Hydrogen Road Tour Wraps Up

The Hydrogen Road Tour, a two-week trip across the U.S. organized by the U.S. Department of Transportation, U.S. Department of Energy, National Hydrogen Association (NHA), and California Fuel Cell Partnership (CaFCP), completed its ground-breaking run from Maine to California highlighting the progress made with the development of hydrogen vehicle and fueling technologies along the way.

Fuel cell and hydrogen-powered vehicles from General Motors, Toyota, Nissan, Honda, Hyundai-Kia, Volkswagen, BMW, Mercedes and Ford drove more than 20,000 miles through 31 cities and 18 states, with Linde North America and Air Products providing the hydrogen. The tour, which took place August 11-23, had many highlights during the trek, including tremendous local press in every area they stopped as well as two new hydrogen fueling station openings – one in Billerica, Massachusetts and the other in Rolla, Missouri – a first for either state.

Linde is supplying the gaseous hydrogen for the Rolla hydrogen station, located at Missouri University of Science and Technology’s E³ (E-cubed) Commons development. The Gas Technology Institute is also a partner. In Massachusetts, a Nuvera PowerTap™ onsite hydrogen generation system opened at Nuvera headquarters in Billerica.

Fuel Cells 2000 was at the Washington, DC stop on August 14th. The parade of vehicles pulled up in front of the U.S. Department of Energy (DOE) where the media and public waited to see and drive the cars firsthand. Under Secretary of Energy Clarence H. “Bud” Albright, Jr. gave a welcome speech followed by speakers from the Department of Transportation, the NHA and CaFCP. At other stops, similar events were planned with local officials, speakers and activities planned for spectators. All in all, the tour was a resounding success that will hopefully translate into more support and funding for fuel cells and hydrogen.
Fuel Cell Technician Training

So you think fuel cells are a fascinating technology, part of a growing alternative energy field that is with ripe with opportunity and you would like to become part of it. Or maybe you think this would be a great field for a relative or friend. So how do people develop the needed skills, and where do they go for training?

Fuel Cell Engineers work in research and development (R&D), designing fuel cell prototypes, performing system analysis, simulation and integration, and developing test methodologies. Entry level positions typically require a Bachelor of Science degree in Chemical or Mechanical Engineering. Senior fuel cell engineers, who assume lead positions in fuel cell testing and design, typically have advanced degrees. Although pursuing this level of education may seem daunting to some, those willing to devote their time to study are rewarded with an exciting and well-paying career. In fact, Smart Money magazine rated Fuel Cell Engineer as one of the Next Hot Jobs (June 2002)

However, those looking to spend less time in school, or to move into the workforce more quickly, can train as Fuel Cell Technician. Fuel cell technicians can be on the job in as little two years, or less, of training, working in research and development under the auspices of a fuel cell engineer, assembling and testing fuel cells. A technician can also obtain employment as a field service technician that services, maintains and troubleshoots fuel cell installations. An experienced fuel cell technician can assume more responsibility, managing projects, analyzing and reporting data, and recommending product design revisions to engineers.

As the need for skilled fuel cell technicians has grown, more and more community colleges are offering Fuel Cell Technician training programs leading to an Associate degree or a certificate. These are often located in states striving to become a hydrogen or fuel cell technology leader, who are facilitating the development of training programs through a collaboration of government, business, academia and non-profits to ensure that a knowledgeable workforce is ready to serve new fuel cell businesses located within their state borders. These Fuel Cell Technician training programs are offered in six states, at the following colleges:

Texas State Technical College, Waco (Waco, Texas) offers an Associate of Applied Science (A.A.S.) degree in Fuel Cell Technology, focusing on basic installation, maintenance, troubleshooting, and repair of fuel cells. Hands-on training is provided at the school’s Fuel Cell Laboratory which includes a fuel cell connected to the building electrical system, a fuel cell system connected with solar panels to serve as a back-up laboratory lighting system, a demonstration fuel cell with an electrolyzer, as well as several other fuel cells. Completion of the TSTC program will qualify a student for entry-level work as a fuel cell technician. This program was developed through the Texas Fuel Cell Technology Consortium, a group of Texas colleges with a shared interest in development of fuel cell curriculum.

