

A quarterly newsletter published by the U.S. Department of Energy for the U.S. fuel cell industry to foster development and adoption of codes and standards

Avista CEO Calls for Focus on Codes, Licensing, and Education

According to Mike Davis, CEO of Avista Labs, Inc., in addition to improving the technology itself, fuel cell developers must focus on codes, standards, licensing, and education to successfully commercialize the technology. Dr. Davis, former Assistant Secretary for Energy Efficiency and Renewable Energy, gave the keynote address at the recent Fuel Cells Summit V held on May 30-31, 2001, in Washington, D.C.

With extensive experience in the energy arena in both public and private sectors, Dr. Davis knows the need for patience to successfully move fuel cells into the marketplace, make a profit, and create a sustainable business. The following are excerpts from his address.

Many questions must be answered to successfully license a fuel cell for residential use. For example, who obtains the permit—the manufacturer, the builder, the homeowner? The industry must think about the amount of time and education needed to clear the hurdles related to building inspection.

Fuel cell systems consist of three main components—the fuel processor, the fuel cell itself, and the power-conditioning equipment. Of these components, power conditioning is the easiest aspect to deal with because the technology and the utility interface do not distinguish between generation sources. Much more work will have to be directed toward fuel cells and fuel processing, by contrast, which vary considerably and thus require a much larger range of applicable regulations.

A huge global market potentially exists for fuel cells, both inside and outside the grid, but much more must be done before this market can be realized. The industry must find the most profitable applications and gain experience in these niche markets before tackling the larger residential and transportation applications.

Dr. Davis stressed that it will be critical for the industry to set reasonable expectations and reduce the chance that expectations will get ahead of the industry's ability to deliver. He expressed hope that many fuel cell companies will succeed and work together to deal with critical issues, such as safety, that could inhibit the success of the entire industry. For example, piping hydrogen around a building could present problems, again raising the need for codes, standards, licensing, and education. It is important to avoid past mistakes made by the solar industry where a fast-growing industry and lax standards led to shoddy installation practices. A similar situation in the fuel cell industry could raise

serious safety issues, create unnecessary costs, and lead to an overall poor reputation with consumers. (This point was stressed by a U.S. Senator who recently visited the Avista facilities.)

The industry needs to work together to ensure newly developed standards are broad and flexible enough to accommodate the variety of systems out there. If individual firms try to gain market advantage by attempting to set specific standards that only they can meet, these efforts will be detrimental to the industry as a whole.



Mike Davis, CEO of Avista Labs, Inc., giving the keynote address at Fuel Cell Summit V

Dr. Davis noted that while the codes and standards issue is not the most glamorous aspect of fuel cell development, it is an extremely important one. Cooperation among stakeholders, like those at Summit V, will be necessary to achieve mass market implementation.

Summit V Targets Regulatory Actions for Fuel Cells

Despite significant progress in overcoming the regulatory hurdles of national model codes and voluntary standards governing fuel cells, more must be done to achieve full regulatory acceptance and market success. Working groups at the recent Fuel Cells Summit V identified over 75 issues to consider before regions can successfully adopt and implement codes and standards regulating fuel cells.

The Summit was the fifth in a series of working meetings that the U.S. Department of Energy, Office of Power Technologies sponsors to support a receptive institutional and regulatory environment for fuel cell technologies. It gives representatives from industry, codes and standards organizations, government agencies, and others a forum to collaborate on codes and standards that impede the penetration of fuel cells into the marketplace.

Over 100 fuel cell manufacturers, distributors, energy companies, and regulators attended. The working groups identified the need for states to begin adopting, implementing, and enforcing codes and standards

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Survey Identifies Permitting Issues and Code Officials' Concerns

As part of a national education campaign inaugurated on behalf of U.S. fuel cell developers, the U.S. Department of Energy (DOE) commissioned a study to “test the waters” of familiarity with building code officials and to help develop an effective agenda for the national education program. The Tri-Cities (Richland, Kennewick, and Pasco) in Washington State were selected for the study because they comprise multiple city and county jurisdictions that enforce a variety of building codes and regulations in a fairly small area. The study provided a useful starting point for considering ways to address gaps in code officials' knowledge of fuel cells.

