EXECUTIVE SUMMARY

When signing the Energy Policy Act of 2005, President Bush reiterated his commitment to the Hydrogen Fuel Initiative and development of hydrogen fuel cell technology that will make it possible for today's children to take their drivers' tests in a pollution-free car. In support of the President's Hydrogen Fuel Initiative, the U.S. Department of Energy (DOE) Hydrogen Program focuses on overcoming critical barriers to the widespread use of hydrogen fuel cell technology, supporting research and development to reduce the cost of hydrogen, reducing the cost and improving the durability of fuel cells, and improving hydrogen storage technology.

The transition to a new, hydrogen-based energy economy, however, also requires an educated human infrastructure – trained safety and code officials, an educated workforce, state and local government officials who understand the near-term realities and long-term potential of the technology, and a public that is familiar and comfortable with using a new fuel. With this in mind, the DOE Hydrogen Program established an education key activity to address the training and informational needs of target audiences that have a role in the near-term transition as well as the long-term development of a hydrogen economy

Designing and maintaining an effective education program entails measuring baseline awareness and periodically measuring what has been learned. This report documents the data and results of statistical surveys undertaken to measure and establish baselines for understanding and awareness about hydrogen, fuel cells, and a hydrogen economy. The baseline data will serve as a reference in designing an education program, and it will be used in comparisons with future survey results to measure changes in understanding and awareness. It is envisioned that the same statistical surveys will be fielded again in approximate three-year intervals (2008 and 2011).

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 categories, about 250 state and local officials, and almost 100 large-scale end users.

The survey questions were designed to accomplish specific objectives. Technical questions were posed to measure technical understanding and awareness of hydrogen technology. Opinion questions measured attitudes about safety, cost, the environment, and convenience. Questions were posed to assess visions about the likelihood of various future applications of hydrogen technology. For most of the questions, "I don't know" or "I have no opinion" were perfectly acceptable answers. Questions about information sources (teachers, friends, government, etc.) and media (radio, Internet, magazines, etc.) were posed to assess how energy technology information is received.

The survey questionnaires were reviewed by National Hydrogen Association and U.S. Fuel Cell Council personnel and by management at the DOE Hydrogen Program office at various stages of

development. *Federal Register* notices were published, and Office of Management and Budget approval to conduct the surveys was obtained, per the Paperwork Reduction Act of 1995. Official pretests of the General Public and Student Surveys were conducted by the contractor that administered the survey. (Because all four surveys were similar, with most of the questions common to all surveys, formal pretests were not conducted for the State and Local Government or Large-Scale User Surveys.)

The General Public and Student Survey samples were selected by random digit dialing. Potential large-scale end users were selected by random sampling. The State and Local Government Survey was of the entire targeted population of government officials (not a random sample). All four surveys were administered by computer-assisted telephone interviewing (CATI). The General Public and Student Surveys were administered in either English or Spanish, at the option of the respondents. For each population, the length of the survey was less than 15 minutes, including the introduction, screening process, and general information and demographic questions.

The data collected for the four component populations are intended (1) as a reference for designing a hydrogen education program, and (2) as a baseline for measuring changes in understanding and awareness over time. Design of an education program itself is beyond the scope of the report, however, and comparisons of the baseline data with future results will not be made until the survey is fielded again. Therefore, this report is essentially a data book, a digest of the survey data collected for the four survey populations. Many conclusions can be made from the survey data. However, the purpose here is not to draw the conclusions, but rather to summarize the data in a way that facilitates drawing them.

Nevertheless, a few observations about the data summaries are salient:

- For every population group, average scores on the technical knowledge questions were lower for the fuel cell questions than for the other technical questions. Figure ES.1 compares the correct responses to technical questions and fuel cell questions for the general public, students, state and local government officials, and large-scale end users.

