

**120V
+E85**

Plug-In Hybrids Plus Ethanol: *We Can Tackle Global Warming*

Let plug-in hybrids power your commute.

We can have the cars of the future—today—with no new technology or infrastructure.

In California, transportation emits over 40% of greenhouse gases. Nationally, it's about 33%. Globally, it's 20%—and rising fast.

- Compared to current hybrid cars, PHEVs use **40-80% less gasoline** and produce far lower greenhouse gas levels, even on the national power grid.
- In a few years, PHEVs could achieve **twice the ambitious benefits** of California's emissions law that requires 30% lower greenhouse gas levels from new cars.
- With "flex-fuel" PHEVs, the range-extension fuel for long-distance travel becomes E85 (85% ethanol). Once that ethanol is cellulosic, we get closer to oil-free, "**zero-carbon**" cars.

"Vehicle emissions are the greatest challenge that we must overcome to stabilize climate. The plug-in hybrid approach, as being pursued by CalCars, seems to be our best bet for controlling vehicle CO₂ emissions in the near-term."

— *James Hansen, Director of the NASA Goddard Institute for Space Studies*

"Moving to these highly efficient plug-in gas-electric hybrids could cut U.S. gasoline use by 85%. Even more important, it could cut automobile carbon emissions by some 85%, making the United States a model for other countries."

— *Lester Brown, President, Earth Policy Institute, author, "Plan B 2.0"*

"We should have a national program to promote plug-in hybrid cars running on electricity and biofuels. I'm happy that initiatives are coming from entrepreneurial groups like CalCars.org and from state and local campaigns."

— *Robert F. Kennedy, Jr., Senior Attorney, Natural Resources Defense Council*

"When entrepreneurs and venture capitalists focus on environmental challenges, we can create whole industries and change behaviors. Innovative campaigns like CalCars' for plug-in hybrids hold up a guiding light to steer our efforts."

— *Sunil Paul, co-founder, BrightMail, Power Lunch for Bay Area Energy Entrepreneurs*

"As California leads on climate change policy, the transportation sector holds the key. PHEVs are ready to be rolled out, starting with corporate and local government fleets."

— *Gail Slocum, Former Mayor, Menlo Park, Climate Change Regulatory Attorney*

"[Plug-in hybrids equal] more energy security and less global warming."

— *Nicholas Kristof, New York Times, February 5, 2006, "100 M.P.G. Cars: It's a Start"*

"[Plug-in hybrids'] potential in terms of national policy, and in terms of global warming, ought to be focused on by anyone paying over \$2 a gallon. And yes, there is an infrastructure investment. Each family would need an extension cord."

— *James Woolsey, Former Director, Central Intelligence Agency*

Organizational affiliations listed for identification only

Electric vehicles generate a third as much greenhouse gas as gasoline cars, even on the national grid (half coal). As the grid gets more renewable, like California today, these numbers will further improve.

— *Argonne National Laboratory/
Electric Power Research Institute/
California Air Resources Board studies*



CalCars
THE CALIFORNIA
CARS INITIATIVE

February 28, 2006

100+ MPG Hybrids

10 TALKING POINTS FOR PLUG-IN HYBRIDS

1. Why plug-in hybrids? Today's hybrids are efficient because they don't idle, they recapture braking energy into a battery, and they use smaller engines. They're a great step forward—but they're still 100% gas-fueled. **Use a larger, rechargeable battery and you add a second cleaner, cheaper, domestic energy source: electricity.**

2. Spend less time—and money—at the pump. A plug-in hybrid (PHEV) is like having a second fuel tank you always use first. Fill up at home from an ordinary socket, at a cost equivalent to less than \$1/gallon. [See box]

3. Use no gas for short trips, still have unlimited range. If your batteries have a longer range than your commute, you'll almost never need gas. But if you forget to plug in, or take a longer trip, you have the same range as always from a gas engine—but in a clean, efficient hybrid.

4. Neo-cons and greens agree. PHEVs have been endorsed by an alliance of environmentalists and conservatives who see it as **the best way to cut our foreign "oil addiction."** Republicans and Democrats, endorsing the DRIVE Act, former cabinet members Shultz and Woolsey, and President Bush in his Advanced Energy Initiative have endorsed PHEVs. Mayors, Governors, Members of Congress, companies like **Google, AutoNation** and **Enterprise Rent-A-Car** want PHEVs.

5. Keep the earth cool. Even though coal powers half the nation's electricity, driving electrically produces **50+% lower greenhouse gases** than a gas-only car. This will only improve as utilities use cleaner, renewable energy.

6. Lead car-makers out of the wilderness. Seven car-makers are interested. **GM and Toyota are finally saying they'll build them, but not before 2010-2011.** Ford might. Waiting makes the perfect the enemy of the good.

PHEVs offer carmakers the chance to leapfrog their competitors. We need commitments to production. Today's batteries are "good enough," for PHEVs; they will improve and get cheaper by the time car-makers are ready for mass-production of Version 2.0 PHEVs.

7. PHEVs are already here. For 15 years, Dr. Andy Frank at UC Davis has converted **Ford/GM** cars and SUVs. **Daimler** is testing PHEV versions of the **Mercedes Sprinter** van. In 2004, non-profit **CalCars.org** converted the first **Prius** PHEV; individuals and companies have since built over 50. Not-yet-available conversions for consumers will cost \$10-\$20,000. So help get carmakers to sell them!

8. Save money in the long run. In high volumes, car-makers could sell PHEVs for under \$2,000-\$5,000 more than current hybrids. Just as car buyers pay for large engines or leather seats without expecting a return on investment, early adopters will pay extra for the PHEV "green feature." A bonus: projections based on experience from electric car fleets show **PHEVs have a lower lifetime cost of ownership than any other vehicle.**

9. Send car battery power the other way. Recharged at night, PHEVs can send power to utilities in what's called "vehicle to grid" (V2G). PHEVs can be mobile generators to emergency centers after disasters. Your car can give your home backup power for outages; paired with rooftop solar, it will be far cleaner and go for days!

10. Deploy the fleet. Fleet buyers are leading the way on many fronts. **Plug-In Partners is a national campaign for a large fleet buy.** Incentive programs can help buy down initial costs and additional warranties can reduce battery risk factors. **CalCars** is working to find ways to get demonstration fleets of "good enough to start" PHEVs on the road—followed by 10,000-100,000 vehicles.

Assumptions for Point #2:

Here's another way to think about it: At \$3/gallon of gas, driving a non-hybrid car costs 8-20 cents/mile (depending on your miles/gallon). With a PHEV, local travel and commuting can drop to 2-4 cents/mile.

Toyota Prius: 260 Watt-hours/electric mile at "off-peak" (overnight) electricity rate (8.8 cents/kiloWatt hour) equals a cost of 2.3 cents/mile. Multiply this by the 45 MPG of a typical Prius to get the equivalent of \$1.03/gallon.

Typical Non-Hybrid SUV: 400 Watt-hours/electric-mile at the off-peak rate equals a cost of 3.5 cents/mile. Multiply this by the less efficient SUV's average of 18 miles/gallon to get an even better \$0.63/gallon. (SUVs get low mileage, so they improve even more!)

100+MPG of gasoline: On roads and highways, our cars use gasoline plus about \$0.01/mile of electricity=80+MPG equivalent.

The California Cars Initiative is a non-profit startup of entrepreneurs, engineers, environmentalists and consumers that combines technology development and advocacy. Support our goal: to get car companies to build PHEVs. [More at www.calcars.org](http://www.calcars.org).