VIII.2 Moving Toward Consistent Analysis in the HFCIT Program: H2A

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Projected End Date: Project continuation and direction determined annually by DOE

Objectives

- Improve the transparency and consistency of analysis of hydrogen systems.
- Improve the understanding of the differences among analyses.
- Seek validation from industry on consistent analysis methodology.
- Develop tools for the consistent reporting and analysis of the cost of hydrogen production technologies.

Technical Barriers

This project addresses the following technical barriers from the Systems Analysis section (4.5) of the Hydrogen, Fuel Cells, and Infrastructure Technologies Program Multi-Year Research, Development, and Demonstration Plan:

(B) Lack of Consistent Data, Assumptions, and Guidelines

(C) Lack of a Macro-System Model (as the H2A model is a prime model in the MSM)

(D) Stove-Piped/Siloed Analytical Capabilities

(E) Lack of Understanding of the Transition of a Hydrocarbon-Based Economy to a Hydrogen-Based Economy

Accomplishments

- Launched DOE H2A Analysis Web site, which provides the latest information about program activities as well as the production and delivery models and case studies.
- Developed modeling tools to assess the cost of producing hydrogen. Completed and released current, advanced, and longer-term case studies for a variety of technologies, including biomass, coal, natural gas, nuclear, wind/electrolysis, ethanol, and methanol.

Introduction

According to the Hydrogen, Fuel Cells, and Infrastructure Technologies Program Multi-Year Research, Development, and Demonstration Plan, systems analysis is conducted to support decision-making in the development of the production, delivery, storage, fuel cell, and safety technologies. To make the appropriate recommendations to decision-makers, analysis of hydrogen technologies and systems must be carried out using consistent and transparent methodologies.

H2A, which stands for Hydrogen Analysis, was formed in 2003 to better leverage the combined talents and capabilities of analysts working on hydrogen systems, and to establish a consistent set of financial parameters and methodologies for cost analyses. The objectives of H2A are to improve the transparency and consistency of analyses, improve the understanding of the differences among analyses, and seek better validation of analysis studies by industry.

Please note that this report covers H2A production accomplishments. Delivery-related H2A accomplishments are addressed in report III.C.1.

Approach

The H2A production models (central and forecourt) were made widely available via the H2A Web site to increase the range and number of possible hydrogen analyses conducted. This effort facilitated enhanced discussions about the pathways toward hydrogen commercialization though the use of consistent analysis results and methodology. The models are used to assess and compare the economic potential of hydrogen production technologies.

Results

- In October 2005, launched the DOE H2A Analysis Web site at http://www.hydrogen.energy.gov/h2a_analysis.html to provide the latest information about program analysis activities as well as the production and delivery models and case studies (see Figure 1).
- Web site statistics for 10/05–5/06 reveal significant activity and interest in modeling tools and analysis information (see Table 1):
  - 9,168 Web page visits
  - 2,042 unique users downloaded the modeling tools
  - 3,579 total downloads of modeling tools
- In order to address the need for transparent reporting and consistent cost methodologies, H2A developed the modeling tools to assess the cost of producing hydrogen (see Figure 2). Posted online in October 2005, the production models (central and forecourt) were used in the development of several key DOE documents, including the Hydrogen Posture Plan, the Solar and Wind Technologies for Hydrogen Production Report to Congress, and the HFCIT Multi-Year Research, Development, and Demonstration Plan.
- Using the H2A production models, key technologies were studied by members of the H2A team to produce current, advanced, and longer-term case studies for the following technologies:
  - Central biomass
  - Central coal
  - Central natural gas reforming
  - Central nuclear
  - Central wind/electrolysis
  - Distributed electrolysis
  - Distributed natural gas reforming
  - Distributed dispensing
  - Distributed ethanol reforming
  - Distributed methanol reforming

