
VIII.0 Systems Analysis Sub-Program 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 Hydrogen 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 2007. Several analytical tools including the HyPRO and Macro-System models were completed and peer reviewed to support the analytical process. Resource and infrastructure analyses were conducted to better understand hydrogen supply issues. A Scenario Analysis was conducted for various fuel cell vehicle penetration rates to understand the infrastructure, hydrogen supply and policy issues to transform the fuel and vehicle system to hydrogen.

Goal

Provide system-level analysis products to support transition-strategy development and the 2015 technology readiness goal by evaluating technologies and pathways, guiding the selection of RD&D projects, and estimating the potential value of RD&D efforts.

Objectives

- By 2008, develop and utilize a macro-system model of the hydrogen fuel infrastructure to support transportation systems. By 2011, enhance the model to include the stationary electrical generation and infrastructure for a full hydrogen economy.
- By 2009, identify and evaluate feasible transition scenarios consistent with infrastructure and hydrogen resources, including an assessment of timing and sequencing issues for an operational hydrogen economy.
- By 2014, complete environmental studies that are necessary for the 2015 technology readiness goal.
- By 2015, analyze the ultimate potential for hydrogen and fuel cell vehicles. The analysis will address necessary resources, hydrogen production, transportation infrastructure, vehicle performance, and interactions between a hydrogen economic sector and other sectors.
- Provide milestone-based analysis, including risk analysis, independent reviews, financial evaluations and environmental analysis, to support the Program's needs prior to the 2015 technology readiness milestone.
- On an annual basis, update the Well-to-Wheels analysis for technologies and pathways for the Hydrogen Program to include technological advances or changes.

FY 2007 Status

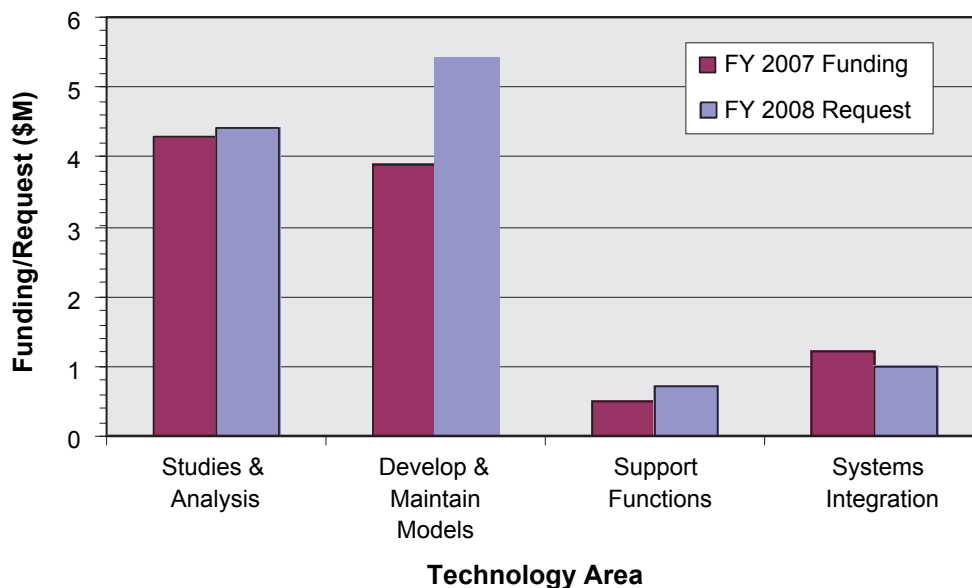
Systems Analysis was established within the DOE Hydrogen Program to develop a consistent, comprehensive framework for examining the economics, benefits, risks, realities, opportunities, and impacts of a hydrogen economy. Existing analysis projects were evaluated in FY 2007 to identify analysis gaps, and a Systems Analysis Plan 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 2007 Accomplishments

- The Directed Technologies, Inc. HyPRO infrastructure model that enables simulation of infrastructure buildout and optimization of hydrogen production portfolio was completed and peer reviewed.
- The first version of the Analysis Repository, which is a searchable online database of past and present hydrogen-related analysis projects and computer models, was developed in FY 2007. Each entry contains, at a minimum, the purpose of the analysis or modeling project and a means to locate more information. The database currently includes approximately 75 analysis projects, of which 30 project entries have been reviewed and published to the user friendly repository website (http://www.hydrogen.energy.gov/analysis_repository/).
- 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, was completed. The model was peer reviewed in the later part of FY 2007. The model was used to analyze the delivered hydrogen cost, well-to-wheel (WTW) parameters (greenhouse gas emissions, petroleum energy use and total energy use) and hydrogen losses for several pathways.
- Scenario analysis workshops were held with industry to gather input and feedback from industry on the hydrogen transition models currently funded by DOE and to review preliminary results of the scenario analysis activities.
- Key analysis activities for resources and infrastructure were completed. Resource analysis included the investigation of indigenous hydrogen supply options, and potential CO₂ sequestration capacity, domestic locations and cost. Infrastructure analysis investigated the U.S. natural gas supply system and determined delivery restrictions for supplied natural gas volumes.

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 2008 budget request includes significantly increased funding for transition, resource and infrastructure analysis, as well as increases for environmental analysis, program analysis, modeling, and systems integration.



FY 2008 Plans

The Systems Analysis activity will focus in FY 2008 on conducting analyses with available models to resolve known gaps in understanding of hydrogen and fuel cell systems and infrastructure. The FY 2007 appropriation included \$9.9 million for Systems Analysis; the FY 2008 request is \$11.5 million. The budget request for FY 2008 reflects the recommendation of the National Research Council to increase funding for well-to-wheel, transition, resource, and infrastructure analysis.



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