

# Plug-In Hybrid Electric Vehicle (PHEV) Value Proposition Study Workshop

Breakout Session # 2 Report  
Third Party Ownership of Batteries

December 12, 2007



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# Third Party Ownership of Batteries

## Value Propositions

### 1. Utility or Electric Service Provider

- Entity providing value: Electric service provider
- Nature of deal: Better energy utilization, better capacity factors, increased use of renewable energy, better load shaping, energy storage for DSM
- Consumer benefit: Lower-cost off-peak electricity, free battery

### 2. Generic Profit Center

- Entity providing value: Examples: energy storage company, smart community developer
- Nature of deal: Lease battery to consumers, assume all or part of purchase and service risk, broker V2G/V2B
- Consumer benefit: Reduced cost and financial risk, increased technology options and service flexibility, possible profit from V2G/V2B



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# Third Party Ownership of Batteries

## Value Propositions

### 3. IT Company

- Entity providing value: Information technology company
- Nature of deal: Integrated billing, load integration, dispatch for utility; free/subsidized battery to consumer
- Consumer benefit: Lower-cost PHEV due to free or subsidized battery

### 4. Emissions Credit Trading Company

- Entity providing value: Trading company (consumer may own battery)
- Nature of deal: Trading company tracks behavior, verifies credits, monetizes environmental goodness
- Consumer benefit: Rebates based on technology choice and behavior



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# Third Party Ownership of Batteries

## Value Propositions

### 5. Joint Venture

- Entity providing value: JV with, for example, auto OEM, utility, insurance company
- Nature of deal: Underwriting of product performance, safety, reliability; utility gets end-of-life batteries
- Consumer benefit: Reduced cost of battery or reduced vehicle lease payment

### 6. Consortium Involving Insurance Companies, Others

- Entity providing value: Insurance companies and others
- Nature of deal: Underwriting of product quality; assurance of performance, safety, service; selling & financing of batteries including recycling
- Consumer benefit: Assurance of product performance, safety, & cost



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# Third Party Ownership of Batteries

## Value Propositions

### 7. Anyone Owns Batteries (ultimately, the consumer)

- Entity providing value: Standards organizations
- Nature of deal: Standardization to drive manufacturing and production scaling (“D” battery model)
- Consumer benefit: Lower cost of energy storage in both stationary and vehicle applications; greater safety; simpler service

### 8. Municipal or Co-op Electricity Provider

- Entity providing value: Local providers
- Nature of deal: Local service & maintenance, convenience, familiar financial relationship
- Consumer benefit: Comfortable and familiar payment mechanism



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# Third Party Ownership of Batteries

## Value Propositions

### 9. Government Agency

- Entity providing value: Federal, state, or local agency
- Nature of deal: Create environmental credits, environmental subsidy to consumers to increase sales of clean cars
- Consumer benefit: Reduced vehicle cost; free battery pack

### 10. Energy Companies (a.k.a. Oil Companies)

- Entity providing value: Energy companies
- Nature of deal: Carbon credits accrue to energy companies; increased volume, brand loyalty, new business line
- Consumer benefit: Reduced \$/gallon price at retail locations for subscribers



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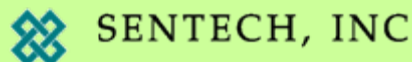
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# Third Party Ownership of Batteries

## Major Themes

- Sorting technique does not reflect final priorities
- All have merit, none stand alone
- Financials are speculative
- No one has done pro forma on any of these value propositions
- Benefits/incentives are applicable to all
- No consensus that 5-year battery life would affect third-party ownership value propositions
  - Low-cost, short cycle life battery **may** preclude second use in utility applications
- Although value propositions are designed toward sustainable business model in 2040, this market has to emerge in next 5-10 years
- If government is committed to this technology as an energy security measure it could offer
  - Energy security credit for consumer, \$/barrel of oil consumption reduced/displaced
  - Incentive fund for manufacturing jump start (e.g., 1M vehicle battery packs per company)



# 1. *Electric Service Provider Owns Batteries*

- What is the value stream for each (impact of the value proposition; \$; metrics):
  - Lower average kWh cost
- Who receives the value (Beneficiaries):
  - Electric service provider
    - T&D capital deferral
    - Higher capacity factor
    - Greater capture of RPS energy
    - Flexibility for implementing DSM
    - Rate-base hard battery assets
    - PR/goodwill
    - Reliability index improvement
    - Renewable energy credit/GHG credits



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# 1. *Electric Service Provider Owns Batteries* *(Cont.)*

