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TO: National Energy Policy Leaders
FROM: Felix Kramer, CalCars Founder, Gail Slocum, former Mayor of Menlo Park
RE: Next-Generation Hybrid Cars Can Reduce Oil Dependence Now

Policy analysts have zeroed in on the importance of energy independence from imported oil. **Plug-In Hybrid Electric Vehicles (PHEVs)**, with their energy-saving, low-emissions technology, are the next step from today's popular hybrids. They can be built now: they await no new technology breakthroughs or changes in infrastructure. In the coming years, we can deliver the promise of PHEVs, with great benefits for national security, the economy and the environment. Bringing to market PHEVs can get people excited about continuing America's tradition of innovation.

The US has just 3% of the world's petroleum reserves, so we can't drill our way to energy security. We import more than half the oil we use -- at a cost of over \$100 billion a year. Even in peacetime, our military presence in the Middle East costs us over \$50 billion a year. As a nation, we depend on oil for our transportation. To gain energy independence, we need to use less oil and diversify our fuels. By innovating to create better cars and trucks, we'll clean up our air, create jobs and a greener, more competitive auto industry.

PHEVs ANSWER THE QUESTION, "WHAT'S THE MOST AFFORDABLE WAY TO INCREASE ENERGY INDEPENDENCE & REDUCE GREENHOUSE GASES QUICKLY?"

So far, our shift to a multi-fuel economy has been too slow. Although natural gas may play a role, few fueling stations are equipped for gas. Bio-diesel has no supply infrastructure. Even optimistic fans of hydrogen fuel cells acknowledge the need for many technology breakthroughs, and that it will be decades before we'll see many fuel cell cars on the road.

We need something more -- and sooner. Hybrids have had tremendous early success; they point the way. Today, all their external energy comes from gasoline. They're more efficient and cleaner than anything else on the road. Still, they don't go far enough in reducing petroleum use. PHEVs can be the next wave of innovation and energy independence.

Over the next 12-24 months, we could leapfrog the progress made by companies now selling hybrids getting 30-55 MPG. Adding the option of plugging in hybrids for overnight charging could double their MPG to 70-90 -- even higher if all travel is local. As Americans migrate to PHEVs, their high efficiency will significantly reduce total dependence on imported oil.

Because PHEVs can be designed and produced rapidly, rely on proven technology, and have declining incremental costs, they are the best solution for reducing our energy needs over the next decade or more.

Federal policies can give new momentum to PHEVs. We don't need research -- we have the technology. We need development plans and economies of scale. To commercialize these vehicles, we need fleet purchase commitments and incentives for car makers and car buyers. Auto manufacturers should take these factors into account and commit to building these critically-important cars.

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PHEVs CAN BE KEY COMPONENT IN PREPARING FOR CATASTROPHIC SCENARIOS

We face a long-term danger: the threat of climate change. Hybrids and the promise of hydrogen from renewable sources don't sufficiently reduce greenhouse gas emissions to meet that challenge. And well before then, things could get much worse. A major terrorist attack on petroleum shipping channels, natural gas pipelines or other vulnerable links in the carbon fuel supply chain could disrupt our entire economy. So could any political/social/military development that permanently drives up fuel costs to much higher levels.

To be prepared for short-term crises and to address global warming, we (and the rest of the world) need to begin putting in place a petroleum-independent model. Transportation is the best place to start.

We envision a three-way mix of

- **PHEVs charged at night** (which won't increase peak electric demand).
- **Rapid scale-up of solar power** (including major support for the "almost-out-of-the-lab" thin film solar products that promise photovoltaics manufactured at 1/10 current cost); also increase the contribution from wind power, already in widespread use in Europe.
- **Cheaper batteries** through mass production and continuing performance improvements. Affordable hydrogen storage, transmission and use in fuel cells all require technology breakthroughs; for batteries, they are welcome but not necessary. It's widely believed that that battery improvements have been small recently. Yet compared to the 2003 Prius NiMH battery, the 2004 version is 15% smaller, 25% lighter, has 35% more specific power -- and costs are down 36%. And the Li-Ion batteries now in our phones, laptops and cameras have seen a rapid decline in cost in the past five years.

We can get started now on all three factors, encouraging manufacturing and economies of scale with fleet orders. Without such a plan, as energy needs increase, we could easily go backwards, increasing our use of coal, which will hasten climate change.

PLUG-IN HYBRID ELECTRIC VEHICLES EXPLAINED

PHEVs offer oil savings far beyond those of today's popular hybrids (including the Toyota Prius, Honda Civic and Ford Escape, with others on the way). These rely entirely on gasoline and braking energy to recharge the battery -- all their propulsion comes from gasoline.

