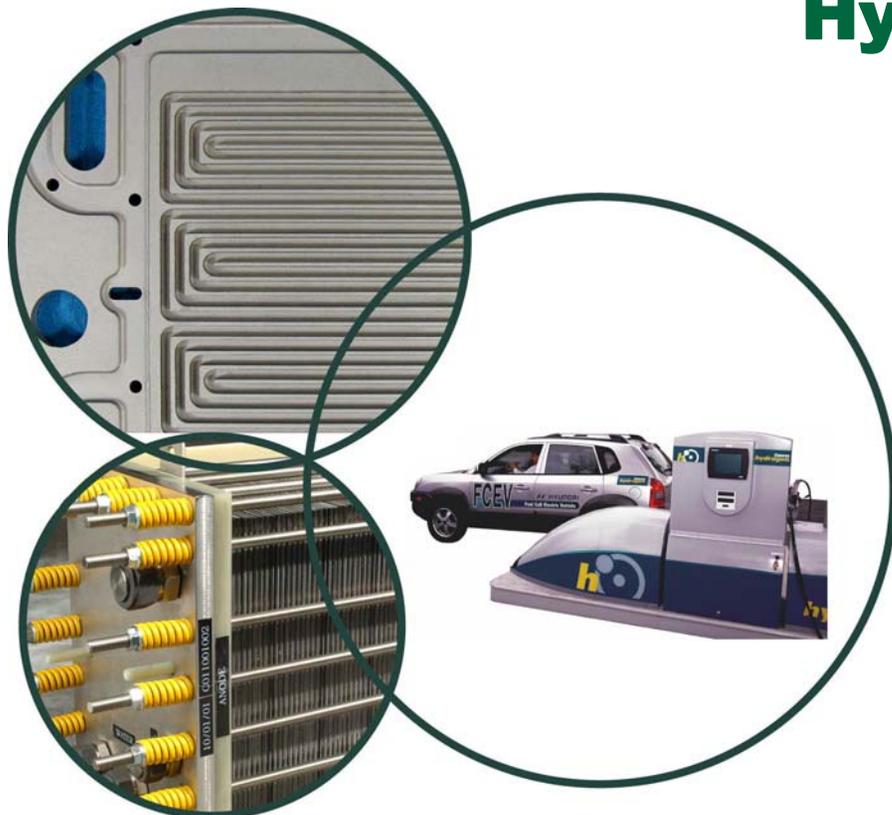




DOE Hydrogen Program

2007 DOE Hydrogen Program: Hydrogen Knowledge and Opinions Assessment



Rick Schmoyer

Oak Ridge National Laboratory

June 12, 2008

Project ID # ED1

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Overview

Timeline

- **Start: April 2003**
- **End: 2012 (currently in “Phase II”)**
- **Percent complete: >33%**

Budget

- **Total project funding**
 - DOE share: 100%
 - Contractor share: 0%
- **Funding received in FY06: \$20,000**
- **Funding for FY07: \$100,000**
- **Funding for FY08: \$240,000 (through March)**

Barriers

- B. Mixed Messages**
- E. Regional Differences**
- F. Difficulty of Measuring Success**

Partners

- **Contacts with national and international organizations to obtain clarifications and data**
- **Opinion Research Corporation (polling and market research)**

Objectives

- **To measure the current level of awareness and understanding of hydrogen and fuel cell technologies in five target populations:**
 - **General public**
 - **Students**
 - **State and local government agencies**
 - **Potential end users**
 - **Safety and codes officials**
- **To compare the current level of awareness and understanding to results of the 2004 baseline**
- **To analyze and summarize results for use in developing strategies and tactics for the Hydrogen Education Program**

Milestones

Month/Year	Milestone
September 2007	Prepare for surveys to be conducted and analyzed in 2008/2009
June 2008	Update literature review
September 2008	Plan for QA and data analysis
September 2008	Complete all five surveys
FY09	Analyze survey findings, compare with baseline, and publish results

