a significant percentage of fleet until 2025-2030

After 2030, additional retrofits taper off



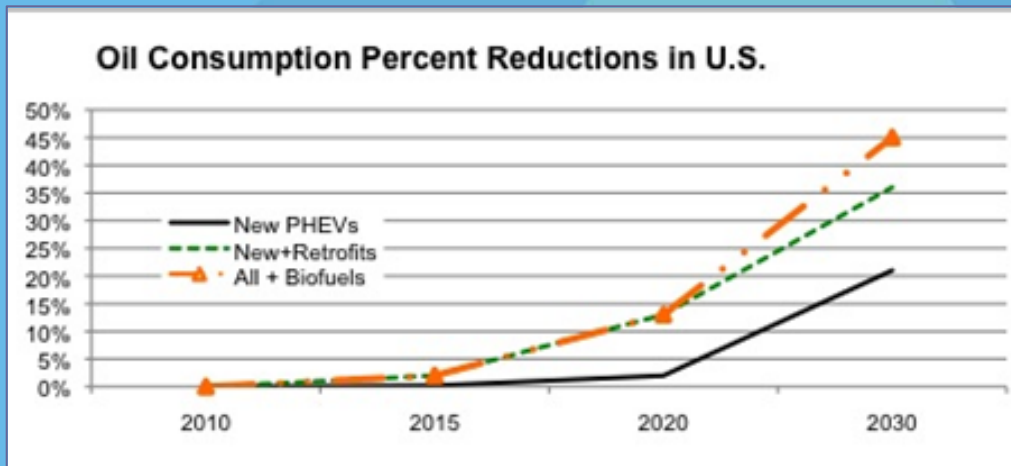
Retrofits, like new vehicles, will remain in the fleet for decades



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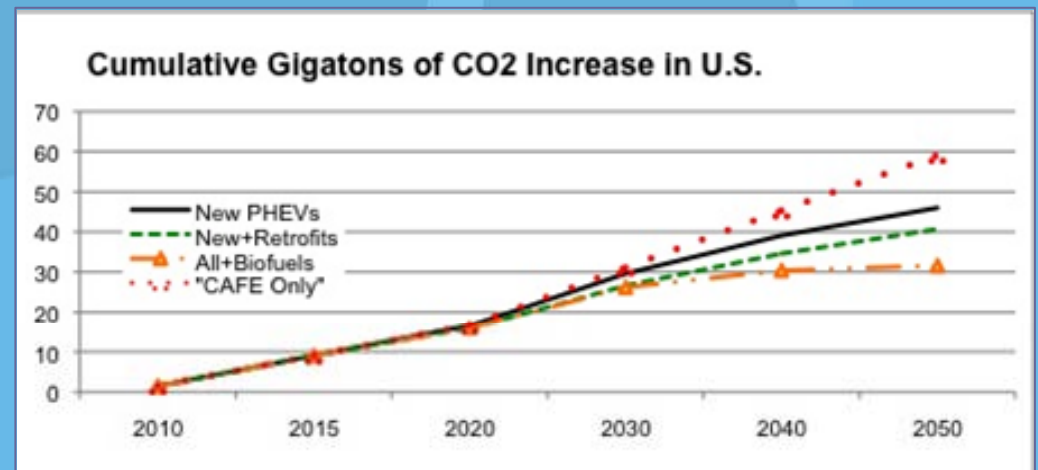
For near- & mid-term impacts, need retrofits



Virtually all near-term oil consumption benefits come from retrofits for a decade.

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

Source: White Paper, "Cash For Clunkers Paves the Way to Retrofit Gas Guzzlers" from CalCars Home Page.



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First retrofit prototypes validate the technology

- Prototypes provide a vision of a future.
- Several startups apply current technologies in innovative ways, turning gas-guzzlers into EVs; for PHEVs, adding to instead of replacing the existing drivetrain.
- Public tax incentives will help attract new players.
- Other companies, large integrators, develop more designs.
- Business models based on technologies and incentives.
- Partnerships with OEMs: Qualified Vehicle Modifiers (QVM) or licensing, bring new revenue streams to OEMs and dealers.
- Attract investors and, we hope, one or more serial entrepreneurs to develop global business opportunity.



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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 180,000 pounds 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.**



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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.



REV 300ACX

Pure Electric

[Vehicle Details](#)

Max Speed: 100mph / 160 kmh
Range: Up to 200 km's
Acceleration: 0-100 <7 seconds
Charge time: 3.5 hrs at 240V



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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



The diagram, titled "Bright Inside", shows a chassis with various components labeled: Engine, Battery Pack, Hybrid System Controller, Electric Drive, and Charger. To the left of the diagram are three images of vehicles: a white VW Transporter van, a silver VW Transporter van, and a white pickup truck.

A PHEV conversion of an existing vehicle for improved fuel economy in your fleet operations

- Proven platform
- Plug in hybrid electric vehicle
- 22 mile all-electric (EV) range
- 57 mpg based on 50 mile daily cycle
- Cargo, cab-chassis & passenger versions
- Fleet integration Q2 2010



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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



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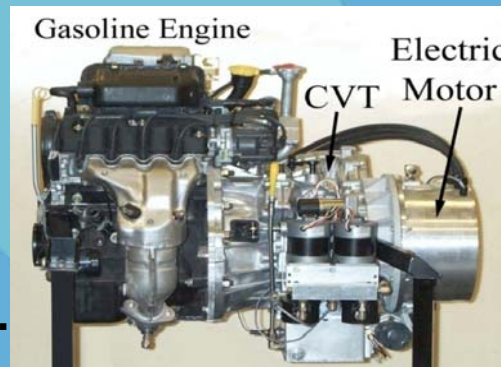
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Efficient Drivetrains Inc.

