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## Some plugging in hybrids to save even more fuel

By Mark Clayton, The Christian Science Monitor

Not long after Dan Kroushl got his new 2004 Toyota Prius, he began to wonder about the mysterious button on the dash. It didn't seem to have any function. Didn't boost the turbo or engage an ejector seat. In online discussions with other Prius enthusiasts, Mr. Kroushl soon discovered the button did have a hidden function: It could turn the gasoline-electric hybrid into an all-electric car — for a mile or so on limited battery power.



Toyota Prius owners Howard and Nancy Bliss are quite happy with the 50 miles per gallon they say they get from these 2002 cars.

By Jim Evans, Kennebec Journal via AP

This "stealth mode" button works fine in Japan and Europe where it's handy for drivers to roll politely about densely packed subdivisions in the early morning and late evening. But the button has been disconnected for North America's Priuses.

Now, scores of Prius owners in the United States are activating the button on their own — despite company warnings that altering the car will void its warranty.

Some drivers, including Kroushl, are going even further: adding battery capacity — and a plug. The hoped for result: a high-tech commuting car that plugs into a socket at night and gets amazing gas mileage the next day.

In effect, these backyard mechanics have turned the hybrid car's appeal on its head. Instead of emphasizing gasoline over electric power and the convenience of today's cars, they're aiming to create less polluting higher-mileage vehicles that emphasize electricity over gasoline — even if it's a bit less convenient.

"One guy I know plugs his Honda hybrid into a windmill for power," Kroushl says. "It costs him practically nothing to drive."

Since before the Model T, electric cars have been among the most efficient modes of transportation. They made a bit of a comeback in the mid-1990s, when General Motors and other automakers reintroduced electric-only cars to meet a proposed California clean-air mandate. But with the weakening of that requirement, which called for some vehicles to be zero-emission in 2003, GM, Toyota, and Honda stopped production of their electric vehicles. Some automakers, which had leased the cars, began taking them back to be destroyed.

Only the dedication of enthusiasts has kept them from disappearing completely. This past summer, after Ford Motor Co. announced it would scrap its electric Think vehicles, environmental groups occupied the

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roof of the company's Norwegian offices and held a mock funeral at a San Francisco dealer. Within two weeks, Ford agreed instead to ship its vehicles to a Norwegian electric-car manufacturer. Just last week, Ford also reluctantly agreed to let Dave Bernikoff-Raboy, a California rancher, buy the all-electric pickup truck he had been leasing. He was so devoted to the vehicle, which recharged off a solar panel, that he camped out near a Ford dealership in Sacramento, to protest that automaker's plans to dispose of its remaining electric fleet.

Now, a growing interest in hybrids has rekindled the hopes of the electricity-firsters. Global demand for hybrids is estimated to rise from about 200,000 units produced annually to more than 1 million vehicles a year by 2010, according to ABI Research, an international market-research firm, in a report last year. If only 1% of these were converted to run primarily on electricity, it would create a base of more than 30,000 vehicles by the end of the decade.

"We're not talking about electric vehicles, but about plug-in hybrid vehicles that can be topped off with electricity for short trips," James Woolsey, former director of the Central Intelligence Agency, said last month during the unveiling of a report by the 16-member National Commission on Energy Policy. "The potential in terms of national policy, and in terms of global warming, ought to be focused on by anyone" concerned about terrorism or "paying over \$2 a gallon."

Other experts are also urging automakers to take a new look.

"We think the transportation fuel sector should be diversified by utilizing more electricity as a fuel — plug-in hybrids that can get 100 miles per gallon and allow you to run on electricity alone for 20 to 30 miles, then shift to the combustion engine," says Gal Luft, director of the Institute for the Analysis of Global Security, an energy-security think tank in Washington.

But automakers show little interest.

"Why would anyone want to do that?" wonders Sam Butto, a Toyota spokesman in Torrance, Calif., when told some Prius owners are creating their own plug-in Priuses. "One of the great features of the Prius is that you don't have to plug it in."

It is also unlikely Toyota would make a plug-in Prius — though "nothing is impossible," he hedges. The problems are many, including a "much, much, much larger battery" needed to increase range, which would add hundreds of pounds, says David Hermance, a Toyota environmental engineer.

### **How green is that plug-in?**

Anyway, plug-in hybrids are not that green, Mr. Hermance argues. They run on electricity that's often created by coal-fired power plants. So, such a car would be only marginally better from an environmental and economic perspective than a regular hybrid and have limited appeal, he concludes. Case closed.

While Andrew Frank concedes that an electric car powered indirectly by coal isn't much better for the environment, he argues it is still more efficient transportation — and it makes a world of difference from the standpoint of energy security.

With engineering students at the University of California at Davis, Professor Frank has spent more than a decade turning production vehicles into plug-in hybrids using off-the-shelf parts. "We just built a high-performance plug-in hybrid Ford Explorer," he says. "It's 325 horsepower — 200 of that horsepower is electric and 125 is gasoline. This car goes like a rocket, but still gets double the fuel economy of a regular hybrid. And for the first 50 miles it is all electric — zero emissions."

That's enough for many drivers to complete their daily commute. Compared with conventional cars, the annual fuel consumption of the modified cars "is only about 10%, because you're using gas so infrequently," he says. "Our studies show [that] the average person would only go to the gas station six times a year compared with maybe 35 times a year."

Built on a stock Explorer platform, the hybrid retains all its original interior space. There is also more space in the engine compartment because the vehicle lacks moving parts like a fan belt, generator, water pump, and even a transmission. Because it has fewer than one-fifth the number of moving parts of a conventional SUV, the hybrid's weight, even with a heavier battery, stays the same. Assembly is simpler and reliability, better. In production, it might cost \$40,000 or less, he says.

### **A nibble from Toyota**

Despite repeated presentations to the Big Three automakers in Detroit, Frank has received little interest from them. But last year, Toyota flew his Explorer to its research facilities in Japan so engineers could pore over the vehicle. "There's no question in my mind that Toyota has plans for a plug-in hybrid right now, but they aren't talking about it," he says.

Certainly, plug-in hybrids are for real. DaimlerChrysler is reportedly near delivery of the first batch of what is

expected to be as many as 100 Sprinter delivery vans that permit travel of up to 20 miles on electricity alone. This will come in handy in car-clogged European cities currently considering bans or other limits on gas- and diesel-powered delivery vehicles.

AC Propulsion had demonstrated a converted VW Jetta with a plug-in hybrid electric vehicle (PHEV) system. Renault is offering its Kangoo PHEV that can go 60 miles on a charge before switching back to gas. Commuter Cars Corp. of Spokane, Wash., is offering a low-volume electric car called the Tango for \$85,000.

Meanwhile, a not-for-profit outfit called CalCars in San Francisco is modifying two Priuses by adding more battery power and a plug. The group has discovered an empty space under the hatch near the current battery that looks almost as if Toyota intended to do this itself one day. "We hope to get significantly more miles per gallon with the additional battery power," says Felix Kramer, the group's founder. "Our purpose is to show Toyota that there is demand for this kind of vehicle."

Will Toyota — or Detroit — respond? Not without major breakthroughs in technology, says Dan Bedore, a Ford spokesman. "It's become pretty clear that our ... non-plug-in hybrid system is the direction we see the market going."

"The answer is they really don't want to do it," Frank says. "We're just a bunch of students. If we can build this with off-the-shelf technology, they can too — and do things better than what we do. If they really were interested in doing something in the short term, they could do it."

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