Evaluation of Hydrogen Storage System Characteristics for Light-Duty Vehicle Applications

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Objectives and Approach

**Objectives**
- Demonstrate an approach to evaluate hydrogen storage system characteristic trade-offs across several vehicle configurations
- Estimate the sensitivity of hydrogen storage system improvements on vehicle viability

**Approach**
- Use an integrated system modeling approach by combining vehicle, cost and viability models to evaluate overall system performance
- Evaluate storage/vehicle combinations to take advantage of unique characteristics of individual storage systems

Background
Hydrogen Storage Engineering Center of Excellence (HSECoE)
- Complement the three materials-based hydrogen storage CoE
- Research and develop onboard vehicular storage systems and components that will reach DOE targets while meeting vehicle related packaging, safety, cost and performance requirements

Model Framework

**Hydrogen Storage Inputs**
- Results to Record
- Design Variables and Settings

**Vehicle Inputs**
- Vehicle Viability Estimation
  - Modified weighting factors to reflect actual market trends
  - Attributes considered
    - Capital cost
    - Fuel cost
    - Acceleration
    - Range

**Run Drive Cycles**
- Majority Buyers Sales Distribution

Results

**Part 1**
- Graphs for Gravimetric Capacity, Transient Response, Storage System Cost Sweep, and Storage System Full Flow Rate Sweep

**Part 2**
- Graphs for Fuel Economy, Capital Cost, and Transient Response

Conclusions

- Estimated the sensitivity of hydrogen storage system improvements on vehicle viability
- Decreasing fuel cell power and increasing battery power can help preserve vehicle viability with slow transient response storage systems
- Using the “Most Viable” and “Best NPC” approaches provides similar results