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.



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Poulsen Hybrid, LLC



poulenhybrid.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.



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The logo for ElectraDrive, featuring the word "ElectraDrive" in a stylized, italicized font with a red outline, set against a dark red background.

ElectraDrive, Inc.



electradrive.net San Jose, CA

- Extended-Range EV Dodge Pickup
- Overall fuel efficiency in mixed driving: 100-150 mpg; combined energy efficiency (including electricity): ~ 80 mpg equivalent.
- Battery pack: 5 kWh Li-ion, up to 15 miles electric range at urban speeds.
- Onboard generator delivers 30-40 kW
- Motor power: 25 kWc / 59 kWp; Motor torque: 2000 Nmp at the wheels.
- All factory auxiliary systems remain intact; acceleration same as or better than factory model.
- Seeking investment funding.



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LincVolt/HLine Conversions



lincvolt.com Woodside, CA ***hlineconversion.com*** Wichita, KS

- Combines demonstration project and development of new business line.
- **Neil Young**: singer, advocate, technology experimenter; (current CD, “Fork in the Road,” about getting off gasoline); forthcoming documentary, “Neil Young Truck Show,” about converting his 1959 Lincoln Continental.
- **Jonathan Goodwin**: ICE conversions, including Hummers and other vehicles.



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EV Power Systems

Evpowersystems.com Rock Hill, SC

- **Supplementary drivetrains for pickups, larger trucks, refuse and terminal vehicles.**
- **Retrofits for Chevy Colorado, Silverado.**
- **25-40% improved MPG in start-stop driving.**
- **System transferable from vehicle to vehicle within fleets; one-day installation.**
- **Co-Founder/CEO John Dabels, automotive marketing, original GM EV-1 team.**
- **President/COO Terence Russell from Ryder Systems.**
- **Co-Founder/CTO James McGreen, former CEO of ZAP Motors (early days).**



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US measures supporting EV/PHEV conversions

Obama campaign and administration

1 million PHEVs by 2015; *“When it becomes possible in the coming years, we should make sure that every government car is a plug-in hybrid.”*

Stimulus measures

- 10% tax credits up to \$4,000 for conversions (needs to be higher).
- \$3,500-\$4,500 “cash for clunkers:” why not expand to convert, not crush?

Colorado State Tax Credit

- \$6,000 credit for conversions.

CalCars begins new advocacy program

- Engaging with stakeholders: small companies, integrators, fleets, NGOs, legislators, Energy Department – and, once credible, eventually OEMs -- to create a broad coalition to launch a new industry.



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Japan & Canada policies on conversions

Japan's Postal Fleet

- Converting 25% of 22,000 vehicles to plug in.

Canada's New EV Technology Roadmap provisions

- “Develop harmonized standards for the conversion of used vehicles to electric traction.”
- “Assess the resource requirements for training, education and certification in skills related to the emerging EV industry. Provide this information to organizations that can develop: 1. technical courses on EV repair, service and maintenance and on the conversion of ICE-based vehicles to EVs.”

Ontario's \$10,000 rebate for new plug-in vehicles

- We **propose and seek allies** to expand this incentive (based on battery size) to include safe, drivable, validated conversions, especially of large gas-guzzlers.



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Key themes: start now for market penetration

- End Business As Usual (BAU) to get near/mid-term impact.
- “Good enough to get started:” Hybrid converters moving to fixing heavy gas guzzlers can produce 4x the fuel saving/100 miles driven.
- ICE conversions -- or too slow market penetration.
- Equalize incentive if conversion matches new car fuel displacement.
- Conversion preserve energy embedded in vehicles.
- Conversions jumpstart component industry; help small companies go from lab to real world demos and selling to large customers.
- Prize or other strategies to identify & incentivize startups/experimenters.
- Spark giant new industry, local green retrofit jobs everywhere.



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Keep up with issues & emerging companies

Follow ICE Conversions news, photos; links to companies

calcars.org/ice-conversions.html

Download eight-page White Paper and analysis

calcars.org/scrap-or-retrofit.html

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POPULAR: [Convert Big Gas-Guzzlers to Plug In](#) | [Research Analysis: Scrap Or Retrofit Clunkers](#)

Plug-In Hybrids Use Cheaper, Cleaner, Domestic Energy

Quick Takes
[How to Get a PHEV](#)
[Where PHEV Conversions Are](#)

9/20/09 DRAFT: *The Big Fix: 16 Founding Points for the Campaign to Upgrade Gas Guzzlers*



Download flyer;
endorse campaign

Watch our video

calcars.org/audio-video.html



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CalCars: a resource for a broad new campaign

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09/01/09: [Important Developments on Hybrid and Gas-Guzzler Conversions](#)

08/21/09: [Plug-Ins: Industry Developments and Media](#)

08/11/09: [The 21st Century Car Industry: Fixed in the USA](#)

03/27/09: [Our New Guzzler Video; Other Media; Apply for US Billions; GM Book; Correction](#)

01/21/09: [Our Testimony on Conversions Bolstered by 140+ Thoughtful Appeals](#)

11/12/08: [Multiple PHEV Conversion Solutions Gain Momentum](#)

10/03/08: [Should We Crush Gas-Guzzlers? Or Convert Them to Plug In? An Analysis](#)

09/20/08: [Another F-150 Conversion company](#) (Envia Rapid Electric Vehicles)

08/04/08: [Andy Grove's Ambitious Conversions Goals at Plug-In 2008](#)

- Print/distribute PDFs from Downloads Page
- And thanks for all you've done—and will do!



Donate!



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