- Who receives the value (Beneficiaries): (contd.)
  - Auto OEMs
    - Offer new “clean vehicles”
    - Reduced technical risk
    - Reduced liability and cost for battery system
  - PHEV consumer
    - Increased performance without emissions
    - Reduced or zero cost for battery (reduced initial cost of vehicle)
    - Overall lower cost of personal transportation
    - Lower operating cost (\$/mile)
    - UPS, emergency, mobile off-grid power available
    - Smoother, quieter ride (reduced noise, vibration, harshness)
    - “Green satisfaction”
    - Battery maintenance eliminated, assurance guaranteed
    - Convenience – reduced trips to fuel station
    - Lower homeowner insurance premiums (backup power available)



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# 1. *Electric Service Provider Owns Batteries (Cont.)*

- What data is available to support this idea? (studies, resource guides, contacts, etc):
  - EPRI PHEV study for GHG, carbon footprint
  - PG&E study on impacts of TOU rates on vehicle charging
  - MADRI study on peak-load impact
  - CARB battery study



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# 1. *Electric Service Provider Owns Batteries (Cont.)*

- What are the evaluation methods to measure impact of implementing this idea/scenario? How do we gather data to measure impact of implementing this idea/scenario?
  - Model vehicle penetration with additional kWh sold
  - PHEV penetration-based operations statements
  - Utility-specific evaluations and demos
  - Market study of where people need to charge (where infrastructure exists and where it is needed)
  - Duty cycle: how and when the consumer plugs in
  - Economic impact study of high gas prices
  - Study GHG system impacts of mass PHEV introduction
  - Utilities need to better understand technology



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# 1. *Electric Service Provider Owns Batteries (Cont.)*

- What are the barriers associated with implementing each scenario?
  - Smart Grid is not available today/tomorrow
  - Regulatory uncertainty; prove PHEV environmental benefit
  - Consumer marketing to overcome resistance
  - Loss of Federal, State, local revenue from fuel tax
  - Lack of/questionable power accessibility (“garage-deprived” consumers)
  - Lack of “roaming charges” model
  - Uncertainty of future gasoline prices dropping
  - Cost of raw materials for batteries may increase
  - PUC education on business model
- What incentives should be put in place to enable the establishment of this value proposition?
  - For consumer: HOV access, parking access, increased speed limit, congestion access



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## 2. *Generic Profit Center*

- What is the value stream for each (impact of the value proposition; \$; metrics):
  - Financing
  - Upfitting and customization
  - Warranty/service for battery
- Who receives the value (Beneficiaries):
  - Consumer: product assurance, reliability, safety
  - Company: second use and salvage value
  - All (maybe): Liability insurance
- What data is available to support this idea? (studies, resource guides, contacts, etc):
  - No data on second use of battery



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## 2. *Generic Profit Center*

- What are the evaluation methods to measure impact of implementing this idea/scenario?
  - Collect battery performance data in both vehicle and stationary applications (~10 years?)
- What are the barriers associated with implementing each scenario?
  - Risk of new technology introduction
  - Battery standardization
  - Manufacturing capability especially in the U.S.
  - Energy security issues, critical materials in the U.S.
  - Insurance underwriting issues
- What incentives should be put in place to enable the establishment of this value proposition?
  - FDIC-like insurance for new technology risk (5-10 years)
  - Incentive for manufacturing kick start (1M vehicle battery packs per company)



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### 3. *IT Company*

- What is the value stream for each (impact of the value proposition; \$; metrics):
  - Knowledge management
  - Aggregation and dispatch of electricity services
  - Warranty service under contract
- Who receives the value (Beneficiaries):
  - Data mining and revenue generation from IT info
    - Market research, fleet mgmt data, vehicle location data
    - OnStar on Steroids
  - Management and trading of REC credits
  - Consumer benefit of car connected to Internet



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### 3. *IT Company*

- What are the evaluation methods to measure impact of implementing this idea/scenario?
  - Codes and standards; IT protocols, interconnects, etc.
  - Study on load matching of renewable energy with vehicle use
  - Data and info on battery performance, reliability, etc.
- What are the barriers associated with implementing each scenario?
  - Inability to resell electricity in most states
- What incentives should be put in place to enable the establishment of this value proposition?
  - Cost of batteries becomes irrelevant
  - Government: passive role, maybe needed in codes & standards?



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## 4. *Emissions Credit Trading Company*

- What is the value stream for each (impact of the value proposition; \$; metrics):
  - Knowledge base of environmental credits
  - “Charge to Change”
- Who receives the value (Beneficiaries):
  - Consumer: free/reduced battery in exchange for environmental credits



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## 4. *Emissions Credit Trading Company*

- What are the evaluation methods to measure impact of implementing this idea/scenario?
  - Study & influence environmental legislation
  - Policy analysis
  - How CO<sub>2</sub> & GHG emissions will be impacted by PHEVs
- What are the barriers associated with implementing this scenario?
  - Unknown environmental value of PHEVs
- What incentives should be put in place to enable the establishment of this value proposition?
  - Displaced oil credit or energy security credit



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