How the Study Was Conducted

Study participants included five building officials, one fire marshal, and one electrical inspector. Each participant completed a questionnaire and took part in a group interview. The questionnaire was designed to assess participants' current knowledge of fuel cells. The group interview helped identify the participants' major issues related to inspecting fuel cell installation and determined the most effective training tools to educate code officials on fuel cells. As part of the interview, participants heard a brief presentation on fuel cells, viewed a fuel cell demonstration, and discussed potential issues.

Issues Identified

The study revealed that code officials need a great deal of education to come up to speed on fuel cells and their relevant codes and standards. None of the code officials participating in the study had previous knowledge of fuel cells or of relevant codes and standards.

The study identified several issues related to permitting a fuel cell installation. The three issues that will most likely concern any jurisdiction are

- 1) fuel supply and storage, as it relates to the type of fuel being used and storage location
- 2) utility interconnect, as it relates to requirements for connecting and supplying electricity back to the local power grid
- 3) fire fighter intervention when responding to a fire with a fuel cell installed in or around the building.

These issues, especially the first, will be handled differently within the thousands of code enforcing jurisdictions across the country. The last two issues should be addressed as future codes and standards, such as IEEE P1547, become referenced; however, these may be inconsistent because of local electric utility requirements and fire department regulations.

The participants were no more concerned about using hydrogen as a fuel than the possibility of storing other hazardous and flammable liquids around a building. Many other issues will attract the attention of code officials including ventilation, clearances, and emergency shutoff valves. The diagram on page 5 identifies the most common installation requirements for a fuel cell in a commercial building. The participants emphasized that such a diagram would be effective as part of a field guide or checklist for code officials.

The group interview indicated that many code officials perceive a fuel cell as a “black box” similar to other household appliances. Their main concerns were related to the inputs, outputs, and connections of the fuel cell system, not the intricate details of the fuel cell itself. To ensure that an appliance complies with standards for safety and performance, code officials rely on certification marks given by testing and certification organizations like Underwriters Laboratories, Inc. As with the installation of a gas-fired furnace, code officials will need to see the certification mark on a stand-alone fuel cell to deem it a safe appliance.

Code Officials

Code officials who participated in the study said that incorporating a half-day workshop into regularly scheduled conferences would be the most effective way to reach and educate code officials throughout the United States. They agreed that conferences organized by model code organizations would be ideal because code officials from across the country traditionally attend these conferences despite time and resource constraints. Participants said that reference materials such as a field guide, checklists, or educational videos should also be made available at these conferences so code officials can take this information back to their respective jurisdictions as a resource.

To access the complete study entitled, “Assessment of Code Officials' Needs in Tri-Cities, Washington, to Accelerate Permitting Process for Fuel Cells in Buildings,” visit <http://www.pnl.gov/main/publications/reports.html>.

