FUEL CELL SUMMIT

Volume 5, Issue 3

A quarterly newsletter from the U.S. Department of Energy to supply information on U.S. regulation of hydrogen and fuel cells.

Hydrogen Fueling Incident in Burnaby, Canada

Bruce Kinzey, Pacific Northwest National Laboratory

On Friday evening, August 6, 2004, a plume of hydrogen gas escaped from the offloading valve of a Praxair liquid hydrogen delivery truck at a Ballard facility in Burnaby, Canada. The plume ignited, resulting in a flash and concussion loud enough to be heard inside the nearby building and to set off the building's seismic event detectors. A small amount of hydrogen gas continued to escape from the trailer tank and burn until a Praxair specialist arrived to manually shut off a critical valve almost eight hours later. In the meantime, emergency response crews called to the scene sprayed water across the hydrogen tank as a precautionary cooling measure.

The local news media reported the story as a collision: "Hydrogen tanker crashes at Ballard Power Systems spewing gas," (Canadian Press, Saturday, August 07, 2004). Various other reports described the event using terms such as "explosion," "noxious fumes," and "incredibly flammable."

The facts of the incident turned out to be much less sensational than originally reported. Between investigation of the physical evidence, interviewing the driver, and reviewing security videos from the facility, the actual cause of this incident appears to have been primarily driver error. A number of steps required as part of the standard safety procedure were either incorrectly applied or omitted altogether. In any case there was no crash or any compromise in the integrity of the fuel tank aboard the truck trailer. Attentiveness to proper procedure would have prevented this incident.

The problem appears to have started when the driver of the truck was preparing to complete the second of two deliveries at the Ballard facility. (A rough schematic of the tank system is shown in Figure 1.) The manual valve shown in the figure was apparently left in an open position following the first unloading. The driver next failed to perform the required procedure of seven purges intended to eliminate contaminants and water from the piping before connecting the hose for the second unloading. He then opened the pneumatic ("automatic" in Figure 1) valve before connecting the hose, which, due to the open manual valve, resulted in a direct release of liquid hydrogen into the ambient air. This liquid immediately vaporized into a hydrogen cloud and quickly ignited. The cause of ignition is still uncertain, but one theory is that a static electricity buildup caused by the rush of vaporizing gas self-ignited the mixture.

Simplified Liquid-System Schematic

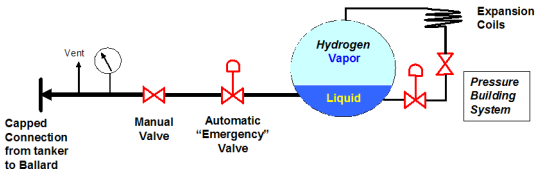

Figure 1. Schematic showing tank and location of valves. Illustration and photos courtesy Ballard Power Systems

The driver immediately returned the pneumatic valve switch to the closed position following the ignition but it failed to halt the flow. It is believed that moisture in the line froze due to the extreme cold temperatures of the liquid (-423° F) preventing the pneumatic valve from fully closing.

Because of its proximity to the liquid transfer line where the flow was exiting, the manual valve could not now be accessed. The flow (and combustion) thus continued until the Praxair specialist arrived,

(cont'd on page 2)

Eighth Annual Hydrogen and Fuel Cells Summit VIII

The eighth annual Hydrogen and Fuel Cells Summit was held June 15-17, 2004, at the University of Miami Convocation Center in Coral Gables, Florida. The focus of the annual Summit meeting is to bring the fuel cell development community together to share information, experiences, and organizational support in developing performance, installation, and operation standards for hydrogen and fuel cell technologies. More than 100 attendees participated in the two and one-half day event this year. Look for feature articles related to Summit VIII presentations in the next few issues of the newsletter, such as the article in this issue authored by Gerry Eisenberg and John Koehr of ASME. ■