Approach

- **Review current literature on hydrogen or fuel cell knowledge and attitudes and publish update of previous literature review (published in 2003)**
- **Review and revise (if necessary) survey instruments used in the 2004 surveys and develop a survey for the safety and codes officials**
- **Obtain approval from the Office of Management and Budget (OMB) to conduct all five surveys**
- **Design and publish a plan for quality assurance and data analysis**
- **Conduct surveys of the five target populations**
- **Analyze 2008 survey results and compare with the 2004 baselines for each target population**
- **Summarize and publish Knowledge and Opinions Assessment Report***

*http://www1.eere.energy.gov/hydrogenandfuelcells/hydrogen_publications.html

Technical Accomplishments—Current Status

- Groundwork
 - Completed compendium of related surveys conducted since the 2003 literature review (FY07)
 - Slightly revised survey instruments for the four surveys conducted in 2004 and developed the survey instrument for the safety and codes officials (FY07)
 - Obtained OMB approval of four surveys and prepared 60-day FRN for new survey (safety and codes officials)
- 2008 General Public Survey completed
- 2008 State and Local Government Officials Survey underway
- Very preliminary analysis of General Public Survey results

Examples of Survey Questions (All Surveys)

- Technical Questions
 - Hydrogen gas is toxic (true/false)?
 - Hydrogen has a distinct odor (true/false)?
 - Rank five items...which is most important to you, personally, when selecting a fuel or power supply: safety, cost, environmental impact, convenience, performance
- Opinion Questions
 - How would you feel if your local gas station also sold hydrogen?
Answers: frightened, uneasy, at ease, pleased, don't know/no opinion.
 - Using hydrogen will reduce U.S. dependence on foreign oil—
disagree, are neutral, agree, no opinion
- Information Resource and Demographic Questions
 - How often do you get energy information from different types of mass media (never, sometimes, frequently, don't know)?:
television, radio, internet, newspapers, etc.
 - Age, sex, education level, etc. (for statistical purposes)

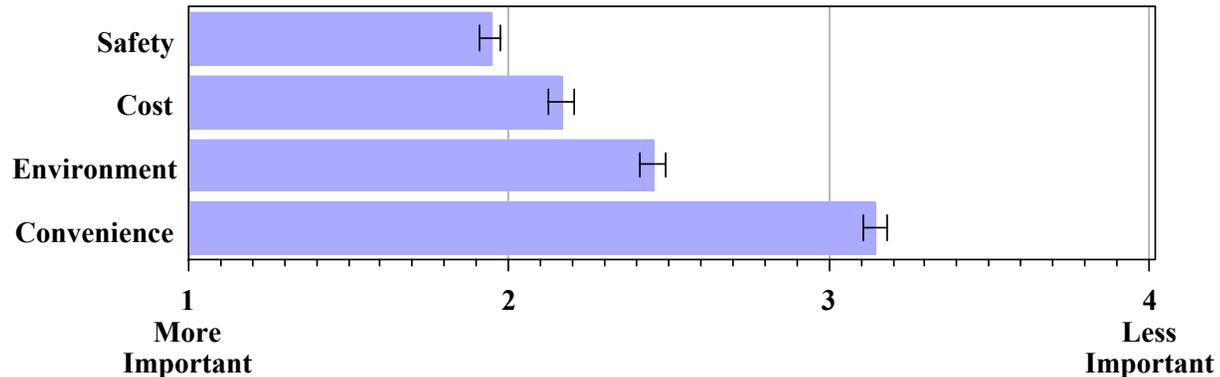
Response Counts and Rates (for Completed Surveys)

Year	Survey Component	Number of Respondents	Response Rate
2004	General Public	889	24.8%
	Student	1,000	27.5%
	State & Local Government	236	95.9%
	End User	99	29.1%
2008	General Public	1,000	23.0%