Correct Technical Responses by Survey Population

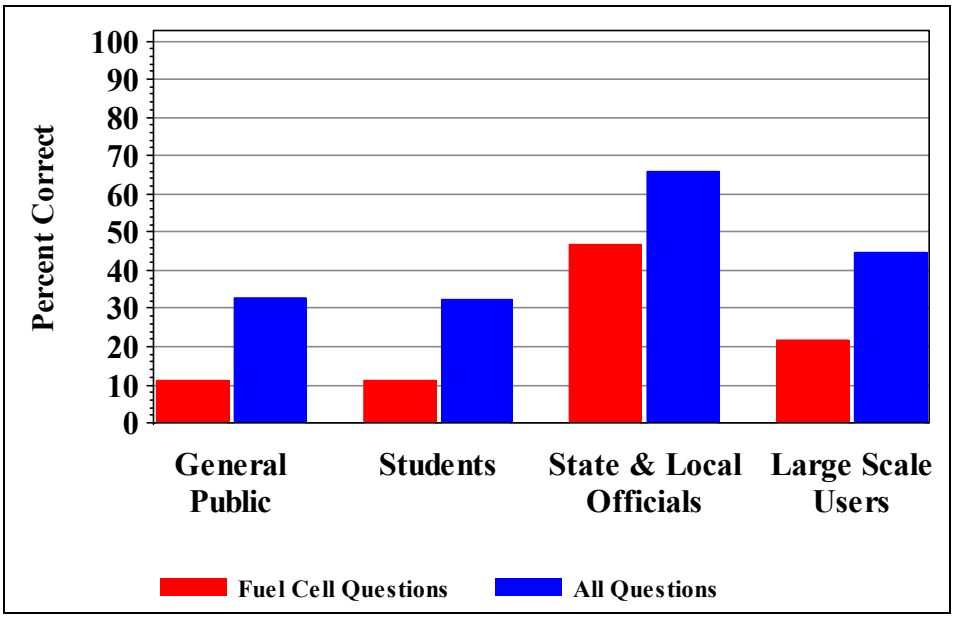

Figure ES.1. The distribution of the average percentage of correct responses to the eleven technical questions overall (all 11 questions) and, in particular, for the three questions about fuel cells for the four survey populations.

- State and local officials expressed more confidence in hydrogen safety than large-scale end users, and they were much more confident than either the general public or students, as can be seen from Figure ES.2. 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.