Patrick Davis New DOE Manager of Hydrogen Program's Safety, Codes and Standards

We welcome Patrick Davis as the U.S. Department of Energy's Hydrogen, Fuel Cells and Infrastructure Technologies (HFCIT) Program Manager of Safety, Codes and Standards. Pat is a chemical engineer with over 20 years experience managing battery and fuel cell research. He is now the Hydrogen Program's representative to the Codes and Standards Technical Team under the FreedomCAR and Fuel Partnership. Pat takes over for Neil Rossmeissl who has moved to the DOE Biomass Program. (Patrick.Davis@ee.doe.gov; 202-586-8061) ■

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reached through the flame with a special tool, and closed the manual valve.

Technically, the ignited gas mixture did not explode but instead resulted in an "over-pressurization" (the difference involves subsonic as opposed to supersonic flame speed and consequent damage to the surroundings is much less). An over-pressurization might be familiar to readers who have used outdoor gas cooking grills and may once have waited a second or two too long with the gas flowing before pressing the igniter switch.

Despite this ignition occurring in the immediate vicinity of the driver, he escaped with only minor injuries similar to those from sunburn. (Hydrogen combustion produces a high output in the ultraviolet spectrum, thus radiant effects really are like common sunburn. Note that had he been actually immersed in the flame or an explosion his injuries would have been more serious.)

The truck only received minor damage during the incident, as shown in Figure 2. After the manual valve was closed by the Praxair specialist, the truck was determined to be roadworthy and was returned to Praxair for inspection. Fortunately for all, this incident largely turned into a non-event.

Figure 2. The truck sustained only minor damages, primarily to the paint.

A reality of modern society is that even given the best technologies and engineering available, no energy system can be made 100% safe no matter how concerted the effort. Considering the widespread dependence of today's economies on various forms of energy and their associated systems, it is no surprise that accidents and other failures occur worldwide on a regular basis. This incident illustrates both the need for exercising caution and also how the characteristics of hydrogen may have helped minimize the severity of the event.

At least two major consequences were avoided in this instance that probably would have occurred had the fire been fossil-fuel related. Because the hydrogen molecule contains no carbon, there is no soot and thus no associated long-wave radiant heat transfer from its combustion. Also, hydrogen's buoyancy causes its combustion to occur upwards, away from objects on the ground. Had the operator of the truck been confronted with a propane or natural gas overpressure event, he probably would have sustained much greater burn damage due to the radiated energy his skin would have received. Likewise, a hydrocarbon fire that burned for several hours is much more likely to spread to nearby materials (such as the truck tires or surrounding equipment) through similar radiant heat transfer. As it was, the fire fighters' dousing of the tanker vehicle was probably unnecessary.

What this incident also underscores is the need for rigorous training on hydrogen properties and behavior, not only for the operators of fueling equipment but also for emergency responders and the general public. The physical and chemical characteristics of hydrogen are different from those of fossil fuels and must be communicated, understood, and accounted for in hydrogen handling and use if the transition to a hydrogen-fueled economy is to be accomplished in the safest manner possible. ■

CSA America and UL Joint Hydrogen Generation Standard

Courtesy of Jennifer S. Henderson, Program Manager, Alternative Energy Applications, CSA America, Inc.

Standardization is the first step in supplying the large volumes of hydrogen needed for a hydrogen-fueled transportation sector. In response to this need, CSA America and Underwriters Laboratories Inc. (UL) expect to finalize development in December 2004 on the Standard for Hydrogen Generators Using Fuel Processing Technologies, CSA America FC5/UL 2264. The new standard sets requirements for stationary hydrogen generators intended for indoor and outdoor commercial and residential use rated below 600 V.

CSA America and UL are developing the joint hydrogen generator standard through UL's Gaseous Hydrogen Generation Appliances Standards Technical Panel (STP 2264), an ANSI accredited consensus body. The panel parallels International Standards Organization (ISO) Technical Committee (TC) 197, Working Group 9 for which CSA America is the Administrative Secretary.

