Hydrogen Energy Infrastructure

NHA 20th Annual Hydrogen Conference
Keynote Session 5: Infrastructure
2 April 2009
Infrastructure Discussion

- Today’s state of affairs
- The next few years
- Longer term
The term *infrastructure* has been used since 1927 to refer collectively to the roads, bridges, rail lines, and similar public works that are required for an industrial economy, or a portion of it, to function.
Focused on Energy Infrastructure

- Clean energy
- Non-conventional oil and gas
- Industrial gases for refining, power generation, xTL, and gasification
50+ Years of Hydrogen Experience

- 2B cu ft per day H₂ production
- Bulk, liquid, and pipeline distribution
- More than 500 H₂ customers
- H₂ energy projects since 1993
  - > 90 hydrogen station projects
  - > 30,000 fuelings/year
- Stations in 16 countries
Hydrogen delivery infrastructure

Volume

On-site Production

Cryogenic Liquid

High Pressure Gas

Gas Pipelines

Proximity

The Next Few Years

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Real advances are being made
Applications that drive hydrogen infrastructure, and deliver value

- Pipeline supplied stations
- Material handling networks
- Back-up/stationary power
- Mass transit/central fleets
- Renewable Energy Park

The Next Few Years
Pipeline Infrastructure

- Every mile of US interstate highways could be paralleled for $40-50 billion
- 75% of the US population could be placed within several miles of a hydrogen pipeline network for $15-20 billion
- Every mile of urban expressway could be paralleled for $7-10 billion
- Less than $2 billion would be required to create an extensive pipeline network in California
- Pipelines don’t care where the hydrogen comes from - facilitates source diversity
Near-term opportunities

- Infrastructure will take steps forward, progressing toward large-scale deployment
  - $15B to deploy significant US H₂ infrastructure

- Funding is needed for H₂ consuming device and infrastructure roll-outs

- A unified, clearly articulated, benefits case
  - Environmental, economics, sustainability, security

- Many countries are moving ahead
  - A truly global endeavor
Renewable & sustainable hydrogen is a must

- Status quo is not an option
- Air Products is committed to 26 collaborative projects focused on renewable hydrogen

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Hydrogen will deliver a better future

- $\text{H}_2$ infrastructure needs inclusion in energy policy and funding
- A focused and appealing message is needed
- Coalitions will deploy advancements . . .

**Academia** + **Government** + **Industry** + **NGO’s**

Hydrogen is the best solution considering economics, environmental, security, and sustainability