III.8 Hydrogen Production Infrastructure Options Analysis

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Objectives

- Understand how a hydrogen production infrastructure for hydrogen (H_2) fuel cell and internal combustion engine vehicles might develop in the U.S.
- Quantify production methods under consistent cost and state-of-technology assumptions
- Analyze infrastructure development under dynamic conditions over time
- Determine factors that will drive infrastructure development
- Define role of externalities such as policy and technology advancement
- Develop a computational model to aid in the analysis

Technical Barriers

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

- A. Lack of Prioritized List of Analyses for Appropriate and Timely Recommendations
- D. Stove-Piped/Siloed Analytical Capabilities
- E. Lack of Understanding of the Transition of a Hydrocarbon-Based Economy to a Hydrogen-Based Economy

Approach

This project's goal is to develop a better understanding of how the H_2 production infrastructure to support fuel cell automobiles might develop in the continental U.S. taking into account the dynamic conditions under which it will evolve. The primary approach to achieve this goal is through the development and use of a computational model simulating industry's decision making process regarding construction of new H_2 production facilities. By simulating the type and scale of production facility built each year, a projection and clearer understanding of the transition to a hydrogen economy may be achieved.

The project will begin in Task 1 with creation of a database of key information describing current, emerging, and proposed hydrogen production technologies. All data will use a consistent set of economic and performance criteria. In Task 2, a computer model will be developed using the Task 1 database as input. The computer model will perform economic optimization calculations for each of the infrastructure options, allowing simulation of which options will be constructed in a given year, and when viewed over multiple years, presenting a clear picture of the transition to the hydrogen economy. The model will identify type and scale of the hydrogen facilities built in each year, expected cost of hydrogen, and identification of stranded assets. A baseline case will be selected to define model accuracy and to have a point of comparison for further studies.

Sensitivity analyses and case studies will be performed in Task 3 by varying model parameters for hydrogen demand, facility costs, and technological developments, and by applying policy drivers (carbon taxes, preferential tax treatment, H_2 subsidies), and political and societal decisions. With a model created and various sensitivity studies performed, the results will be summarized in Task 4 and the DOE will receive recommendations concerning how to facilitate the development of the production infrastructure for widespread hydrogen fuel cell vehicle usage.