

## **X.2 Determine Baseline Knowledge of Hydrogen and Fuel Cells**

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*Start Date: 2003*

*Projected End Date: 2005*

### **Objectives**

- To measure the current level of awareness and understanding of hydrogen and fuel cell technologies and the hydrogen economy in four target populations:
  - General public
  - Students and educators
  - State and local government agencies
  - Potential large-scale users
- To establish a baseline for comparison of future evaluations of awareness, knowledge, and opinion of the same four target populations

### **Technical Barriers**

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

- A. Lack of Awareness
- C. Institutional Barriers and Access to Audiences
- D. Regional Differences

### **Approach**

- Review existing literature on hydrogen knowledge and attitudes
- Design survey instruments that are targeted to specific populations
- Obtain approval from the Office of Management and Budget (OMB) to conduct the surveys
- Conduct surveys and analyze data to establish a baseline of knowledge and opinions for each target population
- Establish a non-survey metrics information collection methodology
- Publish a Baseline Knowledge Assessment report

### **Accomplishments**

- Completed literature review and published final report (2003)
- Published 60-day and 30-day Federal Register Notices concerning surveys (2004)
- Completed survey instruments for all populations (2004)

- Received OMB approval for surveys (2004)
- Conducted pilot surveys of general public and student populations (2004)
- Completed full surveys of general public, student, government, and potential large-scale end user populations (2004)
- Completed data analysis and quality assurance plan (2004)
- Analyzed survey results to determine the baseline knowledge of hydrogen and fuel cells for each of the populations involved in the surveys; to identify subject areas where hydrogen knowledge is lacking; to identify differences, where appropriate, among regions, genders, and age groups; and to determine the appropriate mechanism for conveying information about hydrogen and hydrogen technologies to each of the audiences (2004-2005)
- Continued collection and analysis of non-survey metrics (2004)
- Documented survey and non-survey metrics findings in a draft report (2004)
- Documented programs, methods, and data to facilitate repeating the surveys in 2007/8 and comparing results with the 2004 baseline (2005)

### **Future Directions**

- Archive 2004 survey data, programs, and documents
- Obtain peer review of draft report, incorporate recommendations, and publish final report
- Repeat surveys in 2007/8 and again in 2010/11

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### **Introduction**

The Hydrogen, Fuel Cells, and Infrastructure Technologies Program needs to determine the baseline knowledge of hydrogen and fuel cells in the United States in order to design an appropriate educational program and, in the future, to assess the effectiveness of the educational program. Baseline knowledge of hydrogen and fuel cells will be determined through surveys of four distinct population groups: the general public, students and educators, state and local governments, and potential large-scale users and/or agencies that impact large-scale users. Each of these populations is very different and requires a different approach for assessing knowledge. While recognizing that knowledge-assessment surveys cannot pinpoint causality of changes in knowledge and opinions, subsequent surveys identical in methodology to the baseline surveys can measure changes from baseline knowledge levels. The effect of the educational program will be measured in terms of program activities designed to impact baseline knowledge levels.

### **Approach**

OMB approvals to conduct the surveys were obtained. After design and preliminary testing of the survey instrument and documentation of specific processes and procedures for collecting and analyzing the survey data, Computer-aided Telephone Interview (CATI) methodology was used to administer the surveys. Non-survey metrics were collected on a limited basis. Data analysis and quality assurance plans were carefully constructed.

Scientific sampling was used to survey four populations: (1) the general public, ages 18 and over; (2) students, ages 12-17; (3) state and local government officials from state departments of transportation and environmental protection, state energy offices, and functionally similar personnel from cities and counties; and (4) potential large-scale hydrogen users in three business categories: transportation, businesses requiring uninterrupted power supplies, and industries with large power requirements. It was decided that the survey design should include about 1,000 individuals in each of the general public and student surveys, about 250 state and local officials, and almost 100 large-scale users.

## **Results**

- For every population group, average scores on the technical knowledge questions were lower for the fuel cell questions than for the other technical questions.
- On the technical knowledge questions, over 40% of the general public and large-scale end user responses were “Don’t know.” These responses were not unexpected for the baseline survey. It is expected that there will be fewer “Don’t know” responses when the survey is repeated in 2007/8 and 2010/11.
- State and local officials are more confident about hydrogen safety than large-scale end users, and they are much more confident than either the general public or students. State and local officials also scored much higher on the technical questions. Even those government officials whose technical knowledge scores were below average (among government officials) felt that hydrogen and fuel cells were safe.
- Technical understanding appears to influence opinions about safety. For the general public, student, and large-scale end user surveys, respondents with above-average scores on the eleven technical questions are more likely to have an opinion about hydrogen technology safety, and for those respondents who have an opinion, their opinion is more likely to be positive. These differences are statistically significant.
- The general public ranks safety first in importance, then cost, then environment, and, of least importance, convenience.
- The large-scale end user survey suggests that there is presently little penetration of hydrogen technology. Nor is there much planning for it.
- Buses and commercial vehicles are considered the most likely area for the application of hydrogen and fuel cell technology in the next five years by government officials and large-scale end users. Students consider large power

plants as the most likely application. The general public considers large power plants and buses and commercial vehicles equally likely.

- At least for the general public, perceptions about hydrogen technology can vary with age, education level, geographic region, urban/non-urban status, and sex.
- For the general public, television is the primary medium for obtaining energy information; television is followed by newspapers. For students, the classroom is their primary access to energy information, followed by technical magazines and then television. For state and local officials, the primary media are the Internet followed by science and technology magazines and journals. The large-scale end user obtains energy information from the Internet and trade magazines. The radio is the least used media for all groups except the general public.

## **Conclusions**

This methodology was successful in measuring knowledge levels and opinions of the target populations. Because survey instruments were very similar, comparisons could be made among the target populations; these comparisons showed, for example, wide differences in knowledge levels between the government agencies and the other populations. When repeated in the future, the survey results will be able to compare knowledge levels and opinions about hydrogen and fuel cells to ascertain any changes over time.

## **FY 2005 Publications/Presentations**

1. “Baseline Knowledge Assessment,” poster presentation to the 2005 DOE Hydrogen, Fuel Cells & Infrastructure Technologies Program Review, May 2005.
2. Truett, Schmoyer, and Cooper, *Results of the 2004 Knowledge and Opinions Surveys for the Baseline Knowledge Assessment of the Hydrogen, Fuel Cells, and Infrastructure Technologies Program*, currently in final draft status.