

## Hopes high for plug-in hybrids

*by Mark Sauer*

Electric-car owners such as J.F. Lancelot of San Diego were devastated when auto companies pulled the plug on their battery-powered runabouts a few years ago.

Lancelot drives a Mini Cooper now. "I just waste a lot of gas, like everybody else," he said.

But Lancelot and many other Americans are taking heart from a surge of interest in plug-in hybrid cars, which began with national media exposure last year and got a boost from President Bush in his recent State of the Union address.

CHEVY VOLT - In spite of an internal combustion engine, General Motors does not call its Chevy Volt a hybrid. It is considered an electric vehicle with range extending capability. The interest in plug-in hybrids got a boost following President Bush's recent State of the Union address. CNS Photo by Chevrolet. Bush set a goal of reducing gasoline use in the United States by 20 percent over the next 10 years. In addition to expanding the use of alternative fuels such as ethanol, wind and solar power, the president said, "We need to press on with battery research for plug-in and hybrid vehicles."

Bush followed that the next day with an executive order mandating that all federal agencies with more than 20 vehicles use "PHEVs" - plug-in hybrid electric vehicles - when they become commercially available.

For the long-suffering choir of PHEV advocates, Bush's sermonizing caused a burst of excitement.

"The president is increasing awareness for PHEVs, and that is really important," said Felix Kramer. He founded the California Cars Initiative, a Palo Alto, Calif.-based group that advocates the immediate production of PHEVs.

"Our Web site traffic went way up after Bush's speech," Kramer said. "People want to get educated about this."

Conventional hybrids, such as the Ford Escape and Toyota Prius, are gasoline-powered cars made very efficient by employing an electric motor to start, idle and drive at low speeds, and whose batteries recapture power when the vehicles go downhill or brake.

Plug-in hybrids, which aren't yet available commercially, are electric cars with large batteries backed up by small, efficient gasoline engines should the batteries run down.

Plug-in prototypes typically go 20 to 30 miles on battery power alone, with zero emissions. It's estimated that a typical PHEV sedan would get 100 miles or more per gallon of gas, on average, when longer trips are factored in.

The cost of powering a PHEV is 2 to 4 cents a mile, compared with 8 to 20 cents per mile - depending on fuel efficiency - for a conventional gasoline-powered car when gas is \$3 per gallon, Kramer said.

A driver could plug his or her PHEV into a standard outlet and charge its batteries overnight, when electricity from the grid is plentiful and cheaper than during peak daytime hours, Kramer added.

He said that since the average American commutes fewer than 30 miles per day, many PHEV owners would rarely have to use gas, except to go on trips.

Unlike ethanol and other alternative fuels, which require massive infrastructure investment, "car manufacturers can do this anytime they choose," Kramer said.

James Burns, a professor of mechanical engineering at San Diego State University, has been researching PHEVs for 10 years and has built three prototypes.

"They work very well driving around town," Burns said of PHEVs. Current hybrid cars can be converted to plug-ins now, he noted, with kits that cost about \$10,000 available from various manufacturers.

Burns said he was among several researchers and small companies offering demonstration vehicles to the South Coast Air Quality Management District in Los Angeles. He urges companies and utilities to invite similar fleet demonstrations that could ignite public interest.

"This (PHEV) system is not much more complicated than today's hybrids; they just use bigger batteries," Burns said. "It's the next step in the transition from the internal-combustion engine to fully electric vehicles."

One downside is that the rechargeable batteries, which cost thousands of dollars, generally need to be replaced every few years. Some aren't recyclable.

Despite a strong push from the farm lobby, corn-based ethanol is energy- and water-intensive to produce, and requires investments in distribution infrastructure, Burns and other experts say.

The idea of powering cars with domestically produced electricity instead of oil - 60 percent of which is

imported - has drawn advocates across the political spectrum.

Environmentalists are enthused because it's easier to control carbon emissions, which contribute to global warming, at a relatively small number of power plants than in 240 million gas-powered vehicles.

Autoworkers and automakers are excited about the prospect of new products and markets. Utilities welcome the potential to sell off-peak, underutilized power at night.

And nearly everyone embraces the idea of ending America's dependence on foreign oil.

Critics have said that power plants in many areas of the country, notably those burning coal to produce electricity, don't have California's strict controls and are highly polluting.

But the nonprofit Environmental and Energy Study Institute, which promotes renewable fuels and strategies for a sustainable environment, found an average reduction of 60 percent in carbon emissions per vehicle when a PHEV replaces a conventional car.

Some critics worry that a major shift from gasoline to electricity for powering cars would overtax the grid. To avoid potential brownouts, a major infrastructure investment would be needed, they say.

The U.S. Department of Energy estimates there would be no need to increase electrical-generation capacity until plug-ins constitute nearly 85 percent of the nation's vehicles. That's because most charging can take place during off-peak hours.

Before Bush's speech, PHEVs got a boost in October when Michigan Gov. Jennifer Granholm joined executives from General Motors, DaimlerChrysler and the BMW Group in launching the Hybrid Development Center in suburban Detroit.

In addition, GM introduced the plug-in prototype Chevrolet Volt at the 2007 North American International Auto Show in Detroit this month, and other automakers are presenting similar concept cars.

Yet proponents of PHEVs say consumer preferences, oil-company interests, bureaucratic barriers and other obstacles exist in the absence of dramatic market forces such as skyrocketing gas prices or a terrorist threat to oil supplies.

"The spike to \$3-plus gas last summer sparked a lot of interest," Kramer said. "But we missed a bet after the attacks of 9/11 by not switching to plug-in hybrids at the time when the country was ready for sacrifice and change.

"I'd be very happy if we could see (PHEVs) available commercially by the end of the decade."

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Library researchers Peter Uribe and Beth Wood contributed to this report.