Perception of Hydrogen Safety by Survey Population

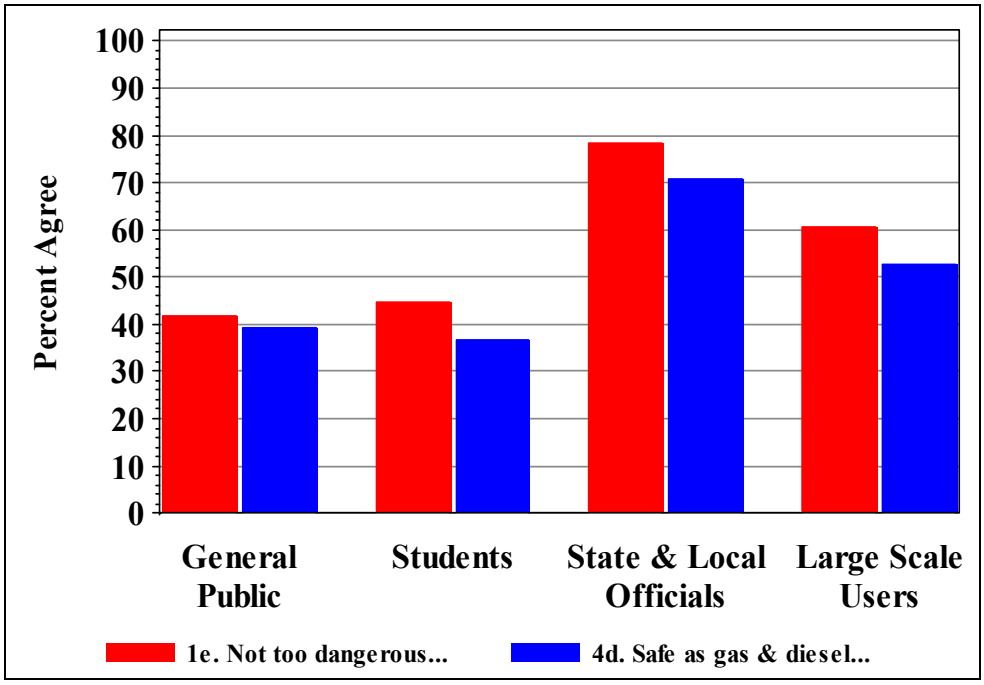

Figure ES.2. The distribution of responses to safety questions about the everyday use of hydrogen from all four survey populations.

- 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 were more likely to have an opinion about hydrogen technology safety, and for those respondents who expressed an opinion, their opinion was more likely to be positive. These differences were statistically significant. Figure ES.3 shows the general public responses to "How would you feel if your local gas station also sold hydrogen" and illustrates the relationship between scores on the technical questions and opinions about safety.

Hydrogen at Gas Stations: General Public Response

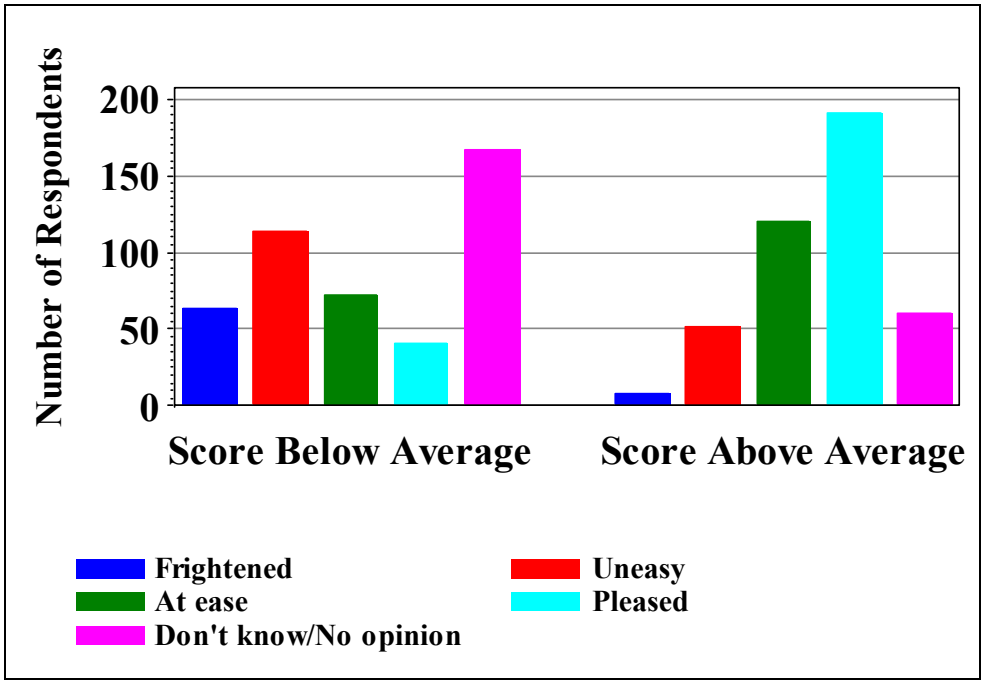

Figure ES.3. The distribution of responses to the question "How would you feel if your local gas station also sold hydrogen" for general public respondents scoring above and below average on the eleven technical questions.

- Using criteria of "Sometimes" or "Frequently" to describe usage, respondents rated media sources for obtaining energy information, as shown in Figure ES.4. The general public and students responded that television is the primary media source of energy information. State and local officials and large-scale end users indicated that their primary media sources are newspapers, the Internet, and science and technology journals. Radio is used least for all groups except the general public.

