

PHEV VPS Workshop Summary Report

PHEV Value Proposition Study Guidance and Evaluation Committee Meeting (December 10)

Industry and utility executives met with the PHEV Value Proposition Study team at the L'Enfant Plaza Hotel in preparation for the workshop held the following two days. A key suggestion was to develop value proposition scenarios for both a mature PHEV market and developing market, which would require introduction incentives. Additionally, it was decided that 2020 was too soon to assume a mature market. The 2030-2040 was a more acceptable time frame.

PHEV Value Proposition Study Workshop (December 11 & 12)

Over 100 experts from the automotive, battery, utility, and supplier industries, as well as several national labs and more, met to identify value propositions that will ultimately provide the consumer with the performance, features, and benefits that allow PHEVs to be cost competitive with other vehicles on the market. The PHEV Value Proposition Study is an ORNL project conducted in collaboration with Sentech and co-funded by the Vehicle Technologies Program and Office of Electricity Delivery and Energy Reliability. Noted speakers included Former Director of Central Intelligence James Woolsey and FERC Commissioner Jon Wellinghoff, Assistant Secretary for Electricity Delivery and Energy Reliability Kevin Kolevar, and Deputy Assistant Secretary for Energy Efficiency David Rodgers. Additional speakers from the industry included Jim Holland (Ford), Michael Andrew (Johnson Controls), Terry Boston (TVA), Mike Rowand (Duke Energy), and Edward Kjaer (Southern California Edison).

Breakout sessions included:

- Value Propositions with Unidirectional Electric Flow
- Value Propositions for Third Party Ownership of Batteries
- Value Propositions for Vehicle to Grid
- Value Propositions for Vehicle to Building
- Consensus Vision for 2030-2040

Further detail can be found in the workshop summary provided below and shortly on the Sentech PHEV VPS website. [Link to site](#)

The project is being coordinated with other national laboratories and industry initiatives in consumer preferences, utility generation/demand projections, and vehicle component cost and value studies. The next step is for the ORNL, Sentech, GE, EPRI, and Ohio State team to analyze, evaluate, and then prioritize the proposed propositions for a benefit/risk assessment before simulating the highest ranking propositions.

PHEV Value Proposition Study Workshop Summary Report, 12-12-07

Recurring Observations

- The hype has outstretched reality. Inaccurate interpretation of PHEV studies and their scope is leading to overly optimistic conclusions and projections
- Battery manufacturing capacity will limit vehicle production and market penetration
- For nuclear and/or renewable power generation, PHEVs are very complementary

- Energy security benefits are the most difficult to quantify. Losses due to our reliance on oil imports have been estimated in the \$350 billion per year (D. Greene for 2006) range based on loss of GDP, transfer of wealth, supply volatility

Value from unidirectional electricity flow (G2V) (with or without smart metering) is expected with or from (ranked in order that the breakout session prioritized them):

- Incentives from utilities, manufacturers, and consumers
- Government regulations, incentives, and federal fleets
- Convenience parking incentives at businesses, airports, municipalities (charging ports will be required)
- Enhanced vehicle capabilities (range, pre-heat/cool, power supply, etc.)
- Convenient charging ports
- Travel conveniences (reduced tolls, etc.)
- Purchasing encouragement with PHEV education, sales person incentives, and trade incentives
- Encouraging social responsibility and PHEV ownership by cooperating with social responsibility clubs, providing special license plates, etc.
- Flexibility in charging options (e.g., distributed generation vs. grid)

Value is expected to be gained when the batteries are owned by a (an) (ranked in no particular order):

- Electric service provider
- Generic profit center
- IT company
- Emissions credit trading organization

Vehicle to grid (V2G) value propositions are expected from (ranked in the order that the breakout session prioritized them):

- “Balancing Authority” (includes wholesale markets organized under the ISO model and the traditional vertically integrated utility model both subject to FERC oversight and not local utilities which are regulated by state PUC) receiving ancillary services
- Vehicle providing local power quality benefits
- Vehicles providing demand response for the grid
- Green power credits
- Various aggregation strategies with parking lots and garages
- Federal tax credit strategies
- Incentives to OEMs to build V2G-ready vehicles

Vehicle to building (V2B) propositions include:

- Emergency back-up power for the building
- Building power management strategies
- Optimization of on-site renewable energy sources

The PHEV from here to 2030 will be influenced by (ranked in the order that the breakout session prioritized them):

- Regulatory requirements (CAFÉ, Carbon Tax, Emission Standards, etc.)
- Technology breakthroughs (primarily in batteries)
- Manufacturing technology advancements and deployment
- Incentives for early adopters

- Industry standards for components and technologies

Consensus view of 2030 of energy - oil

- ~ \$150 a barrel
- Middle East will provide a greater percentage of global oil
- Greater public issue
- Trade imbalance will encourage domestic energy use

Consensus view of 2030 of energy – electricity

- Generation mix will change to cleaner emissions
- Price differential between electricity and liquid fuels will likely increase and drive the PHEV market
- Worldwide number of vehicles will increase from 700 million to 1.2 billion by 2020
- Increasing oil prices and emissions will favor more efficient vehicles and petroleum displacement vehicles (e.g., PHEVs)
- Communications technologies are unseen but an architecture will be in place
- V2B will possibly be adopted, but V2G is unlikely due to battery warranty issues
- Vehicle and utility grid managers need to communication real time (e.g., Smart Grid, ITS)
- Value to the grid is effected by vehicle location

Consensus view for 2030 vehicle parameters

	Conventional Vehicle	Non-Plug-in HEV	PHEV
Fuel Economy	Base Case	-35%	-70%
All Electric Range	--	--	32 miles
Market Share		NiMH & Li-ION will be used	5-10% - limited by battery manufacturing capacity and influenced by CAFÉ requirements
Price Premium	Base Case	\$2k-3k above Base	\$4k-6k above HEV
Performance	Base Case	Comparable in performance & maintenance	Comparable in performance & maintenance with reduced gradeability