

ELECTRIC UTILITIES

Are they the gas stations of the future?



A CONFERENCE BACKGROUND PAPER

authored by

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“If it weren’t for electricity we’d all be watching television by candlelight.”

George Gopal

What if you could buy a car that got over 100 miles per gallon (100+ MPG), emitted almost no greenhouse gases, and helped free America from its addiction to foreign oil? Instead of paying \$4.00 a gallon to fill up your car, you could pay the equivalent of about 50 cents a gallon? Instead of foreign oil, what if your car ran on clean northwest electricity and biofuels? What if electric utilities become the gas stations of the future?

Two years ago that car was just a concept when Professor Andrew Frank of UC Davis, Mark Duvall of the Electric Power Research Institute, Felix Kramer of CalCars, and a few others made prototypes of plug-in hybrid electric vehicles (PHEVs). For example, Kramer took an existing Toyota Prius and added a larger rechargeable battery and got a 100+ MPG car. It was a Prius on steroids!

PHEV development makes significant progress

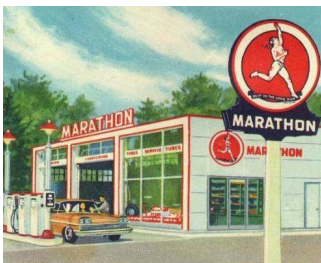
During the intervening period things have changed quickly. It’s now time to buckle your seat belts and drive into the future.

According to Buzz Rodland, president of Rodland Toyota Inc. in Everett, Wash., “We are going to witness the electrification of the automobile. These cars are real and they are coming faster than most people think.” And that may be faster than the typical planning horizon for electric utilities.

The 2007 Cascadia-Microsoft Conference on Transportation, Technology, and Energy, “Jump Start to a Secure, Clean Energy Future,” held at Microsoft’s Redmond campus on May 7, not only featured Prof. Frank, Duvall, and Kramer, but it also featured Nick Zielinski, the chief engineer for the GM Chevy Volt, and Bill Reinert, Toyota’s chief U.S. engineer. Toyota and GM have announced that they both will be making PHEVs. As soon as 2009, GM may make a plug-in version of its Saturn Vue and in the following year will roll out its hot Chevy Volt. GM has said that most drivers of the Chevy Volt may never have to fill up their gas tanks again.

At the Cascadia-Microsoft Conference, Rodland said, “Year to date, the Toyota Prius is the number one selling car in the Northwest. Not just hybrid cars, but all cars. People are coming into Toyota showrooms and asking for a Prius they can recharge at night in their garages.” Reinert showed that the competition for world oil from China and India along with the decline in production from existing oil fields means the price of oil will continue to rise. “It is clear we need to displace petroleum by tapping into diverse energy sources with affordable technology,” said Zielinski. “That is GM’s going-forward strategy.”

Toyota is betting that the company’s future will no longer be oil driven. Currently 25 percent of Toyota passenger car sales in the Northwest are hybrids; Toyota has committed to offering a hybrid drive system as an option on all future redesigned models. That’s a big commitment.



credit: imagelectric.org

PHEV technology converges with political reality

In the U.S., 97 percent of all transportation is based on oil consumption – a dependency that we can no longer afford. We import 60 percent of that oil from some of the least stable places in the world. Burning oil for transportation creates 40 percent of all greenhouse gases in the U.S.

The U.S. Supreme Court, Congress, the White House, and the governors in most of the western states have all in their own way said that we must end our addiction to oil. There is a growing political recognition that the most promising way to do this is with flexible-fueled PHEVs.

The move from oil to electricity in transportation has strong and growing bipartisan support. Sen. Orrin Hatch (R-Utah) spoke at the Cascadia- Microsoft Conference to discuss a PHEV incentives bill that he is working on with Senators Maria Cantwell (D-Wash.) and Barack Obama. (D-Ill.) Reps. Dave Reichert (R-Wash.) and Jay Inslee (D-Wash.) have introduced legislation that would help set up a northwest pilot project for PHEVs. Officials from the U.S. Department of Transportation and the U.S. Department of Energy spoke of pilot projects as did Bill Rogers of the Idaho National Laboratory and Michael Kintner-Myers of the Pacific Northwest National Laboratory.