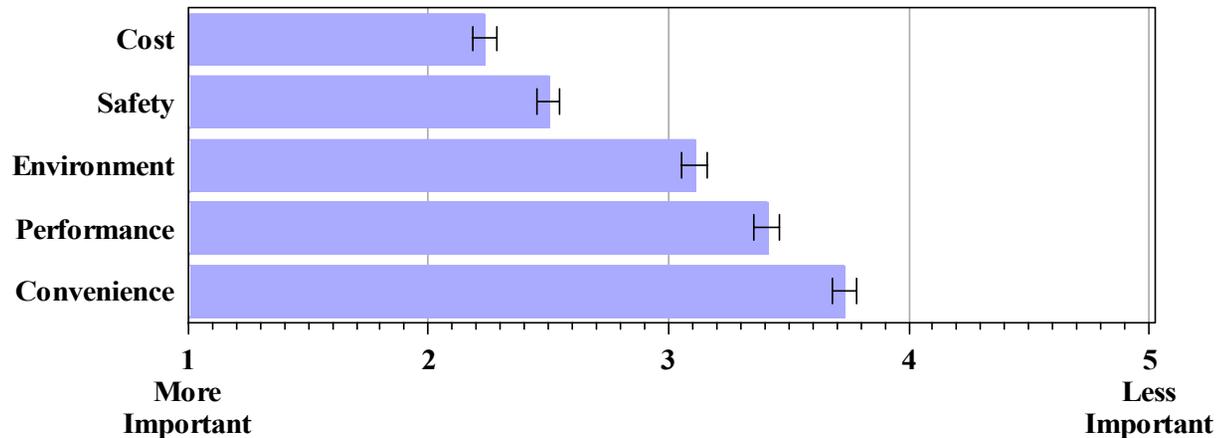
- **Response rates are a challenge in all telephone surveys these days, but to some extent nonresponse bias cancels in cross-year comparisons...**

Average Value Rankings*

2004



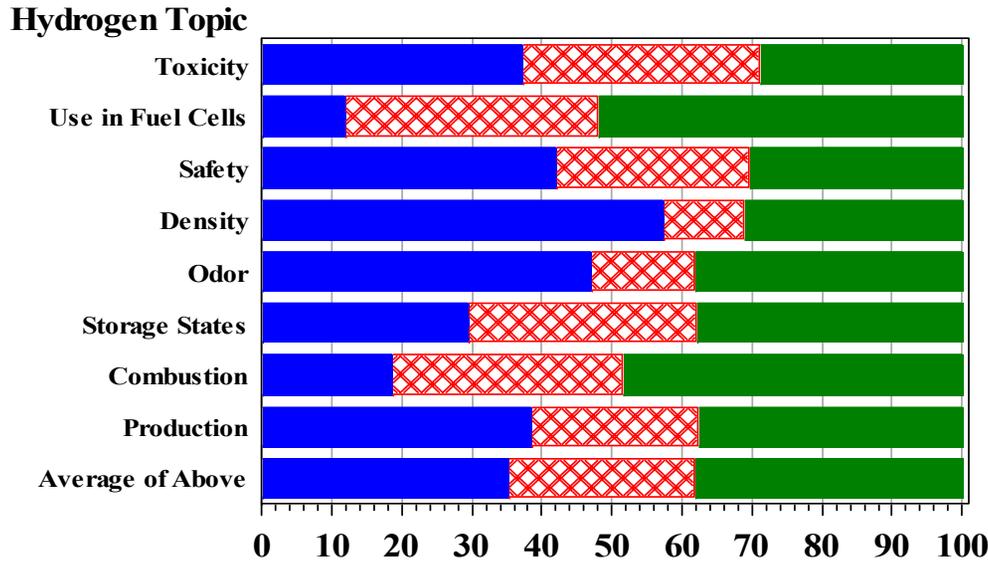
2008



- ***Note: All 2008 General Public Survey results are preliminary.**
- The “|—|”s on the charts are 95% confidence intervals. The differences within years are statistically significant.
- Performance category added for 2008
- Some rankings were partial.
- Cost and safety are most important, but note the 2004-08 switch.

