RE: Regulatory Issues Relating to Electric Vehicles
Docket UE-101521

Brief Perspectives on the Coming EV Market, and its impact on Washington Utilities

James Adcock
Member, Seattle Electric Vehicle Association
Microsoft Research, retired
Electrical Engineer, MIT
Member, Society of Automotive Engineers.

November 28, 2010

Summary: the coming rollout of EVs and PHEVs will happen very slowly, due to high prices, barriers to market entry, limited range, and a period of reactionary politics due to fears of job loss, economy downturn and home foreclosures. This slow rollout will give Utilities and WUTC ample time to take a "wait and see" approach to the impacts – positive or negative – of EVs and PHEVs on Washington Utilities. The important thing is to not inadvertently impose market sanctions during this fragile early rollout period that would discourage would-be early adopters.

Prime Reference:

"Drive Green 2020: More Hope than Reality?"

A Special Report by J. D. Power and Associates, November 2010, businesscenter.jdpower.com

(J. D. Power and Associates is the leading Automotive Marketing Forecast firm, globally)

Near-term sales of EVs and PHEVs will be on the order of 10,000 units a year, nationwide. It is hard to imaging Washington State capturing more than 10% of this, which would mean a maximum of 1,000 EVs and/or PHEVs added per year. About 8 million new cars are sold nationwide each year, or about 1 out of 1,000 new cars sold will be EVs or PHEVs. In practice, as one who has been very actively trying to buy a Nissan Leaf or a Chevy Volt for the last couple years, I can assure you that it is extremely difficult to get one's hands on one of these vehicles, the ordering process is extremely complicated, hidden and obtuse, the wait times are very long, and the prices are very high. And how to even actually get a home charger installed remains in practice a mystery!

It appears that EV sales will exceed PHEVs, at least short term. The higher price and lower EV-range of the Volt appears to make it less desirable to early-adopters than the "pure" EVs. Since the impact of PHEVs in any case is less on Utilities than EVs, for the rest of this analysis we will just stick with "EVs", understanding that PHEV sales, to the extent they occur, will cause fewer potential problems than EVs.

Comparing EV electricity needs to other common household loads:

1.5 kw = hair dryer: one half an EV charging

3.5 kw = a EV charging

6.0 kw = a home with the oven turned on = 2 EVs charging

10 kw = a home with the oven and the air conditioner on = 3 EVs charging

15 kw = a home with the oven, air conditioner, and hot tub on = 5 EVs charging

Conclusion: there are many, many common household loads that a homeowner can come home from work and turn on which are large in comparison to the loads imposed by a rare EV charging. In practice the rare EV purchase will have minimal impact on neighborhoods and utilities.

Ramp rate of new electricity required to meet the needs of EVs: Each EV draws about 3.5 kw while charging. 1,000 new each year means 3.5 Megawatts total – about two additional wind towers a year required, generating power overnight. A bigger impact is IF these EV owners come home after work and are too lazy to set the "delayed charge" feature of their EV chargers, such that they are drawing power during evening peak periods. Since only 1 of a 1,000 new vehicles is an EV – about 1 in 10,000 total vehicles on the street – the possibility of any particular neighborhood transformer being overloaded is extremely remote, as is the possibility of even two EVs in any one neighborhood – except perhaps in a Microsoft "Ghetto."

Time-of-use, time of day charges, separate metering: Separate metering will be met with great hostility from the existing EV community. It has never been required before. No household class of usages, not even hot tubs, has required separate metering in the past. It raises the specter of "Big Brother" imposing punitive electrical rates in the future on EV owners. It intrudes into the sanctity of "one's own castle" when suddenly the State starts asking how exactly one is consuming electricity in one's own home, etc. It is not clear on what regulatory basis WUTC would impose discriminatory pricing on EV owners, as compared to other classes of electricity users, including those homeowners who own hot tubs, or air conditioners. It is not clear how WUTC would apply "value judgments" about which of these ought to be "preferred usages" of electricity vs. "discouraged" uses of electricity – hot tub, air conditioner, or clean air vehicle? In

practice separate metering would prove to be a bottle-neck in the individual acquisition and deployment of EV – one will end up with a $30,000 "brick" in one's driveway while awaiting coordination from the local utility and the installation electrician. In practice early EV adopters are a very knowledgeable and independent group of people, including a large percentage of electricians and engineers. These people will simply "route around damage" if the State attempts to impose onerous installation conditions – and such would in practice not be good policy. We want EVs to be a mainstream technology, embraced by the state and utilities, not a "grey market" hobbyist "hacker" activity.

