

Environment

Local ■ State ■ National

The Rutland Herald | Sunday, April 20, 2008 | The Times Argus

B5



Photo courtesy Joshua Brown

At the UVM Transportation Research Center, scientist Richard Watts heads out in an experimental plug-in hybrid electric car donated to the school by Central Vermont Public Service.

Hybrids rate less than \$1 per gallon

By Joshua Brown
Correspondent

University of Vermont scientist Richard Watts pulls a plug out of a weatherproof socket. He rolls up the green extension cord. Then he yanks the other end out of a socket in the bumper of a car and tosses the cord in the trunk. "It's all charged," he says. "Ready to go?"

It's the right question. Sure, I'm ready to go on a short drive in this nifty, rechargeable Toyota Prius. But his question also applies more broadly to a new generation of plug-in hybrid electric cars like this one. Are they ready to go in cold and hilly Vermont? And, once they leave the lab and hit the showroom in 2010, how will they affect air pollution, the power grid and consumer pocketbooks?

Research projects at UVM, Green

Unconventional cars overcoming Vermont conditions with aplomb

■ ON THE NET

University of Vermont,
Transportation Research Center:
www.uvm.edu/~transctr/
Plug-in hybrids, California Cars
Initiative:
www.calcars.org/

Mountain College and Central Vermont Public Service aim to find out.

Like a conventional hybrid car, a plug-in hybrid runs on a battery pack

when it can and then switches to a gasoline engine. But the plug-in hybrid doesn't just recharge its battery from the engine – it can also recharge by connecting to a standard electrical outlet.

As we ease out of the parking lot behind UVM's Transportation Research Center, the car is delightfully quiet. Watts explains that this vehicle – donated by CVPS for research and customized with a high-capacity lithium-ion battery – should be able to go 20 miles on electric power alone before the gas engine kicks in.

For commuters, that means that a

plug-in hybrid could run mostly on electricity – while today's conventional hybrid runs mostly on gas. A conventional hybrid gets equal to about 50 miles per gallon. Plug-in hybrids can average around 100 mpg on the highway, and for shorter trips, get equal to 300 mpg or better, according to the California Cars Initiative.

But Vermont is not California. Two plug-ins tested through the winter in Vermont ran at equal to 55 miles per gallon over 7,580 miles traveled. That rate climbed to 70 mpg when the batteries were fully charged and the cars were set on their most efficient mode, according to a report issued this week by Green Mountain College and Central Vermont Public Service.

"It's different than flat around here,"

(See Hybrids), Page B6

Hybrids

(Continued from Page B5)

Watts says with a smile as we plunge down Colchester Avenue into Winooski. "Hills change the strain on an engine and the emissions coming out of the tailpipe. Cold weather has all sorts of effects on batteries."

And snow tires, heating the interior, defrosting the windows and warming the engine can all cut down on the plug-in hybrid's efficiency, said CVPS fleet manager Dan Mackey.

Still, even in a Vermont January, a plug-in kicks the financial tires off a gasoline vehicle – and is cheaper to fuel than a conventional hybrid. With gas at \$3.25 per gallon, a trip of 70 miles will cost you \$13.38 in a Hummer, \$4.46 in a Honda Civic hybrid and, with electricity at 12 cents a kilowatt, \$3.97 in one of the CVPS plug-in hybrids. With \$4-per-gallon gasoline anticipated this summer, the plug-in's fueling costs, equivalent to less than a dollar a gallon, may start to look increasingly attractive.

Considering that there may be only three plug-in hybrids in Vermont today, these new cars shouldn't present any strain on the state's power system – yet. But, with General Motors and Toyota planning to bring out plug-in hybrids in 2010, that could quickly change. The Prius hybrids that CVPS had customized by the Toronto-based company Hymotion cost about \$32,000 each, Mackey said. As the purchase price of a plug-in comes

into line with other cars, it may herald a shift in transportation away from the gas pump and onto the electric grid.

