STIMULATING THE HYDROGEN INFRASTRUCTURE

HTAC SUB-COMMITTEE PROGRESS REPORT

February 17, 2011 Kathleen C. Taylor

Objective

- Assemble information on worldwide hydrogen infrastructure development
- Identify opportunities for the DOE

Scope and Teams (5)

- Infrastructure activities targeted to automotive programs. Lead Joan Odgen with John Hofmeister, Charles Freese, Bob Walker, Michael Mills.
- Current non-automotive hydrogen/fuel-cell infrastructure initiatives. Lead Bob Rose with Harol Koyama, Mark Cardillo, Alan Lloyd.
- International infrastructure developments. Lead
 Richard Carlin with Geri Richmond, Michael Mills.

Cont.

- Safety codes and standards, regulations, & permitting. Lead Maurice Kaya with Tom Timbario.
- Hydrogen infrastructure for industrial hydrogen. Lead Kathy Taylor with Tom Timbario.

Time line for report

- January 15 Data collected by teams due to Tom Timbario group – Team leads
- Febrary 11 Needs for stimulating the hydrogen in infrastructure identified by teams sent to K. Taylor & T. Timbariio – Team leads
- March 15 Feedback from all teams assembled
 T. Timbario
- April 15 Draft recommendations due All

Current non-automotive hydrogen fuel cell initiatives - Bob Rose

- Hydrogen infrastructure for stationary power in S. Africa, Central & Latin America, and SE Asia is for traditional specialty & industrial applications – little for FC mkt. development
- Europe trend to integration of renewable H2-FC and energy storage systems
- Europe identifies existing hydrogen infrastructure and excess (stranded) industrial hydrogen.
- Enel inaugurated a hydrogen-fueled combined cycle power plant (1.3 metric tons of H2 per hour.

Current non-automotive hydrogen fuel cell initiatives cont.

- Sahara Wind Project to convert Sahara wind power to H2 for industrial use
- Commercial Activities include (country detail)
 - Power generation & electric grid support
 - Combined heat and power
 - Back-up & remote power generation
 - Material handling equipment
 - Energy storage

Associations include

- Argentina: Asociación Argentina del Hidrógeno
- Australia: <u>Australia Association for Hydrogen Energy</u>
- Brazil: Development Commerce Transport (DCT) Energia (Interim Member*)
- Canada: <u>The Canadian Hydrogen and Fuel Cell Association</u>
- China: China Association for Hydrogen Energy
 Taiwan Association for Hydrogen Energy
- EU: European Hydrogen Association
- France: <u>Association Française de l'Hydrogène</u>
- Germany: <u>Deutscher Wasserstoff- und Brennstoffzellen-Verband (DWV)</u>
- Italy: <u>Italian Hydrogen and Fuel Cell Association</u>
 <u>Italian Hydrogen Forum</u>
- Japan: <u>Hydrogen Energy Systems Society of Japan</u>
- Malaysia: Universiti Teknologi Malaysia (Interim Member*)
- Mexico: <u>Sociedad Mexicana del Hidrógeno</u>
- New Zealand: Massey University Centre for Energy Research (Interim Member*)
- Poland: Polish Hydrogen and Fuel Cell Association
- Sahara Wind
- Spain: <u>Asociación Española del Hidrógeno</u>
- United Kingdom: <u>U.K. Hydrogen and Fuel Cells Association</u>
- United States: <u>Fuel Cell and Hydrogen Energy Association</u>

International infrastructure developments – Richard Carlin

- IPHE website reports informative summary of demonstration and deployment by country
- European Commission (EC) Strategic Energy Technology Plan identifies FC & H2 among the technologies to achieve 2020 targets (cut GHG, increase renewable energy, increase energy efficiency)
- EC Hydrogen & Fuel Cell initiative for 2007-2013 RTD of 900m Euro including 50% industrial match
- Hydrogen fueling stations number approx. 200 world wide (58 in US)

Industrial Hydrogen – K. Taylor

- 2006 industrial hydrogen production in the US was 10,083,000 metric tons, approx. ¼ world production
- Hydrogen production facilities include those facilities with primary purpose to produce hydrogen (e.g. reforming, partial oxidation, electrolysis) and hydrogen produced as a byproduct in petroleum refining.
- Petroleum refining and petrochemical industries account for more that 90% of the hydrogen used.

Industrial hydrogen cont.

- Pipelines currently appear to be the most economical means of moving hydrogen in large quantities over great distances.
- Hydrogen production is currently concentrated in refinery centers along the Gulf Coast and in the Farm Belt.
- The existing hydrogen transmission system is estimated at 450-800 miles (depending on criteria used) and is mostly along the Gulf Coast to connect producers with well established customers.