Mass-Media Use for Energy Information by Survey Population

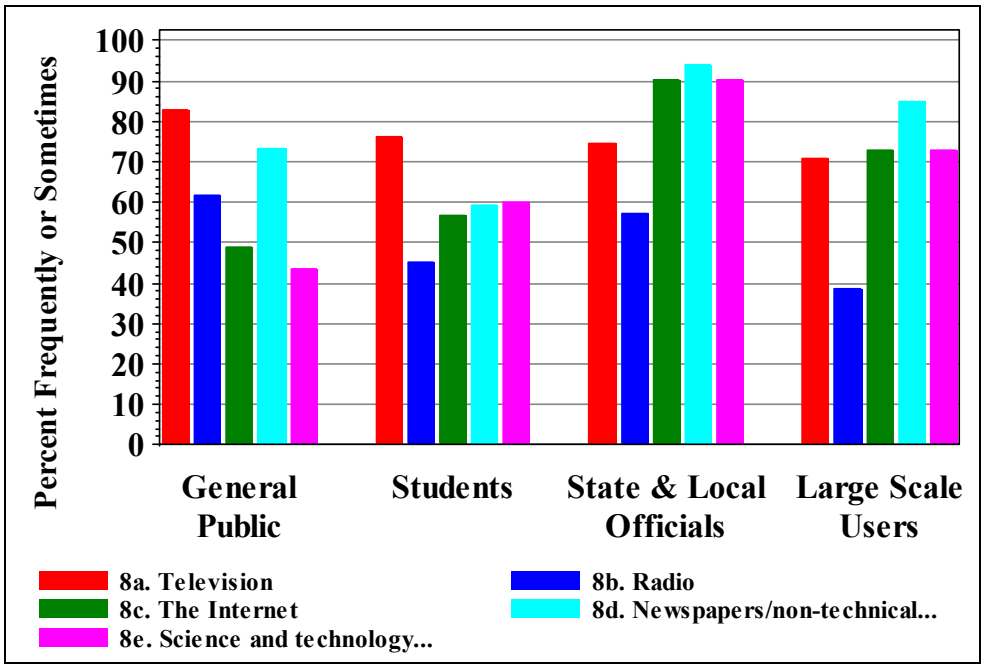

Figure ES.4. The distribution of respondents from all four survey populations indicating either "Sometimes" or "Frequently" for how often they use various information sources for energy information.

- In order of importance, the general public values (Figure ES.5) the following factors:
    1. Safety,
    2. Cost,
    3. Environment,
    4. Convenience.

