



Hydrogen Safety Review Panel

presented by

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for the

DOE Hydrogen Program Review

May 26, 2005

Project SA6

This presentation does not contain any proprietary or confidential information

Overview

Timeline

- First Panel meeting:
Dec 11, 2003
- Continuing

Budget

- Total funding = \$860K
- FY04 = \$395K
- FY05 = \$465K

Partners

- Energetics, Inc.
- Panel member organizations

Barriers addressed

- A. Limited historical database
- B. Proprietary data
- C. Validation of historical data
- D. Liability issues
- E. Variation in standard practice of safety assessments for components and energy systems
- F. Safety is not always treated as a continuing process
- G. Expense of data collection and maintenance
- H. Lack of hydrogen knowledge by authorities having jurisdiction
- I. Lack of hydrogen training facilities for emergency responders

Hydrogen Safety Review Panel

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|---------------------|-------------------------------------|
| Addison Bain, Chair | NASA (ret.) |
| Carol Bailey | Sentech |
| Harold Beeson | NASA White Sands |
| Bill Doerr | FM Global Research |
| Don Frikken | Becht Engineering |
| Jim Hansel | Air Products and Chemicals |
| Richard Kallman | City of Santa Fe Springs, CA |
| Harold Phillippi | ExxonMobil Research and Engineering |
| Jesse Schneider | DaimlerChrysler |
| Rody Stephenson | Jet Propulsion Laboratory (ret.) |
| Bob Zalosh | Worcester Polytechnic Institute |

Program Objectives (Panel-Related)

- ▶ *Starting in 2004, integrate safety procedures into new DOE projects to ensure that they all incorporate hydrogen safety requirements.*
- ▶ *The Hydrogen Safety Review Panel, formed in FY2004, will continue to provide expertise and guidance to the DOE, and will assist with identifying areas of additional research.*
- ▶ *By 2007, publish a handbook of “Best Management Practices for Safety.”*

Ref: Multi-Year Research, Development and Demonstration Plan, p 3-133.

Approach

- ▶ Bringing a cross-section of relevant experience to bear on the success of the Hydrogen Program as a whole
- ▶ Focusing safety reviews on engagement, learning and discussion rather than as audit, investigative or regulatory exercises
- ▶ Identifying project-specific findings/learnings and bringing a broader benefit to the Hydrogen Program

Technical Accomplishments, Progress and Results

- ▶ Conducted site visit safety reviews of 10 projects – production, storage, fuel cells and technology validation (March 3, 2004 – first site visit)
 - Site visit protocol
 - Site visit preliminary report
 - Safety evaluation report
- ▶ Developed safety template for Hydrogen Program Review
 - May 2004 – enhance role and awareness of safety
 - May 2005 – assess safety vulnerabilities, risk mitigation, accident scenarios across the program



Technical Accomplishments, Progress and Results (continued)

- ▶ Completed revision to *Guidance for Safety Aspects of Proposed Hydrogen Projects* (August 2004)
 - A “living” document
 - Articulate the DOE requirement
 - Serve as a resource for project teams
- ▶ Review safety plans for all new projects
 - Develop review team expectations and safety plan checklist (January 2005)
 - Review draft safety plans for Storage Centers of Excellence leads (March 2005)
 - Begin review of safety plan deliverables (April 2005)



Technical Accomplishments, Progress and Results (continued)

- ▶ Develop criteria for selecting projects for review (January 2005)
 - Combine with safety questions for conducting telephone interviews (March 2005)
 - Ready for beta-test
- ▶ Develop safety event reporting process (accidents and near misses) for implementation and analysis
 - Draft template discussing intent, definitions and attributes completed (April 2005)



Technical Accomplishments, Progress and Results (continued)

- ▶ Capturing “lessons learned” from project safety reviews for broader benefits
 - Design and assembly of equipment
 - Operating procedures
 - Equipment maintenance
 - Hydrogen storage materials
 - Other issues
 - Examples and observations

Future Work

▶ Remainder of FY2005

- Review of project safety plans
- Project safety reviews
 - Site visits and reporting
 - Telephone interviews
 - Safety question “one-pagers”
- Panel meeting (June 16-17, 2005)

▶ FY2006

- Review safety plans
- Implementation of project selection criteria for safety reviews; implementation of safety event reporting system
- Initiate development of Best Management Practices

Publications and Presentations

1. Weiner, S.C., “Hydrogen Safety Review Panel: Utilizing a Wealth of Experience,” Fuel Cell Summit Newsletter, Vol. 5, Issue 1, Spring 2004.
http://www.pnl.gov/fuelcells/docs/newsletter/volume5/vol5_issue1.pdf
2. Weiner, S.C., Kinzey, B. and Skolnik, E.G., “Hydrogen Safety Review Panel: Shaping Safety Awareness,” 20th Annual Center for Chemical Process Safety International Conference, Atlanta, GA, April 12, 2005.
3. Weiner, S.C., Kallman, R.A., Ruiz, A. and Schneider, J.M., “Hydrogen Safety: From Policies to Plans to Practices,” International Conference on Hydrogen Safety, Pisa, Italy, September 8-10, 2005. (abstract accepted)