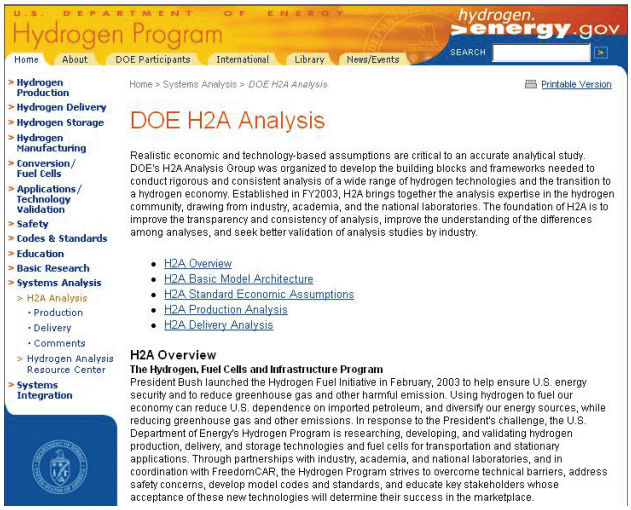

FIGURE 1. DOE H2A Analysis Web Site

TABLE 1. H2A Web Site Statistics

	Visits	Modeling Tools: Total Downloads	Modeling Tools: Unique Users
Oct. 2005	1,004	566	283
Nov. 2005	1,973	1,098	535
Dec. 2005	1,110	370	227
Jan. 2006	1,172	183	135
Feb. 2006	853	227	154
March 2006	812	467	271
April 2006	1,080	334	188
May 2006	1,164	334	249
TOTAL	**9,168**	**3,579**	**2,042**

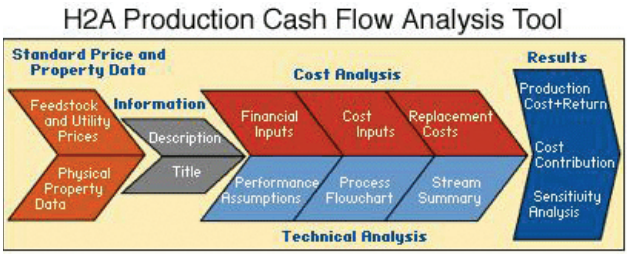

FIGURE 2. H2A Cash Flow Analysis Tool

Current case studies relate to technologies that could be installed today. Advanced case studies relate to technologies that could be installed between 2010 and 2020. Longer-term case studies relate to technologies that could be installed between 2020 and 2030.

Current case studies for most of these technologies are available online. The advanced and longer-term case studies, along with the remaining current case studies, are in the process of being posted.

Conclusions and Future Directions

The H2A effort has successfully pulled together technology analysis expertise, industry review, and DOE support. Of primary importance for the necessary analysis of hydrogen pathways was the development of standard methodologies and tools for performing consistent analyses of hydrogen production technologies.

The dissemination of the modeling approach and tools has increased the number of technologies studied as well as the number of subsequent transition and macro system analyses performed. Efforts related to

hydrogen technology status and commercialization pathways have benefited from H2A results and methodologies.

Future directions

- Apply H2A principles (consistency and transparency) to other areas of analysis.
- Enhance H2A models for other analysis work (e.g., fuel cell analysis).
- Update H2A production model case studies with latest R&D and DOE program direction.
- Use H2A models in technology validation projects.
- Additional H2A model enhancements planned for FY 2007 include automating sensitivity analysis capabilities and graphing, including variable costs and demands, and providing input/output summary reports.

Special Recognitions & Awards/Patents Issued

1. 2005 DOE Hydrogen Program R&D Award for H2A Production Cost Model.

FY 2006 Publications/Presentations

1. Presentation on the "H2A Hydrogen Scenario Model" at the National Hydrogen Association's Annual Hydrogen Conference in March 2006.

2. Paper on "Wind Energy and Production of Hydrogen and Electricity–Opportunities for Renewable Hydrogen" at the POWER-GEN Renewable Energy Conference in April 2006.

3. Presentation and paper on "Status of Hydrogen Production Pathways: Comparison of Energy Efficiency, Fossil Fuel Use, Greenhouse Gas Emissions, and Costs" at the World Hydrogen Energy Conference in June 2006.

4. Hydrogen Posture Plan, Appendix A: "Hydrogen Production and Delivery Pathways" (in press).