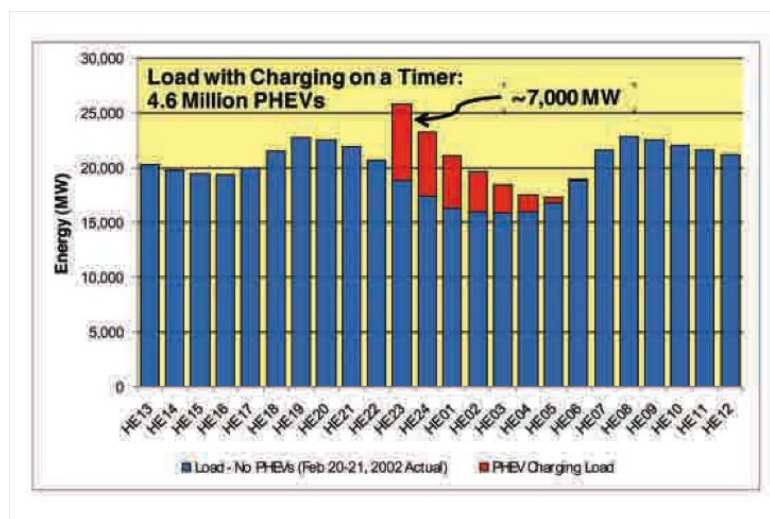
It's not hard to imagine the consumer demand for an extreme gas mileage car. Some makers of all electric (D-Wash.) and Barack Obama. (D-Ill.) Reps. Dave Reichert (R-Wash.) and Jay Inslee (D-Wash.) have introduced legislation that would help set up a northwest pilot project for PHEVs. Officials from the U.S. Department of Transportation and the U.S. Department of Energy spoke of pilot projects as did Bill Rogers of the Idaho National Laboratory and Michael Kintner-Myers of the Pacific Northwest National Laboratory. It's not hard to imagine the consumer demand for an extreme gas mileage car. Some makers of all electric plug-in cars such as the Tesla Roadster and cars from Hybrid Technologies can be purchased now. Hymotion also now sells battery conversion kits that can turn a regular Prius into a plug-in hybrid in two hours. New York State announced last summer that it will convert 600 of their state-owned Prius cars into PHEVs. But the tipping point will occur when one or several manufacturers offer PHEVs in volume.

PHEVs to affect electric utilities

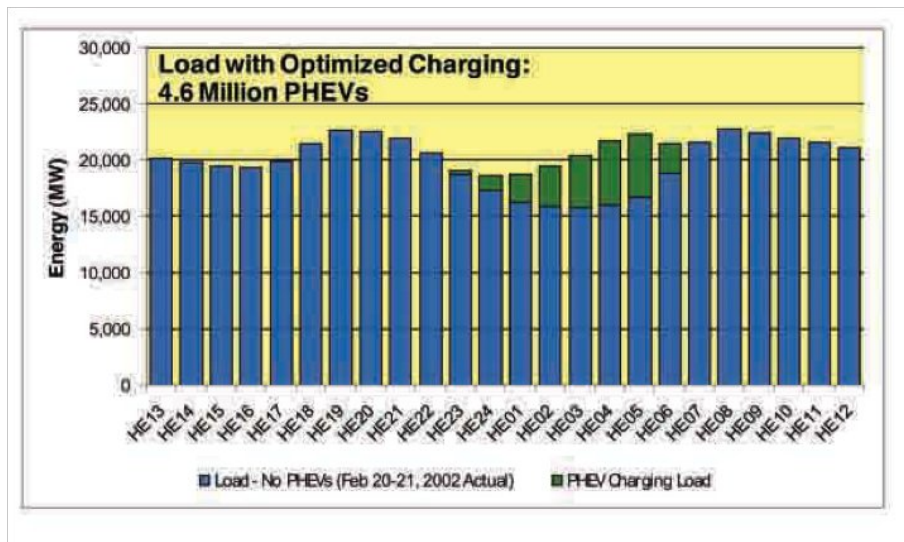
How will PHEVs be recharged? Most manufacturers suggest that they can be recharged using a standard 120-volt home outlet. It is expected that these batteries will power vehicles 20 to 40 miles on a single charge. Since half of the cars on the road are driven 25 miles or less each day, this would eliminate the need for gasoline for most Americans. And at today's northwest electric rates, the cost of electric fuel vehicles is equivalent to about 50 cents a gallon compared to \$3.50 a gallon for gasoline. This means that an owner of two cars (one a PHEV and the other a conventional gas-engine vehicle) will probably drive the plug-in significantly more. Once you buy a plug-in, the operating costs are 1 to 2 cents a mile compared to 12 cents or more for a gas engine car.