Standards Committee Activity Updates

- ▶ **ISO TC 197, Hydrogen Technologies.** As noted below under IEC TC 105, IEC and ISO are working to coordinate efforts. IEC TC 105 is responsible for fuel cell issues and ISO TC 197 is responsible for hydrogen infrastructure issues. The next plenary meeting will be in October in Paris. Contact: Karen Miller (NHA), (202) 223-5547, email: kmiller@ttcorp.com.
- ▶ **ANSI - Z21.83 - 1998/CSA, Fuel Cell Power Systems.** In March, the CSA Fuel Cell Working Group formed assignments for drafting additional proposed coverage to cover all types of fuel cells. Since May, the CSA America Fuel Cell Working Group has been teleconferencing monthly to develop proposed changes and new coverage to ANSI Z21.83. The Working Group's goal is to finish tasks and reach consensus before August/September. A CSA America Fuel Cell Technical Committee and four Canvass Groups are being formed to oversee the development of the following ANSI standards projects: CSA FC 1 - Fuel Cell Power Plants, CSA FC 2 - Residential Fuel Cell Power Generators, CSA FC 3 - Portable Fuel Cell Power Generators, and CSA FC 4 - Fuel Cell Modules. The new Technical Committee will meet in late September. Contact: Steven E. Kazubski (CSA International CSA America Inc.), (216) 524-4990 ext. 8303, email: steve.kazubski@csainternational.org.
- ▶ **IEC TC 105, Fuel Cell Technologies.** IEC TC 105 will meet in London September 6-7. Working Group 2 (Fuel Cell Module) will meet September 3-5, and Working Group 3 (Safety) will meet July 19-20, 2002. IEC and ISO have been working to coordinate efforts between IEC TC 105 and ISO/TC 197. Contact: Steven E. Kazubski (CSA International CSA America Inc.), (216) 524-4990 ext. 8303, email: steve.kazubski@csainternational.org.
- ▶ **ASME PTC 50 Performance Test Code for Fuel Cell Power Systems.** The ASME committee on Fuel Cell Power Systems met on June 12, 2001, at ASME Headquarters in New York City and discussed the section on Test Uncertainty. This section will be included as a non-mandatory appendix to the proposed test code. During a follow-up teleconference meeting on June 20, some refinements were made to this section. Another appendix will provide a sample calculation. The "body" of the code is almost complete. All that remains to be done is to obtain comments from outside reviewers. These comments will be addressed by the Committee, and any changes to the code will be made accordingly. To obtain an electronic copy of the proposed test code, contact the Secretary of PTC 50, Jack Karian (ASME), (212) 591-8552, email: karianj@asme.org.
- ▶ **NFPA 853 Installing Fuel Cells.** NFPA 853 is available by calling (800) 344-3555 or (617) 770-3000, or by visiting www.nfpa.org. Residential fuel cells could be added to the next edition of NFPA 853 (Annual 2003) if proposals are submitted by December 28, 2001. The committee would meet in the spring of 2002 to take action on those proposals. The next revision of the Uniform Mechanical Code will reference NFPA 853. Contact: Don Drewry (Hartford Steam Boiler) at email: Don_Drewry@hsb.com or Richard Bielen (NFPA), (617) 770-3000, email: rbielen@nfpa.org.
- ▶ **NFPA 70 - Article 692, Fuel Cell Plant.** No association amendments were made to Article 692 at the May meeting. The Standards Council will issue the 2002 National Electrical Code (NEC) after its July 9-13, 2001, meeting, probably around July 20th. Contact: Jean O'Connor, (617) 984-7421, fax (617) 984-7070, email joconnor@nfpa.org.
- ▶ **National Evaluation Service (NES).** The Protocol for Evaluation of Stationary Fuel Cell Power Plants has been completed. This document will assist fuel cell manufacturers and users of the technology to better understand what testing and documentation may be necessary to validate compliance with U.S. model building codes and to secure more timely and widespread acceptance by the building community and approval by code officials. A copy of the protocol is available on the NES web site (www.nateval.org). Copy and distribute as appropriate. Contact: Darren Myers (BOCA), (708) 799-2300, email: dmyers@bocai.org.
- ▶ **IEEE P1547, Distributed Resources Interconnected with Electric Power Systems.** The P1547 ballot process remains on schedule for completing and publishing the draft standard this calendar year. The ballot action results were the focus of the April 18-20 Working Group and Ballot Group meeting in New Orleans. Since the draft, seven had not received sufficient affirmative votes. Negative ballot comments will be addressed and a revised draft will be recirculated early this summer. The next group meeting is tentatively planned for this summer in the Golden, Colorado area. Proposed new activities are Standard for Testing Interconnection Systems for Distributed Resources, Application Guide for Distributed Resources, and Recommended Practice for Monitoring and Controlling Distributed Resources. Three discussion topics were Distributed Generators and Equipment-Specifications and Performance (includes Modeling), Network Specifications and Applications with Distributed Resources, and Certification of Distributed Resources and Interconnection Equipment. For further information, visit <http://grouper.ieee.org/groups/scc21/1547/archives/>. Contact: Richard DeBlasio (NREL), (303) 384-6452, email: deblasid@tcplink.nrel.gov or Tom Basso (NREL), (303) 384-6765, email: thomas_basso@nrel.gov.
- ▶ **UL 1741, Standard for Inverters Converters and Controllers for Use in Independent Power Systems.** UL1741 is being harmonized with IEEE P1547. The draft will be reviewed at a meeting in October or November. Publication is expected by year's end. Contact: Tim Zgonena, (847) 272-8800 Ext. 43051, email Timothy.P.Zgonena@us.ul.com.

