

Electric Cars, Identities and Peak Saver Programs

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Date: November 30, 2010

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Executive Summary

This paper views the emerging need for a electric car peak saver program. The paper is based on two assumptions:

1. The electric car prices will fall and that this will result in significant car sales
2. The car's recharging system will use large amounts of electricity

If these assumptions prove to be true, then the paper outlines the requirements and challenges for creating an electric car peak saver program to manage electricity demand during peak electrical grid periods. These include:

- Identity management for vehicles, vehicle owners and charging stations
- Business processes that easily support the vehicle owner to register and deregister their electric cars in utility peak saver programs
- Communication networks that communicate from a charging station to the utility
- Identity federation between utilities and commercial charging stations
- Determining the business case to justify all the expenses associated with the above

Electric Car Sales are Increasing

The emerging electric vehicle industry is rapidly growing. There is growing concern amongst utilities about the impact these vehicles will make on the grid. For example, Jonathan Fahey of The Associated Press recently wrote an article, ["US Utilities thrilled and worried about electric cars"](#), in which he states:

"When plugged into a standard 120-volt socket, the electric car will draw 1,500 watts. By comparison, a medium-sized air conditioner or a countertop microwave oven will draw about 1,000 watts.

But the car can be charged faster, and therefore draw more power, when plugged into a home charging station. The first Leafs and Volts can draw 3,300 watts, and both car makers may boost that to 6,600 watts soon. The Tesla Roadster, an electric sports car with a huge battery, can draw 16,800 watts. That's the equivalent of 280 60-watt light bulbs.

A modest home in the San Francisco Bay area that doesn't need air conditioning might draw 3,000 watts at most.

The "nightmare" scenario, according to Austin Energy's Rabago: People come home from work on a hot afternoon, turn on the air conditioner and the plasma television, blend some frozen cocktail, start cooking dinner on an electric stove —and plug their car into a home charging station."

The assumption this paper is going to use is that electric car price points will drop causing wide spread adoption by consumers AND that the batteries and charging stations will draw large amounts of power.

If these assumptions prove to be true, it is foreseeable that utilities will have to trim grid energy consumption during peak summer periods just like they do today with peak saver programs for air conditioners where the utility automatically stops their air conditioner for short time periods. People who voluntarily belong to these programs will have their vehicle charging stopped for periodic intervals during peak loads to help avoid grid brown outs.

I believe the problem is even more challenging than what is stated because cars move around. It is foreseeable that many owners will drive to work and then want to charge their cars while at work or charge them while shopping. Additionally, owners sell vehicles so how does the utility keep track of what vehicle is enrolled in their program? Finally, the charging stations need to be identified to the utility and also enable automatic control on the car or cars that are charging there by the utility.

The solution requires thinking outside the conventional utility box. There are several key components required to create the infrastructure and processes to support creating peak saver type programs for electric vehicles. They are:

- Identity management for vehicles, vehicle owners and charging stations
- Business processes that easily support the vehicle owner to register and deregister their electric cars in utility peak saver programs
- Communication networks that communicate from a charging station to the utility
- Identity federation between utilities and commercial charging stations

Cars and Charging Stations are Identities

Cars already have their own unique identifier, the vehicle identification number or “VIN”. However, using the VIN isn’t sufficient for a utility to use to identify the car. Why Not?

The vehicle may change ownership. The VIN alone doesn’t let the utility know that the vehicle is part of its peak saver program . It will therefore be critical that cars in the future will have their own “utility identity”.

This will be done via the use of a digital certificate. A digital certificate is a piece of encryption code the utility can verify it issued, is unique to the vehicle/owner and can be stored and removed from the vehicle’s computer system. In the future, when a electric car pulls up to a charging station in the future, the charging station and/or the utility will be able to query the car’s computer system and receive the utility digital certificate identifying the car as part of the utility’s peak saver program. (Note: it is highly likely that cars of the future will have several digital certificates stored in them to denote participating in other programs or services. For example, the car’s manufacturer might include them to identify them as part of their customer service program.)

The charging station also might be enrolled in the peak saver program. In this scenario, the charging station will be instructed by the utility during a peak load to stop charging the vehicle or vehicles attached to it. The charging station will also need to have a computer system that will accept a digital certificate from the utility.