Once the standard is fully developed and approved by UL and CSA's consensus bodies, the standard will be proposed as an American National Standard and, if approved, published as an ANSI/CSA/UL standard.

Other CSA Efforts

CSA America is also working on a series of standards to help harmonize global standards and regulations for fuel cell applications. The first standard in the series was developed for Stationary Fuel Cell Power Systems and published in April 2004. ANSI/CSA America FC 1-2004, Stationary Fuel Cell Power

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Standards Committee Activity Updates

- **IEC TC 105, Fuel Cell Technologies.** WG1: Terminology and WG2: Fuel Cell Modules – Documents have been approved; will be published December 2004. WG3: Stationary FC Safety – Participating national committees have until December 10, 2004, to comment on Committee Draft. WG4: Stationary FC Performance – The Committee Draft was approved; a Final Draft International Standard will be circulated for voting. WG5: Stationary FC Installation – WG5 will become an IEC TC 105/ISO TC 197 Joint Working Group to develop one international standard for installation of both stationary fuel cell power systems and hydrogen generators using fuel-processing technologies or water electrolysis. WG6: Fuel Cell System for Propulsion and Auxiliary Power Units – The activity of WG6 remains suspended; automotive fuel cell systems work will be done under an ISO TC 22 SC 21/IEC TC 105 Joint Working Group. It was reported that ISO TC 22 SC 21 will not likely start this project for several years due to a lack of current support by the automotive industry. WG7: Portable FC Appliances Safety and Performance Requirements – The document will continue as a "Safety" document only; a New Work Item Proposal is needed for developing a "Performance" document for portable fuel cell appliances. WG8: Micro FC Power Systems Safety – A Committee Draft is expected in early 2005. WG 9: Micro Fuel Cell Power Systems Performance – The New Work Item Proposal was approved; eight member countries will participate. WG9 met last on September 20-21, 2004. WG 10: Micro Fuel Cell Power Systems Interchangeability - The New Work Item Proposal was accepted with one negative vote – Germany would like this activity split into two separate documents: for safety requirements and design requirements. Contact: Steve Kazubski (CSA America) (216) 524-4990 ext. 8303, or steve.kazubski@csa-america.org.
- **ICC Ad Hoc Committee for Hydrogen Gas**. The Ad Hoc Committee (AHC) submitted several changes affecting hydrogen in the International Fire, Mechanical and Fuel Gas Codes to the 2004/05 Code Development Cycle. Proposed changes and minutes of past meetings are available for viewing at www.iccsafe.org/cs/cc/h2g/h2g2.html#decisions. The Proposed Changes Monograph will be posted around November 19. The 2005 Code Development Hearings will take place February 21-March 2, 2005, in Cincinnati: Contact: Darren Meyers (ICC), (800) 214-4321 ext. 307, dmeyers@iccsafe.org.
- **UL1741, Standard for Inverters, Converters and Controllers for Use in Independent Power Systems**. After IEEE P1547.1 is published (slated for spring 2005), UL1741 will directly reference IEEE 1547 and IEEE 1547.1 for utility interactive interconnected products. Contact: Tim Zgonena (UL), (847) 272-8800 ext. 43051, (847) 509-6298 (fax), timothy.p.zgonena@us.ul.com; or Susan Malohn (UL STP Secretary), (847) 664-1725, susan.p.malohn@us.ul.com.
- **ISO TC 197, Hydrogen Technologies** - The 2004 Plenary was in Japan at the end of June. WG12 seeks to exclude fuel cells from the standard (ISO 14697:Hydrogen Fuel Product Specifications), as the levels of some contaminants permitted by the standard are believed to be sufficiently high to cause irreparable damage to fuel cells, particularly PEMs. Member countries will have a chance to comment. The WG will develop a new Technical Specification for hydrogen for use in PEM fuel cells in road vehicles. Contact: Karen Hall (NHA), (202) 223-5547, khall@ttcorp.com.
- **NFPA 70, National Electrical Code - Article 692, Fuel Cell Plant**. The 2005 NEC is now available. The closing date for submittal of proposals for the 2008 NEC is November 4, 2005. Contact: Jean O'Connor (NFPA), (617) 984-7421, (617) 984-7070 (fax), joconnor@nfpa.org.
- **NFPA 52, Vehicular Fuel Systems Code**. The 2005 Edition will contain requirements for gaseous and liquid hydrogen refueling operations as well as the requirements for NFPA 57 LNG Vehicular Fuel Systems. The Vehicular Alternative Fuel Systems Technical Committee will meet November 9-11, 2004, to review public comments. The final document will be issued in July 2005. Contact: Carl Rivkin (NFPA), (617) 984-7418, crivkin@nfpa.org.
- **NFPA 55, Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks**. NFPA 50, 50A, and 50B were incorporated into the 2004 Edition of NFPA 5 5 that will be available in early 2005. Requirements for underground storage of hydrogen will be included. Contact: Carl Rivkin (NFPA), (617) 984-7418, crivkin@nfpa.org.
- **NFPA 853, Installation of Stationary Fuel Cell Power Plants**. The 2003 Edition of NFPA 853 has been expanded to stationary fuel cells below 50 kW. The committee is now accepting proposals through 11/29/2004 for what will be the 2006 edition. Contact: Carl Rivkin (NFPA), (617) 984-7418, crivkin@nfpa.org.
- **IEEE 1547 Series of Interconnection Standards**. P1547.1 Draft will be out for ballot this fall; meetings have begun on P1547.4 Draft "Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems." The Board approved the start of "P1547.5 Draft Technical Guidelines for Interconnection of Electric Power Sources Greater than 10MVA to the Power Transmission Grid." Next meeting of the P1547 series will be in early 2005. Contact: Richard DeBlasio (NREL), (303) 275-4333, Dick_DeBlasio@nrel.gov or Tom Basso (NREL), (303) 275-3753, thomas_basso@nrel.gov.