2001**AUG****Calendar of Events**

- 11-16 **National Conference of State Legislatures 27th Annual Meeting.** Henry B. Gonzales Convention Center, San Antonio, Texas. Contact: telephone (303) 837-8225; email meetings@ncsl.org.
- 13-14 **Hart World Fuels Conference: Latin America & The Caribbean.** The Sofitel Rio Palace, Rio de Janeiro, Brazil. Contact: email reg@chemweek.com.
- 20-22 **International Future Transportation Technology Conference.** The Hilton, Costa Mesa, California. Contact: Rosemary Janeshak, Society of Automotive Engineers International, telephone (877) 606-7323 (toll-free in the U.S. and Canada) or (724) 776-4970; fax (724) 776-1830; email janeshak@sae.org; www.sae.org/calendar/ftt/.
- 21-24 **International Energy Program Evaluation Conference.** Salt Lake City, Utah. Contact: telephone (608) 835-6880; email marymcc@tds.net.
- 26-30 **Symposium on Recent Advances in Fuel Cells.** Chicago, Illinois. Contact: Marek A. Wojtowicz, Advanced Fuel Research, (860) 528-9806 ext. 142; fax (860) 528-0648; email marek@AFRInc.com; www.anl.gov/PCS/acsfuel/preprintinfo.html.
- 28-30 **On-Site Power Pavilion at Latin American Power.** Rio de Janeiro, Brazil. Latin America's biggest show for power generation to include EGSA-sponsored pavilion dedicated solely to on-site power generation. Contact: EGSA at (561) 750-5575 or http://email@egsa.org.
- 29-31 **2001 Integrated Energy Efficiency Congress (IEEC): Energy & Facilities.** Cleveland, Ohio. Contact: AEE at (770) 447-5083 or 279-4392; fax (770) 381-9865; email info@addcenter.org; www.aeecenter.org.
- 30-31 **F-Cells 2001: Commercializing Stationary Applications, Cost Reduction Strategies for Utilities, Residential and Industrial Power.** Holiday Inn Victoria, London, England. Contact: International Quality and Productivity Center (IQPC) at (800) 882-8684 or (973) 256-0211; fax (973) 256-0205; email info@iqpc.com; www.iqpc.com or www.f-cellsnetwork.com.

