



DOE and FreedomCAR & Fuel Partnership: Hydrogen Delivery and On-Board Storage Analysis Workshop

January 25, 2006

Welcome



Logistics

- Amenities
 - Bathrooms: Main hallway to your left
 - Food
 - Small cafeteria: Main hallway to your left
 - Large cafeteria: Main hallway to your right, follow the signs, up the stairs (bring a guide)
- Evacuation
 - Announced over the PA System
 - Out the main entrance, turn left and walk up to L'Enfant Plaza, gather by the glass “pyramid” with us
- Foreign Nationals
 - Stay accompanied by a DOE person



Purpose-Objectives

- Joint interchange of information and efforts on analysis across the FreedomCAR DTT, STT, and FPTT Tech Teams and researchers/analysts
- Review of current DOE analysis projects focused on hydrogen delivery and on-board vehicle storage
- An opportunity to review, understand, access and improve the degree of consistency and transparency of analysis approaches
- An opportunity to access this analysis portfolio: Is anything missing?
- Next steps ??



Some Definitions

- Delivery
 - From the point of production (central or distributed) through the dispenser
 - Pathways: Gaseous H₂, Liquid H₂, Carriers
 - Components: pipelines, compression, GH₂/LH₂ terminals, geologic storage, liquefaction, LH₂ trucks, GH₂ tube trailers, storage tanks, dispensers, **carrier system infrastructure**
- Storage (On-board vehicle)
 - High pressure on-board storage tanks
 - Metal hydrides, chemical hydrides, carbon/nano-structures, other novel carrier technology
 - Complete on-board systems
 - **Off-board systems as required (regeneration, transport, cooling, etc.)**



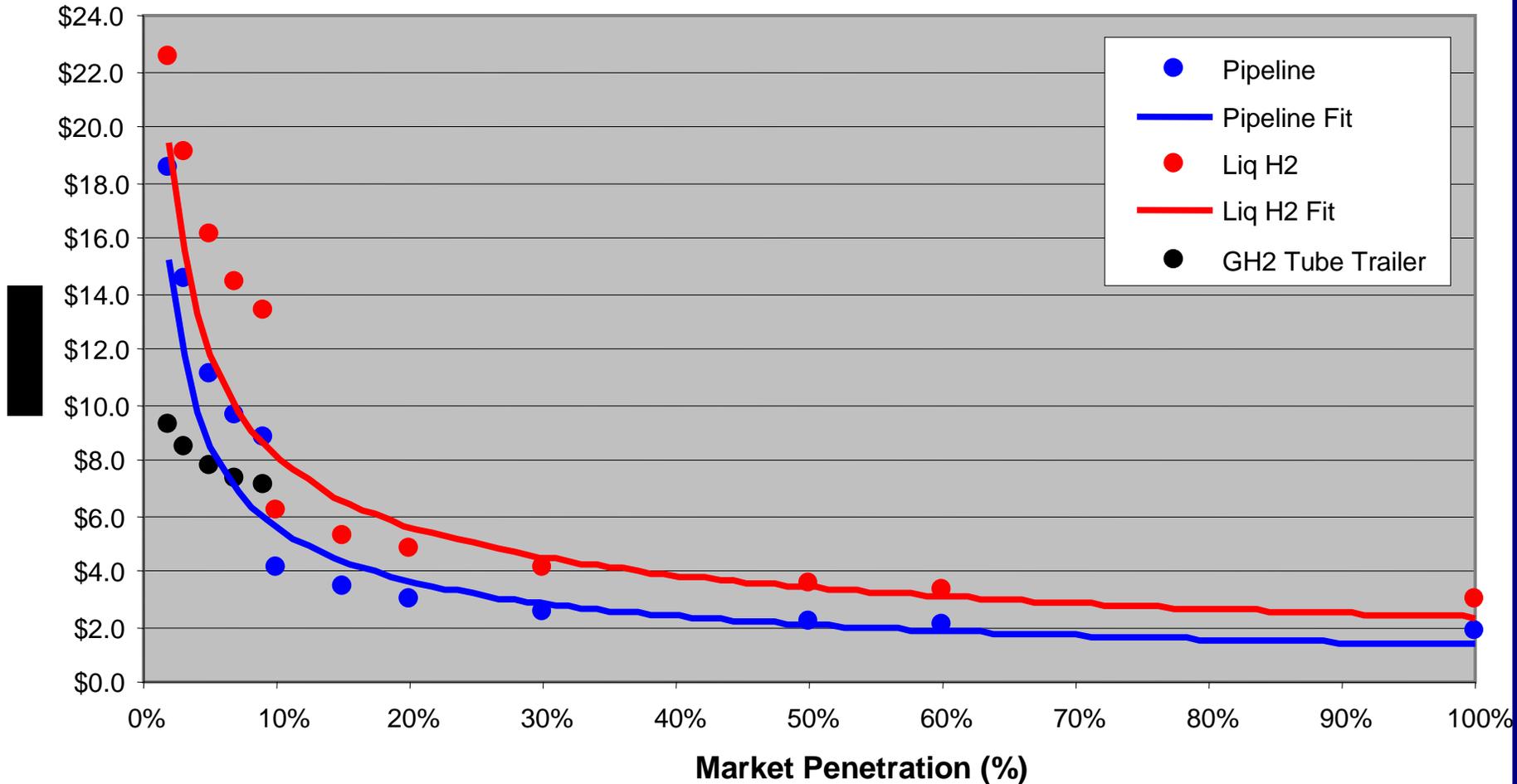
Some Definitions

- Hydrogen Cost Target
 - Equivalent to alternatives on a \$/mile basis
 - \$2-3/gge delivered
 - Includes the cost of delivery (\$1/gge target)
- Off-board system and delivery costs for on-board storage systems must also meet these targets



Current Urban Hydrogen Delivery Cost vs. Market Penetration

Urban: 250k people, Plant 62 miles from city gate





Agenda

- 8:00 am **Registration**
- 8:30 am **Welcome and Introductions**
- 8:45 am **Agenda and Purpose** – Mark Paster, DOE-HFCIT
- 9:00 am **On-Board Storage Systems Analysis** – Rajesh Ahluwalia, ANL
- 9:45 am **On-Board Storage Cost and Efficiency Analysis** – Steve Lasher, TIAX
- 10:30 am **Break**
- 10:45 am **Off-Board Storage and Tube Trailers** – Salvador Aceves and Gene Berry, LLNL
- 11:15 am **Forecourt Storage and Compression Options** – Mark Richards, GTI
- 11:45 am **Lunch – on your own**
- 12:45 pm **H2A Delivery Models and Results: H2A Delivery Team** – Marianne Mintz, ANL
- 1:45 pm **Delivery Analysis Project, Options, and Trade-Offs** – T. P. Chen, Nexant
- 2:45 pm **Break**
- 3:00 pm **Hydrogen Delivery Demonstrations** – Ed Kiczek, Air Products & Chemicals, Inc.
- 3:10 pm **Pathway Cost Distributions: Fuel Pathway Integration Tech Team** – James Uihlein, BP
- 4:00 pm **Discussion**
- 5:00 pm **Adjourn**