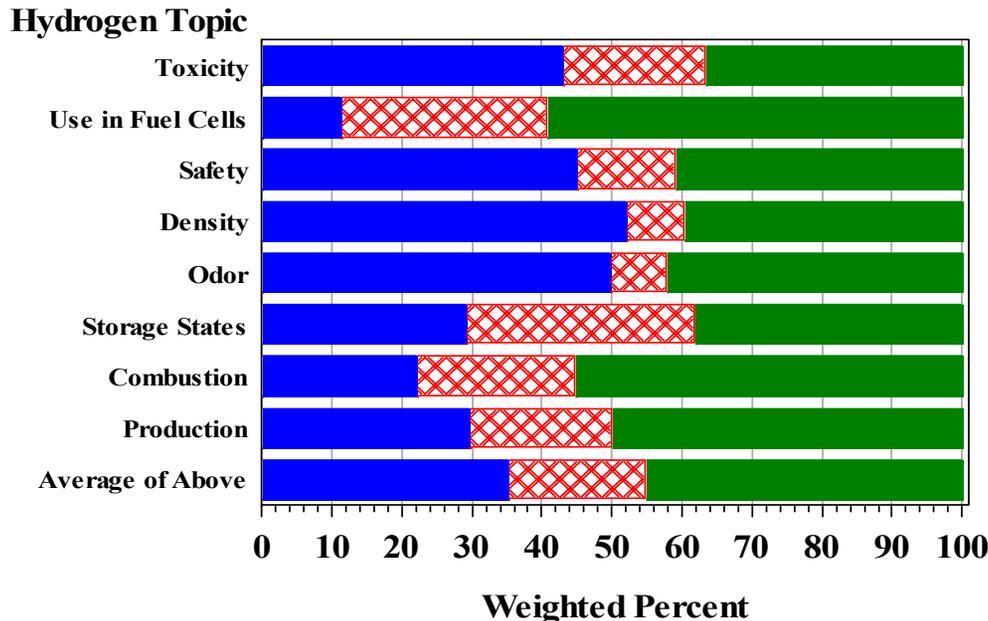
Hydrogen Technical Question Scores

2004



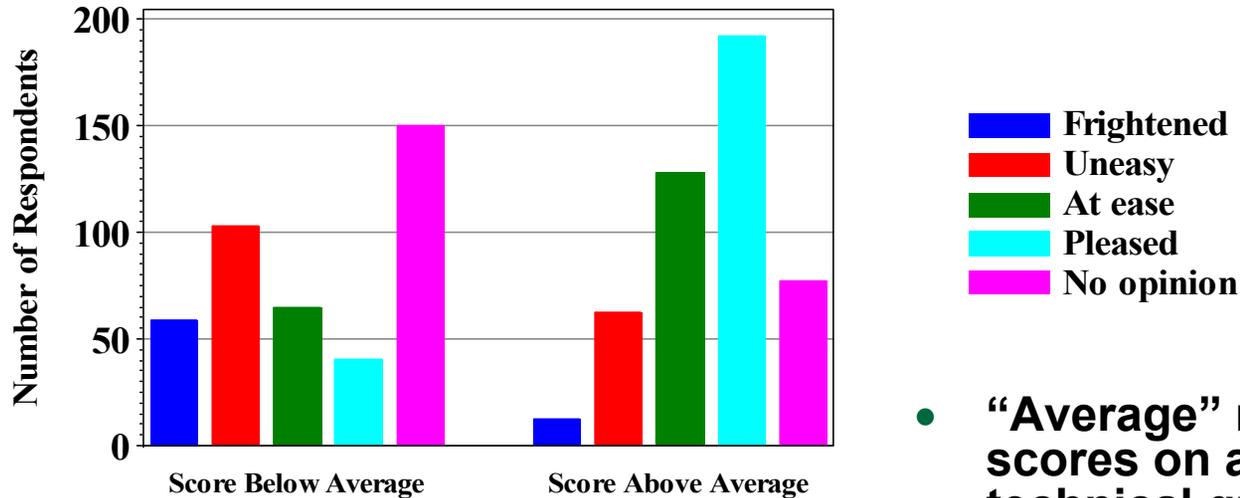
- Overall averages (% ± std. err.):
 - 2004: 35.18 ± 0.89
 - 2008: 35.19 ± 1.03
- Little change in technical understanding