PHEVs offer the best of the gasoline and electric car worlds: safe and high-performance vehicles. Among PHEVs' features:

- **A larger battery pack** than conventional gasoline hybrids, with a 20-40 mile all-electric range -- enables most commuters' round-trip travel to use just the electric motor, with energy from the cleaner, cheaper, domestically-fueled national electrical grid.
- **PHEVs can, but don't have to, be recharged** conveniently and semi-automatically overnight, from a 110-volt outlet. For long day trips or weekends, unlike pure electric vehicles (but like any hybrid), when the batteries run low, the car gets unlimited range from gas tank refills for the internal combustion engine.
- **Low additional initial cost**, when built in quantity by large automakers: only a few thousand dollars more than conventional hybrids. This is where federal tax incentives can help, as can lower fuel costs from the higher efficiency of electric motors, the availability of cheap off-peak utility or rooftop electricity, and lower lifetime service costs.
- **PHEVs have been recognized as an optimal technology** by California's Energy Commission and Air Resources Board (which will grant car-makers emission credits for each PHEV built through 2008), the Electric Power Research Institute (leading efforts to

involve auto makers and utilities in commercializing advanced vehicles), research, environmental and public policy groups.

For more about PHEVs, see the Resources and Vehicles pages at <http://www.calcars.org>.

PHEVs' BENEFITS

- Need not be designed as new vehicles from the ground up -- they can be conversions of existing vehicle types (sedan, SUV, commercial vehicles).
- Are the best short-term way to reduce dependence on imported oil and clean the air.
- Can become the workhorse of public and private vehicle fleets.
- Can mesh with programs envisioned to promote in-home photovoltaic systems -- rooftop electricity can recharge the car.
- Offer most of the benefits people are expecting from hydrogen fuel-cell cars many years sooner, with a far smaller development effort and no support costs.
- When new natural gas, bio-diesel or hydrogen fueling infrastructures are in place, those fuels can be the "range extenders" for a variety of plug-in hybrid vehicles.
- Long-term, can be part of a future advanced electric grid, helping utilities keep voltages steady and ultimately even providing peak power reserves (for a fee car owners keep).

PHEVs WILL BE ATTRACTIVE TO CAR BUYERS BECAUSE THEY CAN:

- Meet or exceed the performance of cars people now like to drive.
- Provide lower total cost of ownership (counting lifetime purchase, service and fuel).
- Offer drivers the option of going to gas stations as little as a few times a year, because gas is barely needed for cars used mostly for local all-electric commuting.
- Reduce the number of maintenance appointments, because electric motors need much less service.
- Fill HOV (carpool) lanes with clean cars (by State law, with Federal permission).
- Give blackout-wary Americans short-term power to keep their refrigerators running when the lights go out (PHEVs can be small portable power generator for many uses).

HOW PHEVs CAN HELP NOW

PHEVs can yield great benefits quickly. The California Cars Initiative (a two-year old, non-profit organization, described on the next page) has laid much of the groundwork for the California launch of this new vehicle type by amassing partners and contacts within the automotive industry as well as with independent technology innovators, utilities, advocacy and environmental groups, state and municipal governments, early-adopter businesses and opinion leaders.

Thousands of consumers want a cost-effective, "greener" choice for their personal vehicles and company fleets. PHEVs offer them the best option for the next decade or longer.

DaimlerChrysler has just become the first major auto maker to make an initial commitment to develop PHEVs for larger vehicles, setting the stage for an aggressive effort in California to put prototype passenger PHEVs on the road very quickly and get people talking about them. This will help to persuade other auto makers there's a market for PHEVs.

CalCars aims to show that PHEVs can be built now and to document their benefits. CalCars is leading a grass-roots technical and promotional effort to demonstrate the feasibility of converting the fast-selling Toyota Prius into a PHEV (see www.priusplus.org). Our team of volunteer engineers is now hard at work "green-tuning" a Prius. We now have a prototype PRIUS+ car on the road. (We're getting help from many places, including a design/

integration group, based at the University of California at Davis, that has already successfully converted nine vehicles into PHEVs.)

Our strategy is to leverage California's critical mass in terms of customer demand and air quality needs to put our State in the driver's seat, in partnership with one or more large auto makers, to jump-start production of PHEVs. A similar initiative at the national level can begin with Federal buying requirements along the lines of EPACT to ensure manufacturers a larger initial market. Tax breaks and other incentives can be provided for PHEV adopters (and possibly manufacturers).

We would like to meet and talk with policy leaders to explore the cheapest, fastest way to clean our air and reduce dependence on foreign oil. Then we can consider specific actions in the national arena needed to promote the rapid adoption of this technology.

Regards,

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P.S. Introducing the California Cars (CalCars) Initiative

CalCars is a nonprofit startup formed by a group of entrepreneurs, technologists, environmentalists and consumers to bring to market the cars we need for the next ten years. Our focus is California, which has the missing ingredients needed to pioneer an unprecedented market transformation.

To spur the adoption of efficient, non-polluting automotive technologies, we've created a front-end marketing operation to promote and then commercialize (with government, corporate and other partners) a near-term "plug-in hybrid" vehicle that blends the best features of electric vehicles and hybrids. Our goal is not to build cars ourselves, but persuade major car makers there's a big market for these far better vehicles.

We're not proposing entirely new cars. Instead, we're proposing new versions of existing vehicles, starting with prototypes building on "proof-of-concept" vehicles that have already been produced. Our first step in that direction is our PRIUS+ campaign.

Please see <http://www.calcars.org> and <http://www.priusplus.org> for more information

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