Value Rankings by the General Public

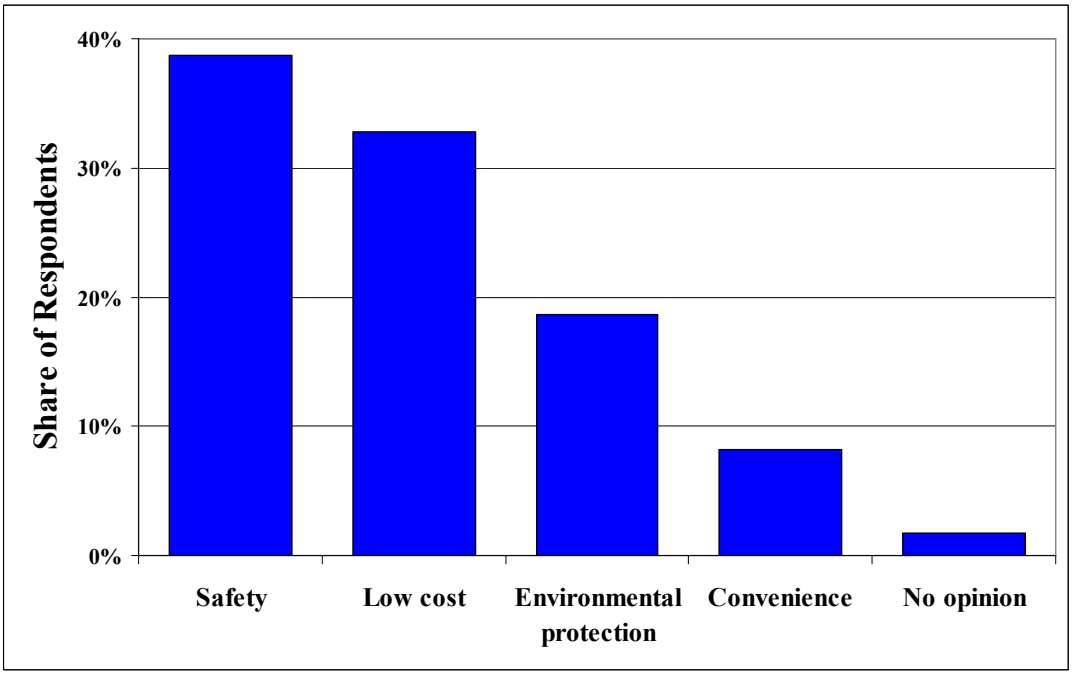

Figure ES.5. Share of general public respondents ranking each factor as most important when all four factors were read.

- The Large-Scale End User Survey suggests, as shown in Figure ES.6, that there is presently little penetration of hydrogen technology; nor is there much planning for it.

Current Use and Future Plans for Hydrogen Technology

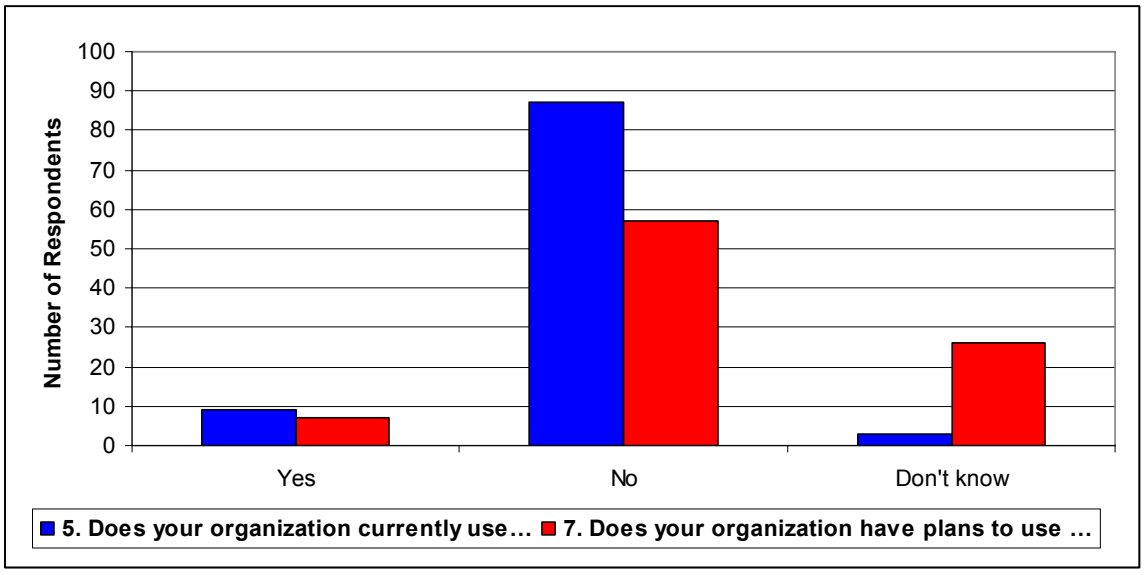

Figure ES.6. The distribution of responses by potential large-scale end users to questions about the organization's current use of and future plans for hydrogen technology.