2008

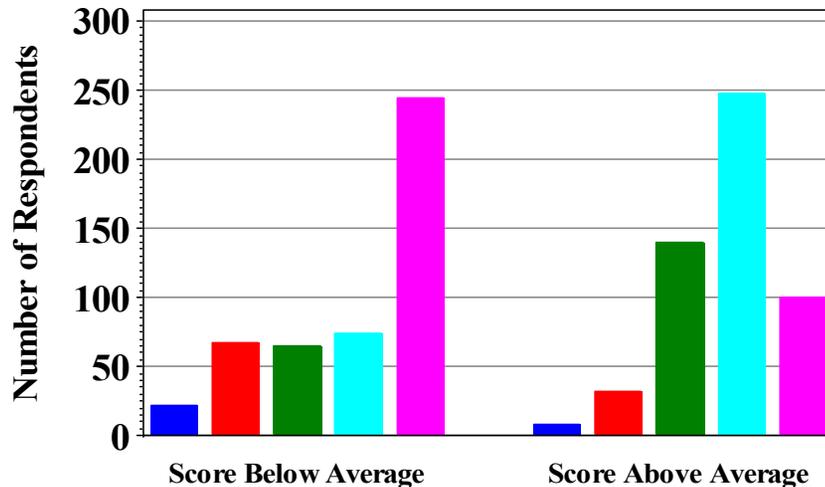


“How would you feel if your local gas station also sold hydrogen?” vs Technical Question Scores