How much load might PHEVs place on northwest utilities? According to U.S. Department of Transportation data, there are about 9.2 million light-duty vehicles in operation in the states of Washington, Oregon, and Idaho. PHEVs could place nearly 7,000 megawatts of load on northwest utilities in the first hour of charging. This assumes that half of the 9.2 million light-duty vehicles were PHEVs that had randomly traveled between 0 and 20 miles before plugging into a common household 120-volt, 15ampere outlet with a timer that delays charging until 10 p.m., which is about the latest that charging can start with the assurance that each PHEV is fully charged prior to the next morning's commute. After 10 p.m., charging load diminishes as PHEV batteries reach their full charge.

Graphic 1 shows actual northwest regional loads as provided by the Northwest Power and Conservation Council for February 20-21, 2002, (a typical winter day) overlaid with PHEV charging loads. The chart illus-



trates that PHEVs could significantly increase our region’s peak load that could require new power plant and transmission line construction. This 7,000-megawatt peak could be four times higher (that’s 28,000 megawatts) if, as some have suggested, PHEVs are charged using 240-volt, 30-ampere outlets like those that are commonly used for clothes dryers and ovens.



However, if the PHEV charging load is actively managed, the same amount of energy can be delivered to each PHEV without exceeding the native load’s peak demand, thus not requiring additional new power plants to meet peak loads. It is important to start active load management when commercial sales of PHEVs first begin so vehicle owners understand that management of PHEV charging is part of the deal when purchasing these vehicles. If managed properly, the load could look as it does in Graphic 2.

What to do next?

Northwest electric utilities should prepare for a new class of customer: the mobile customer driving PHEVs. These mobile customers have different needs than utility static customers. It is important that electric utilities be prepared to serve them and make it easy for PHEV owners to plug in anywhere: at home, at work, when shopping, and when visiting friends and family across town, across the state, or across the nation.

There are plans being prepared for a Northwest PHEV Pilot Project to explore the ways in which this load can be optimally managed. The Northwest Power Planning and Conservation Council has requested a more detailed briefing in the next few months on what would be included in such a project. 28 NWPPA Bulletin June 2007

In general, the pilot project will study how best to integrate PHEVs with the power grid and with the transportation system. It will help create a roadmap to maximize the benefits and reduce the costs of electrifying transportation. Thoughtful integration into the electric power grid will produce the most benefits for customers, the environment, and our nation’s electric utilities. To minimize new infrastructure demands, such as new power plants and T&D lines, the daily charging of large numbers of plug-in vehicles will require active management and coordination between vehicles and the utilities supplying the charging energy.

The question is no longer whether we will replace most of our imported oil with domestic electricity and biofuels in transportation; it is now a question of how best to do it. The Northwest with its clean sustainable electric power grid and its history of cooperation among its electric utilities can be a leader in making this transformation creating a model for the rest of the nation to follow. We can look forward to electric utilities becoming the gas stations of the future and to a future that is cleaner, greener, and more secure. And that future is not far away!

About the Authors

Steve Marshall is an attorney, a Cascadia Center Senior Fellow, and prior Chair of the Municipal League of King County for 2006-2007. Previously he was the assistant general manager of Power and Transmission Services at Snohomish County PUD No. 1 in Wash. Mr. Marshall will be moderating a panel at the Meeting of the Minds session in Portland in July 2008. Marshall can be reached at (206) 909-2019 or at marshallsj@comcast.net.

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