

III Systems Analysis

III.1 Systems Analysis Overview

Introduction

Systems Analysis supports decision-making by providing greater understanding of the contribution of individual components to the hydrogen energy system as a whole, and the interaction of the components and their effects on the system. Analysis will be used to continually evaluate the alternatives for satisfying the functions and requirements of the future hydrogen system/economy and the Program's progress. Analysis is conducted to assess cross-cutting and overall hydrogen system issues, and to support the development of the production, delivery, storage, fuel cell and safety technologies. Particular emphasis is given to transition analysis, as recommended by the National Research Council in the February report, *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs*.

The Systems Analysis activity made several significant contributions to the Hydrogen Program during FY 2005. With the support of the Systems Integration activity and the Fuel Pathway Integration Technical Team, a new hydrogen cost target was set based on analysis of future market conditions and technology status. Analysts from the modeling community (academia, industry and the national laboratories) convened in Washington, D.C. in June 2005 at the Macro-System Model Requirements Workshop to provide input to an effort that will analyze the interrelationships within the hydrogen transportation production and delivery system using the tools and results from a range of analysis methodologies. A Systems Analysis Plan was prepared and is undergoing internal review.

Goal

Support decision-making by evaluating existing and emerging technologies, utilizing a fact-based analytical framework to guide the selection and evaluation of R&D projects, and providing a sound basis for estimating the potential value of research and development efforts.

Objectives

- By 2007, complete evaluation of transition scenarios consistent with developing infrastructure and hydrogen resources.
- By 2008, develop a Macro-System Model of the transitional hydrogen fuel and vehicle infrastructure.
- By 2010, enhance the Macro-System Model to include the stationary electrical generation and infrastructure for a full hydrogen economy.
- Continuously support the integration of the Hydrogen Program within a balanced, overall DOE national energy R&D effort.
- Continuously provide and coordinate analysis of environmental and technoeconomic issues.
- Continuously support a spectrum of analyses, including financial and environmental assessments.

FY 2005 Status

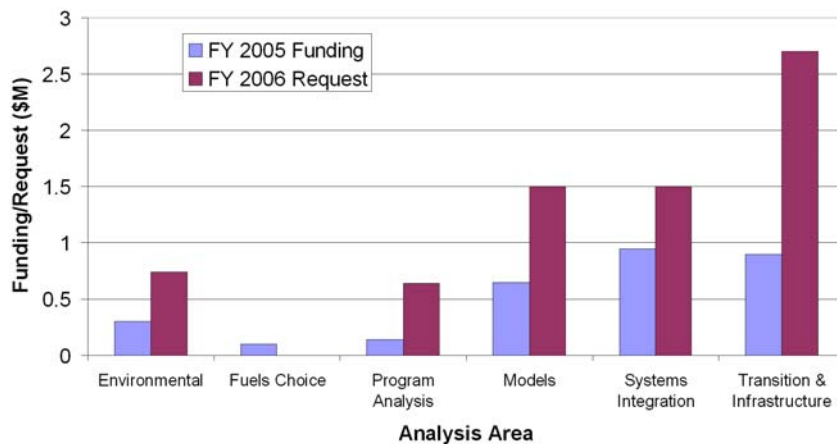
Systems Analysis is a newly established activity within the DOE Hydrogen Program that builds upon formerly fragmented analysis projects and activities to develop a consistent, comprehensive framework for examining the economics, benefits, risks, realities, opportunities, and impacts of a hydrogen economy. Existing analysis projects were evaluated in FY 2005 to identify analysis gaps, and a Systems Analysis Plan, now undergoing review within the Hydrogen Program, was created to address these gaps and to further progress toward the goals and objectives laid out in the Multi-Year Research, Development and Demonstration Plan.

FY 2005 Accomplishments

- Established a process for determining the hydrogen cost target, and revised the target to a range of \$2.00 to \$3.00/gge.
- A first version of the Hydrogen Program Data Book was delivered for review. This web-based data book provides assumptions, data, and guidelines for modelers and analysts to use to ensure consistency between analyses sponsored by the Hydrogen Program.
- A beta test of the H2A Central and Forecourt Production models was completed by members of the analytical community including industry, academia and the national laboratories. The models are currently being prepared for release. Work has commenced on a second version, which will incorporate scaling, efficiency and CO₂ emissions.
- Three new projects began work in FY 2005 on modeling and analyzing scenarios for transitioning to a hydrogen economy. These 3 projects are employing different modeling approaches to maximize understanding of transitional issues and opportunities.
- Work began on the Macro-Systems Model, a dynamic engineering transition model that will simulate the performance and evolution of hydrogen infrastructure using a distributed architecture to link existing and emerging models for system components. A Macro-System Model Requirements Workshop was held, with over 40 analysts in attendance, to determine the requirements of such a model and to better understand the existing models and modeling capabilities that might be incorporated.
- The HyDS model, a multi-regional, multi-time-period linear programming model of hydrogen production in the United States, was expanded and modified to determine the optimal portfolio of hydrogen production technologies in the U.S. The model will be available for analysis applications in FY 2006.

Budget

The budget for the Systems Analysis activity is consistent with the goals and objectives of the effort and is responsive to the recommendations of the National Research Council. The FY 2006 budget request includes significantly increased funding for transition and infrastructure analysis, as well as increases for environmental analysis, program analysis, modeling, and systems integration.



2006 Plans

The Systems Analysis activity will focus in FY 2006 on conducting analyses with available models to resolve known gaps in understanding of hydrogen and fuel cell systems and infrastructure. The FY 2005 appropriation included \$3.4 million for Systems Analysis (in addition to \$2.0 million in congressionally directed projects); the FY 2006 request is \$7.08 million. The budget request for FY 2006 reflects the recommendation of the National Research Council to increase funding for well-to-wheel, transition and infrastructure analysis.

A handwritten signature in cursive script that reads "Fred Joseck".

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