2004 Calendar of Events

NOV

1 - 3 **2nd Annual Power Delivery Asset Management Conference.** Las Vegas, NV. Presented by EPRI. Contact: www.epri.com/event_attachments/2440_1011214.pdf

1 - 4 **2004 US Fuel Cell Council's Annual Fall Meeting**. San Antonio, TX. Contact: www.usfcc.com/

1 - 4 **IGRC 2004 International Gas Research Conference.** Vancouver, BC, Canada. Contact: (847) 768-0789 or visit www.igrc2004.org

1 - 5 **2004 Fuel Cell Seminar.** San Antonio, TX. Contact: www.fuelcellseminar.com/index.asp

2 - 4 **SAE Power Systems Conference.** Reno, NV. Contact: buckshaw@sae.org or visit www.sae.org/events/psc

3 - 4 **Renewable Energy Sources '04**. Moscow, Russia. Presented by International Expo RUIE. Contact: www.iegexpo.com/rus_battery.html

4 - 5 **Onsite Power 2004.** San Antonio, TX. Presented by Remote Site & Equipment Management. Contact: www.remotemagazine.com/onsite_conf_index.htm

4 - 9 **International Hydrogen + Fuel Cells Exhibit and Conference,** Shanghai Intl. Industry Fair. Shanghai, P.R. China. Presented by Arno A. Evers FAIR-PR. Contact: www.fair-pr.com/

7 - 12 **AIChE 2004 Annual Meeting,** Austin, TX. Contact: meetmail@aiche.org or visit www.aiche.org/conferences/annual

9 - 11 **Improving Reliability of Large Interconnected Systems.** Presented by Shaw Power Technologies, Inc. Contact: www.energycentral.com/centers/calendar/event.cfm?eid=11312