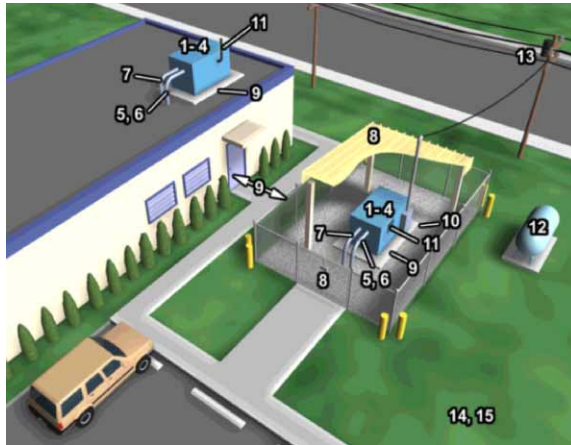
SEPT

- 9-12 **MicroGeneration to PowerParks: Supply Options and Regulatory Challenges for Renewable and Distributed Generation Technologies.** Somerset Inn, Troy, Michigan. Contact: Susan Barnes at (616) 887-0233; http://glrea.org/.
- 9-14 **Hydrogen Power - The Theoretical and Engineering Solutions International Symposium — HYPOTHESIS.** Stralsund, Germany. Contact: telephone +49.3831.456811; fax +49.3831.456687; email hypothesis@fh-stralsund.de; www.hypothesis.de.
- 10-12 **Energy Economy 2001.** Westin Galleria Hotel, Houston, Texas. Contact: Nancy Aloway at nancya@pennwell.com.
- 11-13 **7th Grove Fuel Cell Symposium.** Commercializing Fuel Cells: The Issues Outstanding. Queen Elizabeth II Conference Centre, London, England. Contact: Sarah Wilkinson at +44.1865.843691; fax +44.1865.843958; email sm.wilkinson@elsevier.co.uk; www.grovetfuelcell.com.
- 11-14 **VIII Biennial Conference on Transportation, Energy and Environmental Policy.** Managing Transitions in the Transportation Sector: How Fast and How Far? Asilomar Conference Center, Monterey, California. Contact: itsconference@ucdavis.edu.
- 12-13 **Distributed Energy Summit.** The 5th Annual E Source Distributed Energy Summit. The Westin, Westminster, Colorado. E Source Emerging Technologies Summit and reception on the 11th. Contact: telephone (800) 424-2908 or (720) 548-5700; fax (720) 548-5006; email conferences@ftenergy.com; www.esource.com.
- 16-22 **VII International Conference on Hydrogen Materials Science and Chemistry of Metal Hydrides.** Alushta, Ukraine. Russian and English, with simultaneous translation. Contact: Dr. Schur, Dr. Zaginaichenko, telephone +38.044.444.3001; fax +38.044.252.5516; email shurzag@materials.kiev.ua; www.materials.kiev.ua/IPMS/Events.
- 17-21 **Fifth Biomass Conference of the Americas.** The Rosen Centre Hotel on International Drive, Orlando, Florida. Contact: JoAnn Stirling at (321) 638-1527; email joann@fsec.ucf.edu; www.fsec.ucf.edu/bioam.
- 24 **North American Gas Supply Symposium.** Doubletree Post Oak, Houston, Texas. Contact: telephone (800) 817-8601 or (781) 939-2438 outside the U.S.; email cbireg@cbinet.com.
- 24-25 **Distributed Generation.** Distributed Generation: The Cost-Effective Solution to Improve Reliability and Power Quality, Meet Customers' Needs and Ease the Burden on Constrained T&D Systems. Westin Westminster, Denver, Colorado. Contact: Valerie Anderson at (781) 939-2420 or (781) 939-2438; fax (781) 939-2490; email v.anderson@cbinet.com; www.cbinet.com.
- 24-26 **Powering the Future - New Strategies and Solutions for Deploying Distributed Power in the Marketplace.** Hotel Sofitel (O'Hare), Chicago, Illinois. Contact: telephone (207) 781-9800; www.intertechusa.com.

OCT

- 1-4 **Automotive and Transportation Technology Congress and Exhibition.** Messe D, Sseldorf and SAE International's Alliance for Information Exchange, Barcelona, Spain. Contact: ATTCE at +44.1372.720620; fax +44.1372.720101; email enquiries@isata.com; www.attce.com.
- 8-9 **Power Generation and Sustainable Development.** Liège, Belgium. Contact: Chantal Lacrosse-Pirotte at +32.4.222.29.46; fax +32.4.222.23.88; email ch.lacrosse@aim.skynet.be; www.attce.com; http://www.conf-aim.skynet.be/.
- 15-16 **North American Power Symposium.** Texas A&M University, College Station, Texas. Contact: telephone (979) 847-9048; fax (979) 845-6259; email kbutler@ee.tamu.edu.

Typical Installation Requirements for a Fuel Cell in a Commercial Building



Requirements (numbers correspond to diagram)

