

## Addendum

The Department of Energy's Fuel Cell Technologies Office received additional feedback on compression, storage, and dispensing needs through a request for information (RFI) issued in June 2013.

### Compression

Among the additional needs identified for compression were research and demonstration (R&D) in the following area:

- Proton exchange membrane development to allow for high pressure electrolysis to reduce the number of downstream compression stages necessary.

Additionally, feedback was received that disagreed with some of the conclusions of the report.

- Table 1 of the report (page 6) states that the lack of identified metallic materials for use in high-pressure hydrogen environments is an issue in need of addressing. One respondent stated that this fails to acknowledge the research work conducted at Sandia National Lab, particularly their Technical Reference for Hydrogen Compatibility of Materials.

### Storage

Respondents submitted additional needs for R&D in the area of hydrogen storage:

- Advanced metal alloys in order to lower the cost of hydrogen storage;
- Detailed evaluation and characterization of glass fiber strengthening due to cold operation and/or vacuuming to remove moisture and other contaminants like ammonia that weaken glass fiber; and
- Investigation of hydrogen permeation through glass fiber composites.

Some respondents disagreed with conclusions regarding hydrogen storage needs:

- One respondent disagreed with a recommendation made by the report in Table 2, stating that the lack of availability of high pressure components is not a major limiting factor to reducing cost.
- The report stated that the supplier base for carbon fiber should be expanded in order to decrease the cost of carbon fiber used in high-pressure composite tanks. While several respondents agreed that the lack of competition amongst the supplier base was a contributor to cost, it was also stated that this is not something that can be helped through DOE-supported R&D. Ultimately, the market needs to evolve.

### Other Forecourt Issues

Respondents submitted additional needs for R&D in the area of hydrogen storage:

- It was suggested that further cost reductions could be achieved by integrating hydrogen systems such as onsite reforming with combined heat and power loads for either retail or district applications.

## Hydrogen Compression, Storage, and Dispensing Cost Reduction Workshop

- A respondent disagreed with the report in regards to explosion vent requirements, stating that requirements for containerized storage are not a major impediment to cost reduction.
- It was suggested that the DOE develop reliability targets for CSD components and systems in order to measure progress.
- Affordable -40°C pre-cooling designs for dispensing were also called out as a necessity as were reliability datasets for high pressure components.
- NIST Handbook 44 methodology needs to be validated in the field.
- Further testing, data collection, analysis, and development are needed in order for industry to design and manufacture a meter that meets the 1-2% system accuracy and repeatability goals, especially at 700 bar.

Some respondents disagreed with conclusions regarding forecourt needs:

- Page 13 of the report stated that “low-volume production, small supplier base, and low equipment utilization leads to high cost.” A respondent stated that while small stations are often financially infeasible because of high costs, they are key to expanding the hydrogen highway network. The respondent went on to list several advantages of small stations, including that they can offer hydrogen at a low cost because they avoid some of the obstacles of large stations.