2004



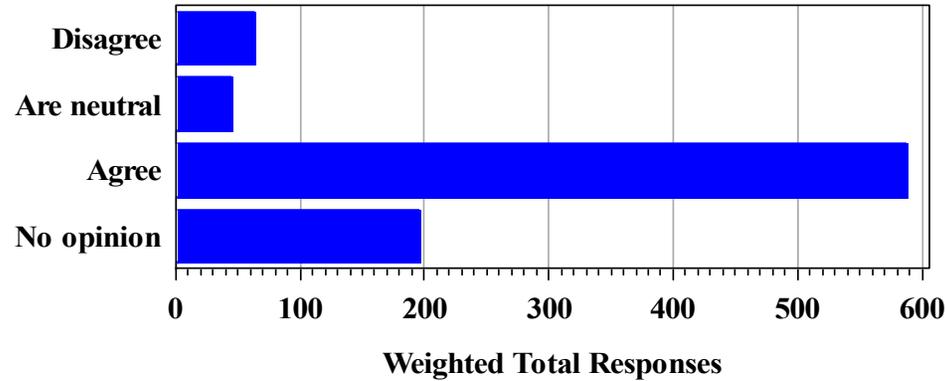
2008



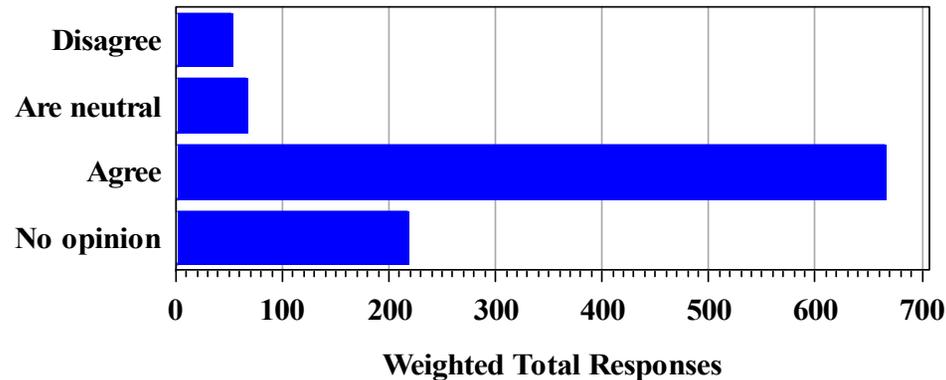
- “Average” refers to scores on all eight technical questions (previous slide)
- Association of technical understanding with technology acceptance is clear (also highly significant: $p < .0001$ both years)

Using hydrogen will reduce U.S. dependence on foreign oil...