"Carrot vs. Stick" incentives for Time-of-Use, Time-of-Day, off-peak charging. This has been tried before in Washington State on an experimental basis, and failed. Why? Because the pricing policies were such that anyone who volunteered for Time-of-Use Time-of-Day found that their monthly payments increased in spite of their best efforts to use electricity off-peak. An effective Time-of-Use Time-of-Day pricing scheme would be such that a ratepayer choosing such a scheme and switching high-use loads off-peak must end up paying less – because that IS the pricing signal we are trying to send ratepayers: Please use electricity off-peak when it is cheap because it is VERY expensive for us to generate power on-peak. The end result is that ratepayers who switch to time-of-use, time-of-day should be paying less money to utilities, such that total utility revenue goes down. Utilities don't like this, because it in turn makes recovery more difficult, so utilities want to set Time-of-Use pricing such that utilities don't lose revenue – and that in turn means there is no incentive for ratepayers to choose Time-of-Use pricing! The only practical way out of this vicious cycle is to apply Time-of-Use pricing to ALL ratepayers universally. Then the hot tub owner can decide to heat the hot tub after dinner instead of during dinner, the clothes dryer will be set for a two hour late-evening delay and the EV owner will hopefully remember to tell the charger to start at 9 pm. Please consider that even if on-peak costs are 2X off-peak costs, avoiding on-peak costs only saves the EV owner about 25 cents – compared to using and enjoying a $30,000 investment – a ratio of more than 100,000 to 1, such that pricing incentives are highly unlikely to drive the EV owner's behavior any more than a couple cents change in gas prices drives the behavior of the gas car owner's behavior. What will drive the EV owner's behavior is the desire to be a "good citizen" and a good representative of the EV community – both reasons why they wanted to buy an EV in the first place!

DOT and the Gas Tax Dilemma

EVs are not the cause of the Gas Tax Dilemma. The Gas Tax Dilemma will be hitting very hard in the coming decade as EPA/NHTSA mandate higher fuel economy for ALL vehicles – of which EVs will be literally only one part in 1000.

Consider:

Large SUV 15,000 miles a year, 15 MPG = $280 state gas taxes collected.

But auto buyers are switching back more to car purchases as gas prices rise:

Midsized Car, 15,000 miles a year, 25 MPG = $168 state gas taxes collected.

And turning more green:

Prius, 15,000 miles a year, 50 MPG = $84 state gas taxes collected.

EVs will be driven fewer miles each year because they only have 100 mile range:

EV, 7500 miles a year, 100 MPGe = $21 state gas taxes – if collected on a "fair" basis.

Now I assume that EV owners would be happy to pay a "fair" amount of $21 a year extra on their car tabs each year if that is what is necessary to make DOT happy – but I suspect that will not make DOT happy, on the contrary DOT want to collect something closer to the $280 per vehicle currently collected on SUVs, and may propose such a punative "alternative taxation scheme" on EVs. Also known as "Don't Tax You, Don't Tax Me, Tax That Fellow behind the Tree" – EV owners being a small minority who they can afford to tax unfairly. But if you tax EV owners unfairly then they will choose NOT to make the extra $20,000 investment to buy an EV in the first place, since they can also buy a Prius at a much lower price, accomplish much the same environmental goals, and not be subject to discriminatory taxation.

What ought to be done instead is say that a road use fee ought to be collected of all vehicle owners at emissions checkup time based on actual mileage driven as displayed on the vehicle odometer. Then drivers are charged road use fees in proportion to how much they actually use the roads.

In summary, to avoid discouraging early adopters of EVs, please:

- No Punitive Pricing schemes on EV electricity
- No Onerous separate metering or other installation restrictions.
- No special "Alternative Minimum" Road Use "Gas Tax" on EVs.

Thank you for your consideration.

PS: What could change these scenarios described above? Radical battery developments, such that range is much higher and prices are MUCH lower. Or another 70's style gas crisis, with rationing and long gas lines. If such happens, then WUTC and utilities WILL need to react swiftly in "crisis mode!"