10 - 11 **The Energy Venture Fair V – Incorporating Clean and Environmental Technologies**. Presented by Infocast. Contact: www.energyventurefair.com/

14 - 17 **NFPA Fall Education Conference.** Contact: www.nfpa.org/ProfessionalDev/EventsCalendar/FallEducation/FallEducation.asp?cookie%5Ftest=1

16 - 17 **Powering the Future 2004**. Ottawa, Ontario, Canada. Presented by Hydro Ottawa Limited. Contact: www.hydroottawa.com/conference2004/

17 - 18 **NEEP 2004 Conference – Energy Efficiency: Policy and Applied Policy**. Contact: www.neep.org/

17 - 19 **EPRI-EEI Annual Power and Fuel Supply Seminar**. Houston, TX. Presented by EPRI. Contact: www.energycentral.com/centers/calendar/event.cfm?eid=11245

29 - 30 **Bioenergy Australia 2004 Conference**. Adelaide, Australia. Presented by Bioenergy Australia. Contact: www.bioenergyaustralia.org/

29 - 3 **2004 MRS Fall Meeting** (including Symposia on Materials Aspects of Fuel Cells, and Materials for Hydrogen Storage). Boston, MA. Sponsored by the Materials Research Society. Contact: info@mrs.org or visit www.mrs.org/meetings/fall2004/

30 - 2 **POWER-GEN International.** Orlando, FL. Presented by PennWell. Contact: pgi04.events.pennnet.com/

DEC

1 - 3 **1st International Conference on the Integration of Renewable Energy Sources and Distributed Energy Resources.** Brussels, Belgium. Organized by OTTI Kolleg. Contact: gabriele.struthoff-mueller@otti.de or visit www.conference-on-integration.com

5 - 6 **Catalysts in Petroleum Refining and Petrochemicals.** Dhahran, Saudi Arabia. Sponsored by King Fahd University and Japan Petroleum Institute. Contact: www.kfupm.edu.sa/

6 - 7 **Lithium Mobile Power 2004** – Advances in Lithium Battery Technologies. Miami Beach, FL. Organized by The Knowledge Foundation. Contact: custserv@knowledgefoundation.com or visit www.knowledgefoundation.com/

6 - 8 **H2PS: The 2004 Hydrogen Production and Storage Forum**. Washington, DC. Presented by Intertech. Contact: (207) 781-9618 or www.intertechusa.com/main.html

10 **2004 Global Energy Awards**. Presented by Platts. Contact: www.platts.com/Events/Energy%20IT/

20 - 21 **International Conference on Electrochemical Power Systems,** ICEPS-2. Hyderabad, India. Contact: saestkkd@yahoo.com, saest_india@rediffmail.com or visit saest_ind.tripod.com

JAN

17 - 18 **6th Annual Northeast Natural Gas Symposium.** Presented by American Conference Institute. Contact: www.americanconference.com/contentframes.cfm?ID=2930

19 - 21 **1st International Fuel Cell Expo – FC EXPO 2005**. Odaiba, Tokyo, Japan. Organized by Reed Elsevier and co-organized by The Hydrogen Energy System Society of Japan (HESS). Contact: www.fcexpo.jp/english/

ASME Hydrogen Standards to Enable Fuel Cell Commercialization

Courtesy of Gerry Eisenberg and John Koehr, American Society of Mechanical Engineers, Codes and Standards

Commercialization of fuel cells, in particular fuel cell vehicles, will require development of an extensive hydrogen infrastructure comparable to that which exists today for petroleum. This infrastructure must include the means to safely and efficiently generate, transport, distribute, store, and use hydrogen as a fuel. The effort required may seem daunting, but steps are already underway within ASME to begin the transition. Standardization of pressure-retaining components, such as tanks, piping, and pipelines, will enable hydrogen infrastructure development not only by assuring safety, but also by establishing confidence in the technical integrity of products.

