

Outline of Fueling Options

HTAC Subgroup

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Objectives

Provide a first order assessment of a range of fuel cell vehicle fueling alternatives to determine

- A rough comparison of costs and financial risks
- Technical and regulatory challenges
- Potential for facilitating consumer adoption of FCVs

Provide a basis to determine if further work is merited and if so, suggestions for scope of work

Alternatives to be explored

- Central
- Portable
- Delivery
- Home

Alternative Descriptions

Type	Brief Description	Advantage	Disadvantage
Central	High capacity, permanent fueling stations acting as replacements to traditional gas stations.	Able to amortize over large base of vehicles Standardized operation Familiar to customers	High capital cost High investment risk Requires volume base (chicken & egg) Large impact of single station outage
Mobile	Small to medium scale (10-20) trailer based refueling with multiple possible temporary sites.	Web based planning, logistics Low tech, lower capital Footprint adapts to vehicle base Capital can be redeployed	Regulations may not support deployment Unfamiliar consumer process for fueling
Delivery	Truck based delivery to homes over night. Note: could be the same equipment as Mobile.	Web based planning and logistics Low tech, lower capital Consumer convenience	Regulations may not support deployment Home fueling equipment not developed (e.g. Hose, etc.)
Home	Small, low capacity home based refueling devices .	Convenience Confidence of minimum mileage / fuel Cost? (Potential) Independence	Regulations may not support deployment Unfamiliar process Additional capital purchase Small filling capacity (~1kg/day)

Hypothetical Mobile Elements

- Truck based tube trailer with 10,000 psi H₂ , dispenser, no compression
- Capable of "bumping" FCVs to 50%-80% of full tank
- Deployed to sites that are pre-approved by authorities and have agreements with land owner for usage, e.g. Big box lots, government, car dealers, etc.
- Deployment locations may change based on location of FCV fleet, traffic patterns, etc.
- FCV car app connected real time with all locations and planned, next day locations. App could also "tell" the stations where they planned to refuel, for better logistic preparations.
- Central H₂ depot could have additional tube trailers to refuel in high demand to accomplish "hot swapping" if needed.
- H₂ gas quality sampling at central tube depot.

Hypothetical Delivery Elements

- Ideally the same equipment used in Mobile fueling would be used at night for Delivery fueling
 - Truck based tube trailer with 10,000 psi H₂ , dispenser, no compression
 - Capable of "bumping" FCVs to 50%-80% of full tank
 - Central tube depot
- Deliveries performed overnight and scheduled day before via internet.
- FCV owner equipment would consist of fueling interface if car not parked within access to road.
- Alternative to owner equipment could be requirement to park at curbside.

Hypothetical Home Elements

- Home refueling device either electrolyzer or reformer based capable of ~1kg per 10 hours and up to 5000 psi dispensing pressure
- Dispensing nozzle.
- Refueling service / access (for reformer, if not using natural gas as input fuel)
- Interface software between car and home refueled for automated filling and monitoring.
- Optional: heat exchange into hot water heater

Conceptual Home Refueler Example

- Input fuel: methanol-water mix.
- 10 hour capacity: ~1kg H₂
- Maximum output pressure: 5,000 psi
- High pressure storage: none (storage on board FCV only)
- Approximate dimensions: 80cm X 30cm X 30cm, not including fuel tank
- Retail price: ~\$5,000 not including nozzle
- Maintenance: annual compressor

Key Subgroup Work Streams

- Gathering existing data, organizing and assessing it.
- Interviews with stake holders and experts.
- Synthesizing information.

Target Results

- Cost comparisons between each alternative.
- Identification / validation of advantages and challenges with each approach.
- Assessment of how the different fueling methods may or may not assist with adoption and expansion of FCVs, compared to current status.

Status

- Some data gathered on electrolyzers and reformers
- Multiple calls to Honda, no response
- Contacted Toyota. Internal discussion / consideration
- Sub-group not yet formed