



# Gaseous Hydrogen Delivery Breakout

Strategic Directions for  
Hydrogen Delivery Workshop

*May 7-8, 2003*

*Crystal City, Virginia*

# Targets/Objectives

- More work is needed to better define delivery target metrics
- Assumptions about targets for costs and energy efficiency need to be qualified
- Technology improvements likely to lower costs, but may not have major impact on total cost
- A significant impact on cost would come through permitting policy changes, e.g., use of public land

# Priority Barriers

- ***System Issues:*** need to assess delivery options in context of total system
- ***Materials:*** corrosion, H<sub>2</sub> permeability
- ***Construction:*** welding, joining
- ***Maintenance and Operation:*** leak detection
- ***Pipeline Safety:*** odorants, flame visibility
- ***Compression:*** cost, reliability

# R&D Needs

## ■ H2 Infrastructure Models/Studies

- Staged modeling/analytical effort to get to ultimate goal of a realistic, multi-energy distribution network model

## ■ Pipeline Technology

- Improved field connection systems are required to replace manual welding.
- Develop a coaxial pipeline system so that existing natural gas pipelines can be used for H2 without total loss of natural gas flow capability

# R&D Needs

## ■ Pipeline Materials

- Develop and test new and existing materials to eliminate or reduce the likelihood of hydrogen embrittlement
- Test existing high strength steel alloys for use in large diameter high pressure H<sub>2</sub> transmission pipelines

## ■ Odorants and Leak Detection

- Identify, compare, and field test novel odorants
- Identify, develop, and field test innovative tracers and leak detection sensor technology

# R&D Needs

## ■ Advanced Compressors

- Survey existing and emerging compression technologies and compare to industry needs for distribution and point of use
- Minimize moving parts or address component wear through new designs and improved materials technology
  - New or improved designs may include electrochemical, guided rotor, metal hydrides, linear compression technologies
  - New materials technology targeting wear, efficiency and reliability issues

# “Take home” messages

- Need to consider whole system when planning R&D – pipeline part of delivery system, which is just part of the H2 infrastructure
- Pipeline Costs: Higher required volume to deliver the same amount of energy requires increased compression.
- Safety, integrity, reliability: Metal embrittlement, no H2 odorant, low ignition energy, ‘invisible’ flame
- Role of federal gov’t vs industry for H2 research to address market failures