1. Component - Relevant standards from ANSI, ASME, IEEE, UL.
2. NFPA 853, Chapters 4-6 - Automatic and control shutdown for fuel, ventilation, and fire protection systems.
3. NFPA 853, Chapter 4 - Unattended fuel cell units shall have shutoff valve installed ahead of any flexible connector to other controls.
4. Oil lubrication system consists of a sealed system; does not require manufacturer's installation instructions.
5. NFPA 853, Chapter 5 - All fuel piping outside the fuel cell power plant shall be marked or identified in accordance with ANSI A13.1. The design, location, and installation of piping valves and fittings from the outlet of the point of delivery from the supply to the inlets of the equipment shutoff valves for the case of 1) natural gas (in accordance with NFPA 54), 2) liquefied petroleum gas (in accordance with NFPA 58), 3) hydrogen (in accordance with ASME/ANSI B31.3), 4) biogas (in accordance with NFPA 54), and 5) liquid fuels (in accordance with NFPA 30). Piping protection is outlined in MSS SP-69, Pipe Hangers & Supports – Selection and Application.
6. ASME Boiler and Pressure Vessel Code, where fuel cell power plants employ pressure vessels or power piping.
7. NFPA 70, Article 692- All wiring and batteries must be protected from arcing and shorting. Fire protection installation process of electrical equipment and components in accordance with NFPA 853, Section 6.1.4.
8. NFPA 853, Section 3.3.1 – A fuel cell installation should meet the following conditions: 1) The room shall be separated from the remainder of the building by floor, wall, and ceiling construction that has at least a 1-hour fire resistance rating in accordance with NFPA 251, 2) electrical, piping penetrations, and joints associated with the room shall be sealed with approved materials that have a fire resistance rating of 1-hour, and openings between the room and other occupied spaces shall be protected by fire doors (installed in accordance with NFPA 80) and fire dampers (installed in accordance with NFPA 80), and 3) each room shall be provided with egress (in accordance with NFPA 101). Unit and auxiliary equipment must be protected from natural elements (wind, sun, precipitation, detritus) and vehicular impact.
9. NFPA 853, Sections 3.1, 3.2, & 3.4 - (outdoor location) Unit must be anchored properly and placed on a firm foundation. Unit must be above the base flood elevation and sited in a manner that permits service, maintenance, and emergency access. Unit must be located away from hazardous materials and building openings. Foundation to be made of noncombustible materials. Air intakes to a fuel cell power plant shall be located so that other exhausts, gases, or contaminants do not adversely affect the plant.
10. NFPA 853, Sections 3.1 & 3.3 - (indoor) Same foundation requirements as outdoor installations, as each apply. Must be located away from hazardous materials and building openings.
11. NFPA 853, Section 3.2.3 and Chapter 5 - The exhaust outlet(s) from process areas that contain fuel-bearing components of a fuel cell power plant shall be located at least 15 ft (4.6 m) from HVAC air intakes, windows, doors, and other openings into buildings. For design of ventilation and exhaust system, all fuel cell power plants shall be provided with a source of ventilation, exhaust, and makeup air in accordance with this chapter (exception: fuel cell power plants installed outdoors and listed prepackaged or pre-engineered and match modular fuel cell power plants that have a sealed, direct ventilation, and exhaust system installed in accordance with manufacturer's installation instructions.

The ventilation exhaust system shall be designed to provide a negative or neutral pressure in the room.

For the ventilation system, separate mechanical ventilation is required, a control interlock shall be provided to shutdown the unit upon loss of ventilation. For the exhaust system, the exhaust rate from the room shall not be less than 1 cfm/ft² of floor area and not less than 150 cfm of total floor area.
12. NFPA 853, Chapter 4 and Section 6.1.1.1, "Fuel Supplies and Storage Arrangements" - This section applies to natural gas (also refer to NFPA 54), liquefied petroleum gas (also refer to NFPA 58), hydrogen (also refer to NFPA 50A and 50B), biogas (also refer to NFPA 54), and liquid fuels (also refer to NFPA 30). The Flammable and Combustible Liquids Code, API (American Petroleum Institute) 620, "Design and Construction of Large Welded Low-Pressure Storage Tanks," may also apply. Sites with fuel storage tanks shall have fire hydrants provided in accordance with NFPA 30 and NFPA 24. Hydrant shall have a water supply of at least 250 gpm for 2 hours.
13. Grid Interconnection for fuel cells in accordance with standard currently under development by IEEE SC 21, (Standard P1547), and NFPA 70, Article 692.
14. Local zoning ordinances (e.g., definition of hazardous materials and relation to residential zones, distance to property line and rights-of-way, access by local fire and safety authorities) may need to be consulted in some areas.
15. Fire Protection - Local building inspectors will require a fire risk evaluation be performed for each installation with respect to design, layout, and operating conditions of the unit. From that analysis, the inspector may require any or several of a variety of fire protection systems (portable versus fixed systems, foam or gaseous extinguishers, automatic sprinklers or dry chemical fire suppression systems).