Easy Business Processes for Certificate Issuance, Removal and Renewals

Most consumers will not want to:

- Be confused over what a digital certificate is
- Hassled by having to go through some complex procedure to install one in their electric car
- Find out the certificate has expired and now their car isn't part of the program
- Have trouble with removing the utility's digital certificate from their car when it's sold

The challenge for the utilities in using digital certificates is that they now must have in place the infrastructure to easily allow their customers to enrol their vehicle in a peak saver program, quickly remove them when the vehicle is sold and automatically issue renewals on digital certificates.

This requires the utilities to work very closely with electric car manufacturers to install computer systems in the car that will automatically store the utility's digital certificates and communicate with the owner's energy management system. Thus in the future, when the owner buys a new car, the sales representative asks the owner if they want to be part of a peak saver program. If they agree they enrol the owner's vehicle in the program and the digital certificate is installed before it rolls off the lot.

When a vehicle is sold, the former owner or new owner could direct their home energy management software they are adding or removing a vehicle. The energy management system would then automatically notify the utility and remove the vehicle from the program or notify the new owner they can enrol in the program. Finally, it is also possible the state vehicle registration branch could notify new owners of the peak saver program.

Digital certificates also normally have a "shelf life" after which the digital certificate expires. Depending on the time set by the utility, this could or could not pose a problem for the vehicle's owner. The utility will need to implement an automatic digital certificate renewal program for vehicles. This can get complicated since the vehicles move around and the owner may not know or be able to automatically renew their car's digital certificate.

Finally, the utility's customer service departments will have to be trained on the business processes of digital certificates as well as learn how to handle technical questions about this.

How Does the Utility Talk to Your Car?

The utility needs to be able to talk to your car or the charging station to identify if the car is part of a program, tell it to stop charging and then restart. What communication network is going to be used?

In large urban centers there are many existing commercial networks that the utility can use. It is foreseeable that the utility will “piggyback” some of their communication needs with owners of these networks or construct hybrid networks using their own private networks as well as commercial ones.

In non-urban centers the challenge of deploying vehicle peak saver programs increases. There are fewer networks available and the costs potentially rise for using these or building a utility’s network.

Then there is the issue of data privacy for the data being transmitted. Digital security requirements need to be identified and then the network constructed to secure the communication.

Finally, the criticality of the network availability needs to be considered. Depending on how the utility and the regulators assess the criticality of the relationship between car peak saver program and demand response, then the availability of the network may or may not become important. If the risk is deemed high, then costs for deploying the network will likely rise.

Communicating Between a New “Gas” Station and the Utility

Let’s say you pull into your company’s parking lot and want to recharge your vehicle while you work. It is likely the “charging station” in the future will be run by one of the existing “gas” companies like Chevron, Shell, Exxon, etc. There needs to be:

- Communication between these companies identity management systems and the utility to let them know that your car belongs to the peak saver program
- Stop electrical charging to the vehicle when directed by the utility.

This means that “identity federation” will be used between the charging station’s company and the utility. Identity federation means building electronic trust between two or more parties. Utility companies must therefore have the ability to build electronic trust between themselves and other entity’s, like commercial charging stations, in order to deliver a peak saver program.

Who's Going to Pay for This?

This paper is written on the assumption that electric cars will become widely adopted AND that they will draw large amounts of energy. If either of these assumptions proves to be untrue, then the need to use digital certificates and identity management systems will not be pressing. HOWEVER, if this is true, then a business case needs to be constructed by the utility and regulators identifying the cost for assembling all of the components mentioned above, the benefits and who is going to pay for all of this.

If the above assumptions are valid the time frame is likely between 3-5 years in large commercial centers to prepare the infrastructure to deploy electric car peak saver programs.

Proof of concept pilots with car manufacturers, vehicle charging companies and vehicle owners need to be rapidly implemented to understand the true infrastructure, business and technical processes and business costs associated with these programs.

Summary

It is very early days in the electric vehicle industry. Utilities and energy regulators must look down the road and begin rapidly trying to catch up and get ahead of the curve operationally from their grid demand-response perspective. They must consider the need for vehicle peak saver programs and then understand the complexity and costs associated with this. It's time to wake up and smell the electrons that will be used to not only charge the vehicles but also understand how to identify and integrate them into a demand-response program.

About the Author

Guy Huntington is a very experienced, independent identity management consultant who has recently led the conceptual architecture for a utility smart grid as well as having rescued several large Fortune 500 identity projects. He has written numerous papers on [identity management and smart grid](#). He can be contacted at 604-861-6804, guy@hvl.net or www.authenticationworld.com.