Houston Community College, Northeast (Houston, Texas) has a Fuel Cell specialization certificate track through the Instrumentation and Controls Engineering Technology A.A.S. program. The curriculum focuses on basic concepts and principles of fuel cells, training students to work in industrial, institutional, or commercial transportation applications.

Stark State College of Technology (North Canton, Ohio) offers a Mechanical Engineering Technology A.A.S. program with an optional track in Fuel Cell Technology. A U.S. Department of Labor fuel cell technology scholarship is available to encourage students to enroll in the school’s program. The Fuel Cell Technology training program was developed through a grant from the National Science Foundation and was implemented through the Power Partnership for Ohio. In addition, the school has opened a Fuel Cell Prototyping Center and is working with its business tenants to develop training opportunities for students.

Hocking Technical College (Nelsonville, Ohio) recently developed two new fuel cell curricula—Alternative Energy Technology and Fuel Cells, and Automotive Hybrids and Fuel Cells—leading to an A.A.S. degree. Graduates of the two programs will be able to work as technicians that construct, install, troubleshoot, modify, and test fuel cell and other alternative energy-powered equipment or vehicles. Students gain real-life experience by working at a company or laboratory, and program students will receive further training at an alternative energy field station in the Bahamas. In addition, Hocking’s new Alternative Energy Center facility will be completed in Fall 2009, providing Energy Technology students additional hands-on learning experiences.

Fuel cell at TSTC in Waco, TX

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Naugatuck Valley Community College (Naugatuck, Connecticut) has a unique Fuel Cell Technology Certificate program that is offered absolutely free-of-charge! The one-semester program is funded by a Connecticut company, FuelCell Energy, who covers the costs of tuition, lab fees and books, and also provides a small stipend to students. Upon successful completion of the courses, graduates receive a job interview at FuelCell Energy’s Connecticut manufacturing facility, but there is no obligation to take a position with the company if employment is offered.

Midlands Technical College (Columbia, South Carolina) delivers fuel cell technician training through its two-semester Power Engineering and Delivery certificate, offered by the Engineering Technology Program. Coursework covers the fundamentals of power generation and alternate energy sources, including three phase power circuits, transmission lines, transformers, and fuel cells, and the associated systems. Midlands’ fuel cell laboratory opened in 2006 to offer basic fuel cell training, and two new laboratories - a fuel cell subsystems lab and a commercial-variety analytical testing lab – will be open within a year.

St. Paul College (St. Paul, Minnesota) offers a Fuel Cell Technician certificate to students that already possess a foundation in related fields by having completed one of the school’s related A.A.S. programs (electronics, electricity, energy production, energy systems, chemical laboratory technician). The four-course, 16 credit program includes coursework in fuel cell installation and operation, fuel data acquisition and analysis, and fuel cell product design and manufacturing. Although graduates of fuel cell technician training programs often start at entry-level positions, experienced technicians have the potential to advance to more senior-level technician positions. Or they can continue their education to become Fuel Cell Engineer. But no matter what level of training the student aspires to, the nation’s strong growth in green energy jobs makes a potential fuel cell career a desirable and exciting one. Check out the Fuel Cell Career and Education Center at www.fuelcells.org to start your future today. (SC)

Several universities offer specializations in hydrogen and fuel cell studies through their engineering programs. These include:

**Kettering University** (Flint, Michigan) - Kettering’s goal is to become a leader for the development of fuel cell systems and components and to provide highly educated and professionally trained graduates for the industry. The school’s Mechanical Engineering Program offers a Fuel Cell & Hybrids minor. Students in the program have the opportunity to work with faculty and graduate students on various research projects at Kettering’s Center for Fuel Cell Systems Integration.

The **University of Michigan** is developing three new hydrogen and fuel cell technology programs that include Hydrogen Technology concentrations for most Engineering B.S. degree programs, an Interdisciplinary Professional Program (InterPro) in Hydrogen Technology, and a continuing education certificate program in Fuel Cell Technology.