Note: Refer to ANSI Z21.83 for information regarding construction, performance, and testing of fuel cell power plants.

*Summit V Targets Regulatory Actions for Fuel Cells
(cont'd from page 1)*

regulating fuel cells; for building professionals and manufacturers to understand regulatory requirements; and for regulators to examine installation requirements when considering how to penetrate the market.

David Conover, National Evaluation Service

- **The existence of a code or standard does not imply its adoption in all jurisdictions.** Conover stressed that it typically takes several years for a newly developed code or standard to be adopted, and those responsible for its enforcement and implementation must become fully aware of the requirements. (For details on the current status of ongoing codes and standards activities related to fuel cells, visit <http://www.pnl.gov/fuelcells/summit5/presentations/statusreport.pdf>.)



Summit attendees tour the BCHP Test Site at University of Maryland.



Dave Holmes (foreground) and Gene Connelly of Avista Labs (background, in red shirt) describe the Avista 3-kW fuel cell to Summit attendees.

Todd Strothers, Canadian Standards Association (CSA)

- **To ensure fuel cell components comply with codes and standards, developers should completely understand Z21.83 and NFPA 853 before designing a component for manufacturing.** Strothers explained that it can take up to 6 months to list a new product through CSA, but systems can be broken into parts and certified separately to minimize this time requirement. To further avoid delays, systems integrators should ensure that all components used in their systems have been certified prior to submitting the overall system for certification.

Guy Tomberlin, building code inspector for County of Fairfax, Virginia

- **To smooth the permitting process, builders should include building code supplements describing the appropriate location for a fuel cell system, identify the components, and provide certification of qualified installers.** Tomberlin said that if the manufacturer can prove it has met the “spirit and intent” of the overriding code, inspectors will often approve installation.

Tim Bernadowski, Dominion Virginia Power

- **States need to start working on the adoption of new codes and standards regulating fuel cells, as well as zoning and environmental regulations.**

Chris Fennell, National Association of Home Builders Research Center

- **When considering how to penetrate the market, regulators need to consider what kind of impact fuel cell installation will have on the actual construction site, when the fuel cell system should be installed, and if a specialist will be required to install the system.** Fennell warned that problems in approving and/or subsequently operating and servicing initial installations may damage the reputation of fuel cells that will take years to repair.

Harry Jones, Underwriters Laboratories

- **Standardized connections to waste water, electricity, etc., should exist to minimize any required special approvals.**
- **Manufacturers need to monitor the standards-making process and keep code committees informed so they don't write something that is out of date with the technology.**

Alan Mace, Idatech

- **It is not cost-effective to test and list a technology that changes rapidly in the early stages of development.** Mace commented that on many of Idatech's installations, the code officials did not require strict adherence to standards for installations specifically considered temporary.

Bob Rose of the U.S. Fuel Cell Council noted that residential demand is high for stationary systems. Manufacturer activity continues, and there has been recent patent activity in methane, propane, and natural gas fuels for applications in the residential sector.

To the Fuel Cells Summit Community

To download the entire presentations and discussions from the recent Fuel Cells Summit V, visit <http://www.pnl.gov/fuelcells/summits.htm>. We have made every effort to ensure these documents are accurate. However, some information or statement may be misinterpreted. If you attended Summit V and wish to correct any error or omission, please email Bruce Kinzey of Pacific Northwest National Laboratory at Bruce.Kinzey@pnl.gov with proposed corrections.

To view the current table containing specific action items identified in the working group presentations, visit <http://www.pnl.gov/fuelcells/Summit5/actiontab.htm>. If you wish to get involved in any activity (including activities with responsible parties already identified), please email Bruce to state your interest.

We hope to see you at Summit VI!

Bruce Kinzey, (202) 646-5231