Since 1884, ASME has been developing codes and standards that protect public health and safety. The traditional approach to standards development involved writing prescriptive standards only after technology has been established and commercialized. With the push toward a hydrogen economy, government and industry have realized that they cannot afford a hydrogen-related safety incident that may undermine consumer confidence. As a result, ASME has adopted a more anticipatory approach to standardization for hydrogen infrastructure that involves writing standards with more performance-based requirements in parallel with technology development and before commercialization has begun.

Today, ASME codes and standards are used for hydrogen storage, transmission, and distribution. The anticipated requirements of the hydrogen economy will require local refueling stations with the capability to fill gaseous hydrogen vehicle tanks rapidly, to pressures as high as 10,000 psig. Although current standards could be used to build pressure vessels, piping, and pipelines meeting these operating requirements, it is likely that the resulting components would not, as a practical matter, enable commercialization of the technology.

ASME has worked closely with the US Department of Energy (DOE), national laboratories, and other standards developing organizations (SDOs) to identify lead organizations to address the need for standards for hydrogen applications. ASME was selected to lead the efforts for pressure vessels, piping, and pipelines for the storage, transportation, and distribution of hydrogen. Initial work by the ASME's Hydrogen Steering Committee led to the formation of volunteer task forces under the ASME Board on Pressure Technology Codes and Standards (BPTCS) to explore the standardization requirements for storage tanks, transportation tanks, portable tanks, piping, and pipelines for hydrogen-specific applications. The task forces submitted their recommendations at the end of 2003, and these recommendations led to initiation of standards actions, formation of project teams, and commencement of supporting research.

The ASME Boiler and Pressure Vessel (BPV) Standards Committee appointed a project team to develop new Code rules in Section VIII (pressure vessels) and Section XII (transport tanks) for hydrogen storage and transport tanks to be used in the storage and transport of liquid and gaseous hydrogen and metal hydrides. Rules for gaseous storage vessels with maximum allowable working pressures (MAWP) up to 15,000 psig will be needed. Research activities are being coordinated to develop data and technical reports concurrent with standards development; these have been prioritized per Project Team needs. The Project Team may identify additional needs and gaps as drafts are developed.

Specific technical areas to be addressed include the following:

- Development of Code rules to accommodate new high-strength steels and high-strength aluminum for the construction of relatively lightweight vessels.
- Obtaining data on hydrogen embrittlement used with composite vessels.
- Development of rules for composite vessels up to 15,000 psig MAWP using guidance from ASME Code Case 2390, DOT standards FRP-1, FRP-2 and CFFC, and CSA NGV-2.
- Development of a Nonmandatory Appendix that includes a method to address metal hydride expansion loadings in vessel design.
- Development of a revision to expand the scope of Section XII to accommodate composite trailer tubes using the guidelines from existing published documents.
- Development of rules for an ASME BPV Section XII application for construction of weight-efficient, high-strength steel and aluminum portable metallic tanks to be used in gaseous hydrogen service over 3,600 psig.
- Development of a new ASME Boiler and Pressure Vessel Code or Standard for portable nonmetallic gaseous tanks, using the guidance from existing standards such as DOT FRP-1 or CSA NGV-2.

Among other ASME standards, a new Project Team on Hydrogen Piping and Pipelines was formed under the ASME B31 Standards Committee to develop a new code for hydrogen piping and pipelines that contains requirements specific to hydrogen service in power, process, transportation, distribution, commercial, and residential applications. The BPV Project Team on Hydrogen tanks met on September 1, 2004, in New Orleans. ASME is soliciting international participation on the volunteer project teams and standards committees in order to advance these important new standards.