The **University of Central Florida’s Engineering Technology program** is also developing a Hydrogen and Fuel Cell Education concentration for B.S. students. The program will prepare graduates for research, development, and demonstration activities in government, industry, and academia. Courses will be offered both in class and on line.

**Fuel Cell Career and Education Center**

Fuel Cells 2000’s Fuel Cell Career and Education Center provides information along three separate areas of activity: Education, Employment Opportunities, and Professional Development - to service every stage of the job search - from laying the groundwork with a fuel cell-focused degree to training and workshops at the professional level. For students, we have both a map and a list of all the colleges and universities worldwide with fuel cell degrees, courses or research. We also have science experiments, internship information and resources for school projects and reports. For teachers, we have links to lesson plans, grants, fuel cell education kits and loads of free information to use in your classroom. For professionals and job seekers, we include articles, links to fuel cell companies’ employment pages, job search and recruiting sites. We also have links to technical training and networking groups.

Find out where the U.S. Presidential candidates stand on fuel cells and get involved at the local and state level to show your support for fuel cells. Check out our Grassroots webpage to find out how.
UTC Power Chalking Up Installations

A recent article in the magazine, Building Design, discusses the future use of fuel cells in new buildings, quoting an engineer working on five separate fuel cell projects in London as saying “Ten to 15 years from now, every single new building will be powered by fuel cells...It’s the magic bullet — until we get fusion power going.” As much as we may support that idea, it may be a little optimistic to predict all buildings will be powered by fuel cells, yet London has an aggressive plan to cut carbon emissions by 20 percent in new commercial buildings and fuel cells could help achieve that goal. Just last year, Ballard Power Systems and Plug Power sponsored a study outlining the role fuel cells can play in addressing the issues of greenhouse gas emissions and climate change and seems the idea is catching on.

Over here in the United States, UTC Power has racked up several significant high profile fuel cell installations with more coming down the pipeline. First came the big news that UTC Power was selected by the New York Power Authority (NYPA) to supply 12 fuel cells totaling 4.8 megawatts of power for the Freedom Tower and three other new towers under construction at the World Trade Center site in lower Manhattan. The fuel cells are set to be delivered in January 2009 and will constitute one of the largest fuel cell installations in the world.

The lions at the Bronx Zoo also have something to roar about. NYPA is planning to install another UTC 200-kW fuel cell in the Wildlife Conservation Society’s “Madagascar!” exhibit inside the restored historic Lion House. The fuel cell will operate in conjunction with the existing on-site Bronx Zoo power facility and the Con Edison power grid with the excess heat captured and used for heating the facility. The Lion House will be the first landmark building in New York City that will receive the U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) certification.

UTC is helping to bring spread the LEED movement into the supermarket market. Grocery stores use lots of power - lighting, air conditioning, refrigeration and freezer sections for various food items, etc. Price Chopper Supermarkets has broken ground on a new store in Colonie, New York, that will be the first LEED certified supermarket in the state. The new 69,000 square foot store and pharmacy is slated to open in Spring of 2009 and will incorporate a PureCell® Model 400 fuel cell. For this project, Price Chopper was able to take advantage of the New York State Energy Research Development Authority’s (NYSERDA) New Construction Program. This program offers technical assistance and funding to developers, architects, and engineers for the design and construction of high performance and green buildings. New York offers other tax credits as well.

The fuel cell will generate approximately 60 percent of the store’s power needs and will also be capable of providing 400kW of standby power if there’s a grid failure, enabling the store to operate without disruption.

For this project, UTC can draw on its experience in the grocery world – the company recently installed a 200-kW fuel cell at a brand-new 46,000-square-foot Whole Foods grocery store that was built in Glastonbury, Connecticut. That unit will be generating 50 percent of the electricity and heat and nearly 100 percent of the hot water needed to operate the store. It is configured for grid-independent operation and will also provide standby power if needed. Whole Foods took advantage of an Onsite Renewable Energy grant from the Connecticut Clean Energy Fund (CCEF) to help defray the fuel cell’s cost.