Research in 2007 by UVM's Watts and Green Mountain College's Richard Letendre shows that the Vermont electricity grid can handle 50,000 plug-ins without any changes to the existing system. The number rises to more than 100,000 if people recharge the cars at night.

"If everyone plugged in at 8 in the morning and 6 at night that would be a disaster," Watts said, because that is the peak period of demand. The additional draw on the grid would force power providers to buy more expensive, dirtier power from outside the state – or might cause the grid to fail.

"But there are valleys in use overnight," Watts said. Part of his new research in collaboration with UVM engineering professor Paul Hines will be exploring ways that drivers could be encouraged to recharge their plug-in cars at these off-peak times.

This is also part of the reason Central Vermont Public Service launched its Plug 'n Go program, the nation's first utility program that offers customers off-peak rates to recharge plug-in hybrid electric vehicles.

"We'll allow people to have a second meter at their home," said CVPS's Dan Mackey, "that is set on a timer to run at night." The company anticipates that this will save customers money while idle nighttime electricity capacity is

"It's different than flat around here. Hills change the strain on an engine and the emissions coming out of the tailpipe. Cold weather has all sorts of effects on batteries."

Richard Watts, UVM scientist

put to use – and reduce oil consumption and air pollution too.

But doesn't a plug-in hybrid just shift pollution from cars to power plants? Yes, but it's less pollution than a gasoline car, even when emissions from the nation's coal-heavy power grid are taken into account. And since Vermont's electricity supply is very clean compared to most other states – it has a high proportion coming from hydro and nuclear power – cars that run on electricity could make a significant impact on the state's overall greenhouse gas emissions.

Nationwide, transportation produces about 28 percent of U.S. greenhouse gas emissions, according to the Environmental Protection Agency. In Vermont, transportation produces 44 percent of the state's greenhouse gas emissions, Watts reports.

"Switching 50,000 existing vehicles from gasoline to plug-in hybrid electric vehicles would reduce carbon emissions by 31 percent," Watts and Letendre wrote in a report released this February.

A 2007 study conducted by the

Electric Power Research Institute and the Natural Resources Defense Council concluded that by 2,050 plug-in hybrids could reduce emissions of greenhouses gas nationally by more than 450 million metric tons each year, equal to eliminating more than 80 million cars and saving about 4 million barrels of oil each day.

Watts' research shows that the fuel costs for a plug-in hybrid running on electricity in Burlington would be one-third of the cost of a comparable vehicle getting 25 mpg. Vermonters driving an average of 20,000 miles a year would save over \$1,700 a year in energy cost – at today's prices.

"But many details about these cars in Vermont are unclear," Watts says. "We don't know specifically how they will do over

different length trips and on different parts of our electrical grid. Will the performance be the same in Burlington as in Hightgate Falls?"

That's why Watts and other volunteers will be taking careful notes on the performance of UVM's new research car as they use it to commute. As we head out of Winooski, a dashboard computer screen shows energy flowing from the battery to the electric motor to the wheels. Watts steps hard on the accelerator, and the gas engine rumbles to life while the display shows an orange arrow from the engine to the electric motor.

"I'm surprised there are not more accidents as people are looking at these screens," Watts jokes. He toggles to a new screen

and then puts on the brakes. "See this '99 mpg? When it's braking, it's regenerating. It's putting energy back in the battery."

Not so long ago, General Motors killed its electric car program, and Toyota Motors discouraged Prius owners from modifying their hybrid vehicles to run as plug-ins. Now the arrows seem to be running the other direction. Today, General Motors is pushing hard to bring the plug-in Chevrolet Volt to the marketplace by the end of 2010. Toyota may have a plug-in Prius available to fleet owners before that. And the California Air Resources Board last month demanded that manufacturers produce 58,000 plug-in hybrids in the next few years.

"Why I'm so interested is that plug-in hybrids allow you to choose your energy source," Watts says. "With a gas car you have only one choice; whereas in theory, with this car you could be plugged into wind, power, or solar, or a wood chip plant. All these could power your car instead of oil."

Joshua Brown is a science writer for the University of Vermont.