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Electric cars may hold solution for power storage

By Evan Halper

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NEWARK, Del. — The thick blue cables and white boxes alongside an industrial garage here look like those in any electric-car charging station. But they work in a way that could upend the relationship Americans have with energy.

The retrofitted Mini Coopers and other vehicles plugged into sockets where a Chrysler plant once stood do more than suck energy out of the multi-state electricity grid. They also send power back into it.

With every zap of juice into or out of the region's fragile power network, the car owner gets paid.

The pilot project here at the University of Delaware has had enough success to set off a frenzy of activity in the auto and electricity industries, particularly in California, where Gov. Jerry Brown's transportation plan this year promoted "vehicle-to-grid" technology.

Entrepreneurs and government agencies see the technology as a possible solution to a vexing dilemma: how to affordably store renewable energy so it can be available when it is needed, not only when the wind blows or the sun shines.

"This is a fascinating option," said Robert Weisenmiller, chair of the California Energy Commission. "The technology works. You can do this. The question is … what do we need to do to make it happen?"

California has the nation's most aggressive goals for renewable power and also wants to put 1.5 million zero-emission vehicles on the road over the next decade. State officials say vehicle-to-grid technology could point toward a way to accomplish both goals faster, for less money.

The idea is that utilities would pay vehicle owners to store electricity in the batteries of electric vehicles when the power grid has a surplus and drain electricity back out of them when demand rises.

The plan takes advantage of a key fact about cars: They spend most of their time parked. The technology makes idle vehicles a source of storage for utilities and cash for car owners.

The "Cash Back Car" is how the concept is described by Jon Wellinghoff, the recently retired chair of the Federal Energy Regulatory Commission. "It provides another incentive for people to buy electric cars," he said.

The technology could solve a potentially serious problem. The power grid, a massive tangle of power plants, transformers and thousands of miles of wire, needs to maintain a steady and balanced flow of power. Sudden surges threaten crashes that can cause blackouts. That makes the stop-and-go nature of energy from the wind and sun a constant source of worry.

A cost-effective method of storing renewable energy and controlling its flow into the system has long eluded the energy industry, which has taken to calling storage the "Holy Grail."

Of course, nothing with electricity is simple. To begin with, carmakers are not in the business of keeping the electricity grid stable. They build cars to perform on the road and worry what all this usage will do to their batteries.

"Almost without exception, their first response is, 'If you use my battery for that purpose, we will void the warranty,'" said Tom Gage, chief executive of EVGrid, a California vehicle-to-grid technology company.

Innovators in the field are gradually convincing car manufacturers of the potential to create a "value proposition for the car owner" and thus boost sales, Gage said. Ultimately, however, carmakers may be put at ease by experiments being conducted by the military.

The Navy has begun an intensive study with MIT to test batteries used only for driving against those that are plugged into the grid for storage.

And the week before Christmas, the Pentagon transported 13 Nissan Leafs to a Southern California Edison charging facility in Pomona as part of a $20-million program involving dozens of vehicles at Los Angeles Air Force Base and the Naval Air Weapons Station at China Lake.

The Pentagon hopes to eventually employ the technology at bases across the country, which could jump-start mass production of the chargers and software involved.

"We're looking to determine if we can make electric vehicles cost-competitive with conventional vehicles," said Camron Gorguinpour, executive director of the Defense Department's Plug-In Electric Vehicle Program. The department pays about $200 per month to lease a Nissan Leaf. Using a vehicle to store energy, he said, could generate enough revenue to offset most of that cost.

"You could pay close to nothing for the lease," he said.

But battery wear is just one hurdle. An even bigger challenge is reshaping utility regulations, electricity markets and the complicated tangle of algorithms that form the backbone of the grid.

"It can be an administrative nightmare to have a bunch of little power sources being fed into the grid," said Scott Shepard, an analyst at Navigant Consulting.

Staff members at the California Public Utilities Commission are exploring the regulatory changes that would be needed.

Utilities may prefer other emerging technologies that could prove more lucrative. Power companies typically make money by investing in large plants and charging customers enough to provide a guaranteed rate of return. There are no large storage plants involved with vehicle storage.

Nevertheless, back in Delaware, the professor who gave birth to the program, Willett Kempton, is gratified to see the concept taking hold.

He first proposed the idea in a paper in 1997. Researchers had begun their hunt for storage options. The electric car industry was also starting to have success. Kempton hit on the idea of combining the two.

"In industrialized countries, the average car battery is used only one hour per day," he noted. Why not put the storage devices to work?

Ten years later, he had a concept car up and running and demonstrated the technology in front of the Federal Energy Regulatory Commission headquarters in Washington, where regulators could see, for the first time, a car sending juice back to the grid.

This year, the university began getting paid for power storage created by its fleet of Minis. And just this month, Honda provided a vehicle to the pilot.

"There is momentum behind this idea," Kempton said. "These batteries are a huge resource, and we are going to need them."