2004

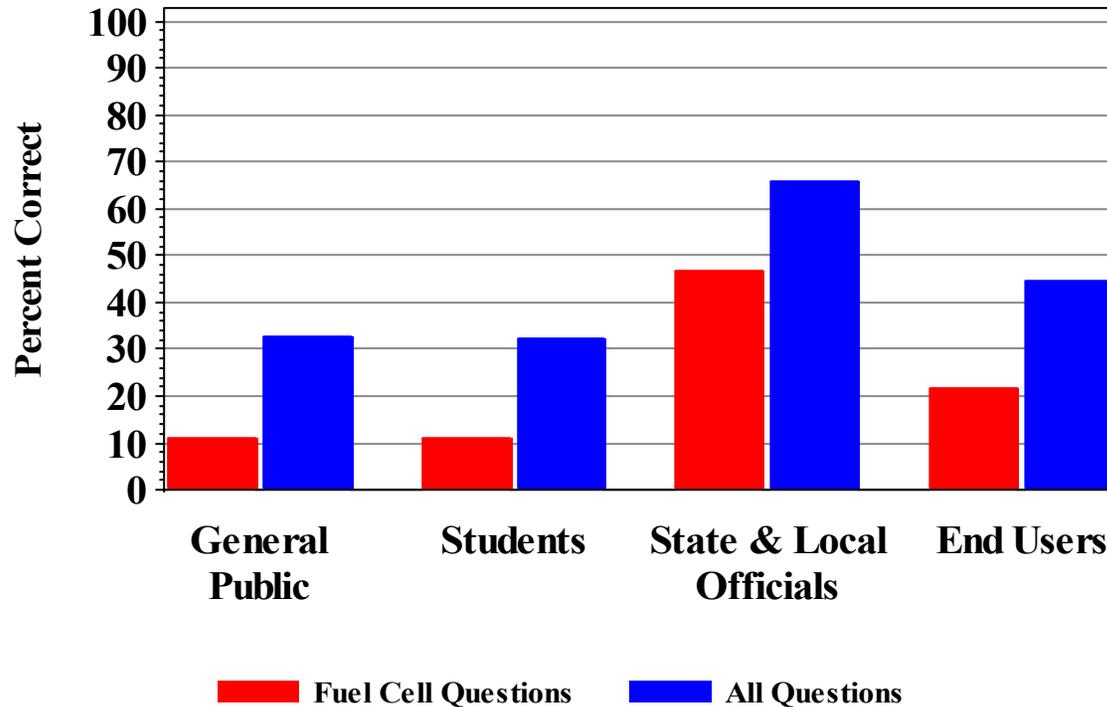


2008



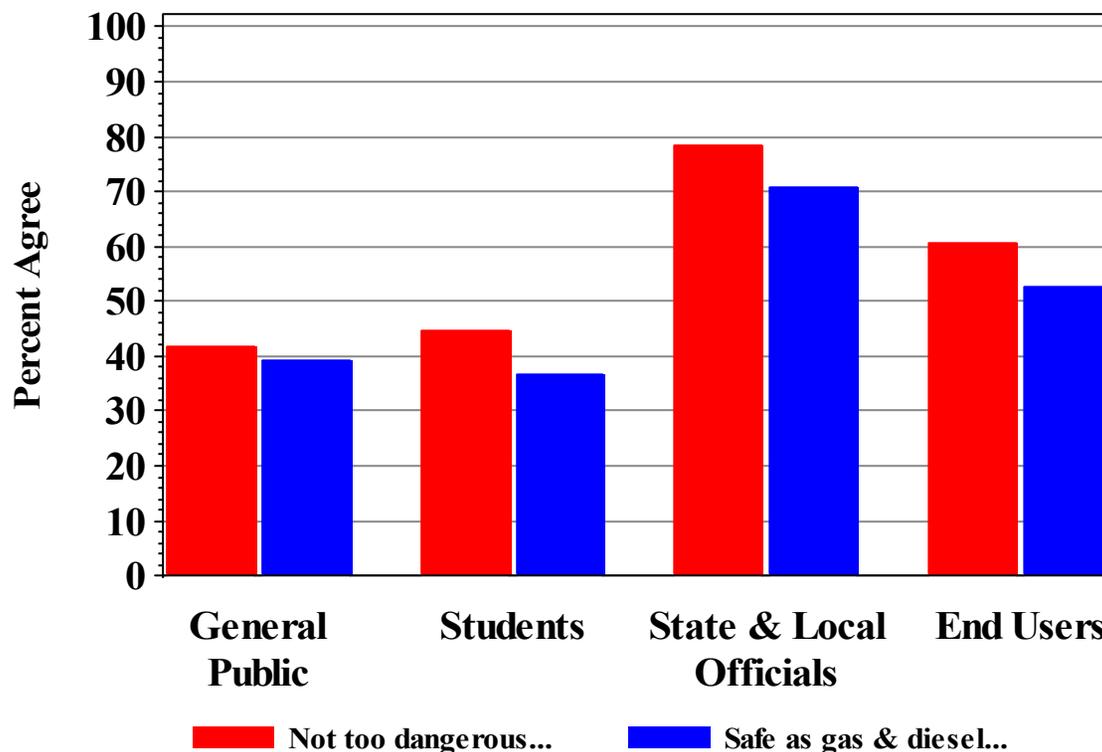
- Little change in other opinions as well.

Technical Question Scores for Other Target Populations (2004 Only)



- **Eleven technical questions about hydrogen, three about fuel cells in particular**
 - People were more familiar with hydrogen in general than fuel cells
 - State & local officials were the most “aware”
 - Potential end users were a distant second

Perception of Hydrogen Safety by Other Target Populations (2004 Only)



- Responses to “Hydrogen is too dangerous for everyday use by the general public” (red, percent disagree) and “Hydrogen is as safe as gasoline and diesel fuels” (blue, percent agree)
- Again note the association of technology acceptance and technical awareness (compare previous slide)

Future Work

- Conduct 2008 survey of end users, students, and state and local officials (under way)
- Obtain OMB approval for survey of safety and codes officials (may entail modifying the survey design or questionnaire)
- Conduct survey of safety and codes officials (FY08?)
- Analyze and report on survey findings (FY09)
- Prepare presentations and other publications to publicize the results of the surveys

Summary

- Nonresponse bias is a challenge, but to some extent cancels in cross-year comparisons.
- The general public is more concerned about safety and cost than the environment, but more concerned about the environment than convenience and performance.
- Hydrogen technology acceptance is strongly associated with hydrogen technical awareness.
- The general public's hydrogen technical awareness has not improved in the last four years. Opinions about hydrogen are also about the same.
- The association between technical awareness and technology acceptance extends to the student, state & local official, and potential end user populations.
- Interpretations to be discussed in the Q&A session...