

V.F.2 Hydrogen Delivery Infrastructure Options Analysis

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Contract Number: DE-FC36-05GO15032

Subcontractors:

Air Liquide, Houston, TX

Chevron Technology Ventures, Houston, TX

Gas Technology Institute, Chicago, IL

National Renewable Energy Laboratory, Golden, CO

Pinnacle West, Phoenix, AZ

TIAX, Cambridge, MA

Start Date: June 1, 2005

Projected End Date: July 31, 2006

Objectives

- Recommend hydrogen delivery strategy to DOE in terms of a pathway to build a cost-effective and energy-efficient infrastructure for both the transition and long-term hydrogen deliveries
- Assist DOE to plan required R&D efforts to achieve the performance and cost goals for hydrogen delivery

Technical Barriers

This project addresses the following technical barrier from the Hydrogen Delivery section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- A. Lack of Hydrogen/Carrier and Infrastructure Options Analysis

Technical Targets

This project is evaluating and conducting trade-offs of various hydrogen delivery options. It will assist DOE to develop the delivery strategy and plan for the required R&D to achieve the technical targets for hydrogen delivery.

Approach

The project, which just started, will evaluate and analyze the following seven options for delivering hydrogen from central, semi-central, and distributed production plants to the points of use:

- Option 1: Dedicated pipelines for gaseous hydrogen delivery
- Option 2: Use of existing natural gas or oil pipelines for gaseous hydrogen delivery
- Option 3: Use of existing natural gas pipelines by blending in gaseous hydrogen with the separation of hydrogen from natural gas at the point of use
- Option 4: Truck or rail delivery of gaseous hydrogen
- Option 5: Truck, rail, or pipeline transport of liquid hydrogen
- Option 6: Use of novel solid or liquid H₂ carriers in slurry/solvent form transported by pipeline/rail/trucks
- Option 7: Transport of methanol or ethanol by truck, rail, or pipeline with reformation to hydrogen at point of use

The analysis will be conducted under the following six technical tasks:

- Task 1: Collect and compile data and knowledge for the seven delivery options and relevant information on the regional energy resources and hydrogen demand centers in U.S.
- Task 2: Evaluate current efficiencies and costs of the seven delivery options considered and their potential performance and cost improvements
- Task 3: Evaluate existing infrastructure capability in the U.S. for hydrogen delivery
- Task 4: Assess greenhouse gas and pollutant emissions of the seven delivery options considered
- Task 5: Compare and rank the seven delivery options using a performance/cost model to be constructed in this task
- Task 6: Recommend transition and long-term hydrogen delivery strategies for both urban and rural areas, including required R&D and also the proper split of central and distributed production in conjunction with the production infrastructure analysis

Accomplishments

The project team is in the midst of conducting Task 1. As part of the effort, the team is close to completing a critical review of the H2A hydrogen delivery component model previously developed by the National Renewable Energy Laboratory. The review comments will soon be delivered to DOE.

In addition to the comments, the project team has also put efforts in developing a plan to expand the H2A model to incorporate the additional delivery options considered in this project. The expanded model will have the ability to show the impacts of technology advancements in each delivery option and will consider the regional energy resources and hydrogen demand centers in the U.S. for providing the practical delivery volume and distance to the model for each delivery option.