Visit www.asme.org/cns/hydrogen to learn more about volunteering, or contact Gerry Eisenberg at eisenbergg@asme.org for more information. ■

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Ohio Announces $103M Effort to Build State Fuel Cell Industry

The state of Ohio has made a major commitment to building a fuel cell industry in its state. In May 2002 Governor Bob Taft announced the Ohio Fuel Cell Initiative, investing $103M over the next three years to promote the fuel cell industry in Ohio. The initiative includes $75 million for financing, including low-interest loans to fuel cell-related companies who want to relocate to Ohio or expand their current operations in Ohio, $25 million for competitive research and development grants, and $3 million in training grants to help companies train or re-train their employees in fuel cell-related skills.

In September 2004 the state's Department of Development released the Ohio Fuel Cell Roadmap, a five-year strategic guide to create an environment that supports the research, development, and early commercialization of fuel cells in Ohio.

"We have particular strengths in Ohio, and we are hoping to capitalize on them" said Mike McKay, Team Leader of the Ohio Fuel Cell Initiative for the Ohio Department of Development.

Among those strengths is a solid base of more than 12 colleges and universities, 39 industry partners, and federal and local government research organizations committed to the idea of working together to develop fuel cells. In 2002 these organizations formally organized the Ohio Fuel Cell Coalition, which this year hosted its fourth Annual Ohio Fuel Cell Symposium near Columbus in May.

Another example is the Wright Fuel Cell Group (previously known as the Power Partnership for Ohio), which includes five university partners and 18 industry partners, headquartered at Case Western Reserve University in Cleveland. The Wright Group is aimed at cutting-edge world-class fuel cell research and development, leading to commercialization of technologies and creating technology jobs in Ohio.

"Building the industry isn't just about having fuel cell manufacturers in your state, it's also about having a supply chain, having the research, having the other tools that you need to make this comprehensive," said McKay who rattled off a list of projects the state is helping to fund. The Wright Group was founded with $18 million in capital funds from the state last year for a Wright Center of Innovation (WCI) in fuel cells. As partners in the Wright Fuel Cell Group, The Ohio State University and the University of Toledo, among other schools, will also receive funds to expand and build fuel cell R&D facilities on their campuses. In addition to WCI funding, Stark State College of Technology received a $2 million grant from the state to build a Fuel Cell Prototyping Center – a research business park right on campus. "They broke ground this summer," said McKay.

"We want to help the companies that are making things of value to a fuel cell industry," said McKay. "By involving those companies in this new market, we are creating a supply chain that will help us build a fuel cell cluster in Ohio."

"We've invested more than $32 million in fuel cell-related research, development and demonstration projects in the past two years," said McKay. "I think we are going to see some results in short order, maybe in the next 6 months."

For more information about Ohio's Fuel Cell Initiative contact Mike McKay by phone at: (614) 644-9159, or by E-mail at: mmckay@odod.state.oh.us. To learn more about the Ohio Fuel Cell Coalition and roadmap visit their websites at www.fuelcellsohio.org and www.thirdfrontier.com/.

Ohio governor Bob Taft test drives a fuel cell car.

CSA America and UL Joint Hydrogen Generation Standard *(cont'd from page 2)*

Systems, includes requirements for the operation, construction, and performance of stationary fuel cell power systems. CSA America is also working on new standards for Hydrogen Gas Dispensing Systems and Pressure Relief Devices for use on Hydrogen Fuel Containers.

For the development of international fuel cell standards, CSA America serves as the U.S. Technical Advisory Group Administrator to the International Electrotechnical Commission's Technical Committee 105, Fuel Cell Technologies. It is also working with the International Organization for Standardization (ISO) to facilitate the development of an ISO standard for hydrogen generators using fuel-processing technologies.

Parties interested in hydrogen fuel processing technologies are welcome to join the standards development efforts by becoming a member of either or both consensus bodies. The next STP 2264 meeting is scheduled for October 20-21, 2004, in Northbrook, Illinois.

Please contact Jennifer Henderson at jennifer.henderson@csa-america.org or Susan Malohn at Susan.P.Malohn@us.ul.com for details.