Over in East Hartford, Connecticut, Cabela’s, a retailer of hunting, fishing and sporting goods equipment, just finished installing four UTC 200-kW fuel cells in the area between its store and Pratt & Whitney Aircraft (part of the UTC family). This 650-acre area used to be an airport but is now home to both Cabela’s megastore and the state-owned Rentschler Field football stadium. The fuel cells will provide base load power for the whole store and for décor, were decorated with huge butterflies and flowers. The units cost about $850,000 each but Cabela’s estimates that they will save more than $60,000 per year on energy costs, after adding in savings from the fuel cells’ heat recovery.

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Overseas Automakers Showcase Vehicle Improvements

A recent report by the National Research Council entitled *Transitions to Alternative Transportation Technologies - A Focus on Hydrogen* estimates that two million fuel cell vehicles could be deployed on U.S. roads by 2020. This scenario also anticipates that the number could grow rapidly to 25 million fuel cell vehicles by 2030, leading to large reductions in both U.S. oil consumption and CO2 emissions.

The study also finds that fuel cell vehicles could be competitive with gas-powered engines in the U.S. by 2023. A Japanese government report anticipates the commercialization of fuel cell vehicles in that country will begin in 2015.

Auto manufacturers are already moving fuel cell vehicles into the hands of consumers, deploying the vehicles to regular customers in Japan and the U.S. through short-term leases. Performance information collected during these deployments is used by auto manufacturers to refine their fuel cell vehicle designs in the next generation models, increasing performance and durability while reducing component size and costs. Some of the latest "next generation" models include the Nissan X-Trail FCV, the Suzuki SX4-FCV and the Toyota FCHV-adv.

Suzuki, which has been developing fuel cell light duty vehicles with GM since 2001, just revealed its newest fuel cell fuel cell vehicle, the SX4-FCV. It is based on the company’s SX4 SUV, an update from Suzuki’s earlier fuel cell demonstrators (debuiting in 2003 and 2004) that had used the MR Wagon as its base. The SX4-FCV uses GM’s 80-kW fuel cell and a 70-MPa high-pressure hydrogen tank, attaining a maximum speed of 150km/h and a range of 250-km. The SX4-FCV has just been approved for road testing by Japan’s government.

Nissan’s updated 2008 model X-Trail FCV features a new 10,000 psi, high-pressure fuel tank that carries enough hydrogen to attain a driving range of 300 miles. The fuel cell-battery hybrid SUV uses Nissan’s own 90-kw fuel cell. It has been certified for road use in Japan and an X-Trail FCV has already been deployed to Kanagawa Toshi Kotsu Ltd. as a for-hire vehicle in their chauffeur-driven fleet.

Toyota’s latest model fuel cell vehicle, the FCHV-adv, employs a new 90-kW high performance fuel cell stack and new 70 Mpa high pressure tanks that deliver a driving range of about 830 km (more than 500 miles) on a single tank of hydrogen. This is more than double the range of the company’s previous FCHV. The improved fuel cell also allows for cold starts at temperatures as low as -30° C. The FCHV-adv attained certification by the Japanese government in June.

In addition, Renault debuted its brand new fuel cell car, the Scenic ZEV H2 in May. Based on the company’s Grand Scenic model, the fuel cell vehicle was developed as part of a joint project with Nissan. It features Nissan’s 90-kW fuel cell stack, a high-pressure hydrogen storage tank and a 25-kW lithium-ion battery for peak loads. The top speed is 100 miles per hour, with a range of around 150 miles.

Both the Renault Scenic ZEV H2 and the Nissan X-Trail FCV will featured this summer at several European environmental expos. (SC)

What About China?

