May 2003

U.S. to Lead in Development of Hydrogen Power Research

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In January 2003 President Bush announced a FreedomCAR (**C**ooperative **A**utomotive **R**esearch) and Fuel Initiative that will provide $1.2 billion funding over five years allowing the United States to lead in research and development of hydrogen-powered fuel cells as a source of power for vehicles, homes, and businesses. The initiative, the goal of which is to lessen our dependence on foreign oil and promote the development of an environmentally clean fuel-cell technology with zero or near-zero emissions, intends to create a supporting infrastructure that is safe, economic, and reliable. A cooperative effort from both government and industry is necessary because of the high cost and risk in making hydrogen and fuel-cell technology commercially viable.

The U.S. Department of Energy's Hydrogen Codes and Standards and Coordinating Committee (HC&SCC) requested that NIST Weights and Measures Division (WMD) take a leading role in developing legal metrology standards for hydrogen refueling stations. The HC&SCC is coordinating the development of hydrogen-related codes and standards by public and private organizations and plans to promote and share this information with other national and international agencies involved in codes and standards. Various standards developing organizations (SDOs) for energy and fuel systems, in addition to governmental and environmental agencies and the auto industry, are involved in a collaborative effort to harmonize codes and standards for hydrogen fuel cells and related technologies. The goal is to prevent duplication of effort and to ensure all essential elements are in place for a commercial program.

While HC&SCC's goal is to have hydrogen fuel-cell technology and the necessary supporting infrastructure commercially viable by the year 2020, many of the major auto manufacturers already have developed hydrogen-fueled prototype vehicles. However, hydrogen-powered vehicles, outside of fleets, may not be available until the year 2015.

The infrastructure for hydrogen fuel-cell technology will cover a wide gamut of services such as production, delivery, storage, transportation, distribution, communications, and safety. However, many SDOs involved in the harmonization work believe that there are no overwhelming safety issues.

WMD is investigating with HC&SCC to determine the effect of hydrogen fuel-cell technology on weights and measures functions and the best use of resources in the standards-developing process. Hydrogen (H_2) can be derived from many processes, for example, by reforming fossil fuels, gasification of biomass, or through the electrolysis of water. Some processes are more plausible than others, but hydrogen remains a viable fuel source. When developed, hydrogen-fueling stations for fuel-cell vehicles would be similar to the corner service station.

Hydrogen as a cryogenic liquid is addressed in Section 3.34. Cryogenic Liquid-Measuring Devices in NIST Handbook 44. Currently, compressed hydrogen gas is more feasible as a vehicle motor fuel than liquid hydrogen. WMD staff observed a limited number of hydrogen motor-fuel dispensers that use mass flow metering technology similar to that currently in use to deliver compressed natural gas (CNG) motor fuel. Before CNG mass flow metering technology and standards in Section 3.37 Mass Flow Meters of Handbook 44 are applied to H_2 applications, some properties of hydrogen and components of the hydrogen dispenser design must be closely examined. To name a few:

· H_2 purity levels for specific fuel cell applications
· CNG-dispenser components' compati-bility with H_2
· Indicated units (GGE or other)
· Return of H_2 to storage in 3600-psi or 5000-psi systems

The weights and measures community follows a specific process to develop device standards and method of sale requirements. Once the need for specific weights and measures standards is established, standards should be developed in concert with work at both the HC&SCC national and international level. A joint effort will do much to avoid trade barriers. The process should follow current procedures to allow for due process for all parties affected by new or modified standards. The process also needs to be timely for those sectors making large capital investments in weights and measures technology.