

Hydrogen Fuel Cells for Material Handling

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Target Market: Electric Lift Trucks



Class 3 Rider Pallet Trucks



Class 2 Stand-up Reach Trucks



Class 1 Sit-down Lift Trucks

- **North American customers want transparent “ Plug and Play” fuel cell products to power the various OEM models in their lift truck fleets**

Material Handling in California

- Multi-billion dollar North American market opportunity to supply hydrogen to distribution centers and manufacturing plants
 - California is the single biggest market
- Over 50,000 electric lift trucks operating in large fleets in California
 - Provide California with cost effective, controlled industrial settings for developing and rolling out distributed hydrogen refueling
- Individual warehouses represent commercial scale hydrogen
 - Up to 300 kg per day demand
 - Consistent high utilization
 - Predictable and rapid adoption
 - Options for renewable H₂ and reduce load on grid
- Leverage baseload demands for hydrogen in CA warehouses to build infrastructure for on-road vehicles

H₂ Material Handling Fueling System

- Installation

- Components
 - H₂ Supply
 - Compressed gas
 - Liquid
 - On-site generation

 - Compression and Storage
 - Compressors
 - Liquid pumps
 - Linde ionic compressor
 - High pressure storage tanks

 - Indoor dispenser

- Operation

Hydrogen Fueling - Installation



 plug power

POWER POWER AHEAD

Hydrogen Fueling - Installation



Hydrogen Supply, Compression and Storage



Hydrogen Supply and/or Generation

Liquid H₂ Supply



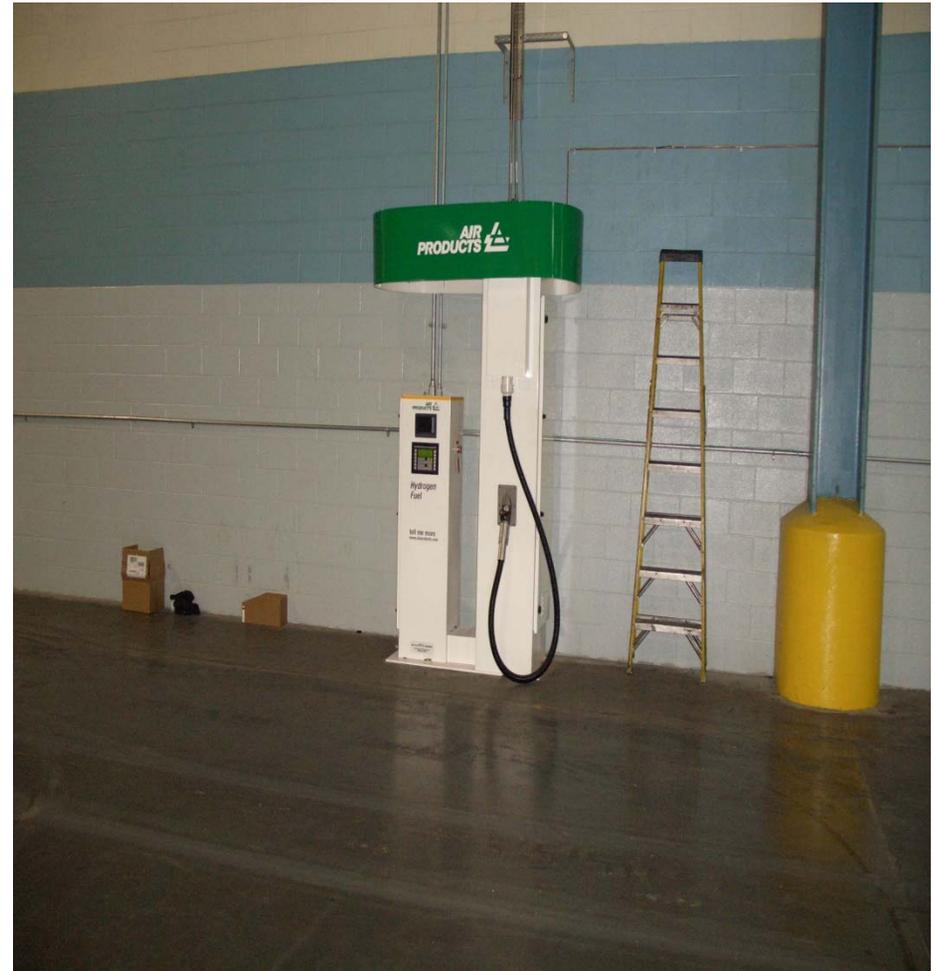
On-site generation such as Natural Gas Reforming 9

Hydrogen Storage



Hydrogen Indoor Dispensing

Indoor Fueling Stations – Air Products



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Indoor Fueling Stations - Linde



Commercialization Status

- Over one million operating hours of Plug Power fuel cells in lift trucks
- Over 106,000 refuelings to date on Plug Power units
 - No safety incidents
- Average 330 H₂ kg per day. Expect to more than double by March.

Some Current Customers

- Walmart (Washington Courthouse, OH)
- Bridgestone (Warren County, TN & Graniteville, SC)
- Nestle Waters (Dallas, TX)
- GENCO/Kimberly Clark (Graniteville, SC)
- Central Grocers (Joliet, IL)
- Sysco (Canton, MI)
- DLA (Susquehanna, PA)

- Wegmans (Pottsville, PA)
- Whole Foods Markets (Landover, MD)
- Anheuser Busch (Fort Collins, CO)
- FedEx (Springfield, MO)
- Coca-Cola Bottling (Charlotte, NC)
- Sysco (Houston, TX & Philadelphia, PA)

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Roll out at Central Grocers – First Greenfields Site



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The logo for Plug Power, featuring the word "plug" in a white, lowercase, sans-serif font with a cluster of small white dots to its left, and the word "power" in a white, lowercase, sans-serif font to its right.

A banner with a blue and green background. The word "POWER" is written in large, bold, green, uppercase letters. Below it, the words "POWER AHEAD" are written in white, uppercase letters.

Barriers to Commercialization in California

- Strong interest from prospects in California due to high cost of grid electricity and productivity benefits
- Largest barrier to market is hydrogen – competing against grid electricity; simplicity of doing business with utility companies and “known costs”
- Need first movers - others will follow
- Companies with operations in California make decisions at corporate headquarters, many outside California (Ace Hardware, Kroger, Target, Home Depot, Lowe’s)

Commercialization in California

- Incentive on customer operation and upfront costs of hydrogen at initial sites

- Opportunity to normalize hydrogen business model with volume in California
 - Reduce uncertainty of how to control energy and operating costs
 - Overcome perceived risk/return issue
 - Simplify hydrogen transactions and costs
 - Facilitate hydrogen business model for customer to take initial risk

- Short-term incentive will result in immediate volume of fuel cells in specialty vehicles, fueled by hydrogen in California



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