One of the leading auto manufacturers in China, Shanghai Automotive Industry Corp. Group (SAIC), is working on the development of fuel cell vehicles along with fuel cell manufacturer, Shanghai Shen Li High Tech Co. Ltd. Three fuel cell vehicles have been developed using the popular Chao Yue vehicle which is based on Volkswagens’s Santana sedan. The latest model, the Chao Yue III, can attain a top speed of 110 km/h using Shen Li’s 60-kw fuel cell. The most recent development from the pairing, introduced in 2007, is the Shanghai fuel cell vehicle. 20 cars were deployed for the recent Beijing Olympics to shuttle VIP’s, athletes and visitors around the city. In November, Shanghai will be hosting the 2nd China International Hydrogen & Fuel Cell Expo from the 18th until the 20th, providing visitors with the opportunity to learn about other fuel cell activities in the country.
Are You a Fuel Cell Insider?

Fuel Cells 2000 recently launched the Fuel Cell Insider blog (www.fuelcellinsider.org), a new web log devoted entirely to fuel cells and related fuel. We created the blog to elevate the discourse about fuel cells and fight some of the critics out there as well as provide visitors an inside look into the industry. The main goal is to encourage discussion about the important role fuel cells play in the ongoing energy and climate change debate.

Since our launch on July 1, the blog has included opinion pieces, analyses and editorials from industry experts from around the world as well as a few snippets of our own interactions with fuel vehicles and media/outreach events. We want to help educate the general public, policymakers and media about fuel cells and the hydrogen infrastructure as well as also spotlight demonstrations and firsthand experiences with the technology.

Some of the recent posts include:

“When a Fuel Cell Isn’t a Fuel Cell” - a look at HHOs
“Don’t Flush Yet - Why Joe Romm is Wrong” - a rebuttal to an editorial trashing hydrogen storage projects by Joe Romm on Grist.

Fuel Cells 2000 will be continually updating the Fuel Cell Insider with new posts and resources and we need your support to keep it thriving. If you work in the fuel cell industry, your insight and expertise would be useful to answer readers’ questions or respond to negative comments. If you are just interested in fuel cells, we hope you will post words of support or any questions you might have about the technology or industry as a whole. The more active our blog is, the more visible it becomes to critics, supporters and other people poking around the web. If there is an area of research or fuel cell application that you want to see covered or can contribute an article on, please let us know at info@fuelcellinsider.org.

Reliability is one of fuel cells’ strongest selling points, besides low-to-zero emissions, so a lot of facilities that need quality power all the time are some of the best customers. Several hospitals already have fuel cells installed around the country and now UTC will be providing St. Helena Hospital in California’s Napa Valley with PureCell® Model 400 system next summer. The fuel cell will provide 400-kW of power to the 181-bed full-service community hospital with the waste heat being used to supply hot water and space heating for three of the hospital’s buildings. The fuel cell was partially funded by a grant from the California Self Generation Incentive Program (SGIP), run by the California Public Utilities Commission. SGIP provides rebates for purchases of advance power technologies and fuel cells qualify under both renewable and nonrenewable categories. The incentives ($4.50/Watt for renewable fuel cells, $2.50/Watt for non-renewable fuel cells) only apply to the first 3 MW of system output (5 MW maximum).

These installations will hopefully help raise the profile of fuel cell technology while reducing carbon emissions and increasing reliability at each location. To see what’s going on in your state, Fuel Cells 2000’s State Fuel Cell and Hydrogen database catalogues all state policy, incentives, grant programs and rebates.

New Vision Documents Released

The California Fuel Cell Partnership (CaFCP) has released its “Vision for Rollout of Fuel Cell Vehicles and Hydrogen Fuel Stations” which outlines the infrastructure needed to accommodate the thousands of fuel cell vehicles expected to be on the road in California by 2012, along with some ideas about how to deploy and pay for the fueling stations. The bottom line is that a phased transition is possible and affordable, but needs government support in the start-up phase.

The Fuel Cell Commercialization Conference of Japan has also released a vision document - a collective endorsement of a 2015 passenger vehicle “commercialization date.” The paper calls for a large demonstration of vehicles and infrastructure beginning in 2011, a date consistent with the anticipated second Learning Demonstration in the US and with the initial scale-up to meet California ZEV requirements.

You can read Bob Rose’s take on these reports on our Fuel Cell Insider blog.