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## **FUEL CELL CONNECTION – September 2006 Issue**

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## News on U.S. Government Fuel Cell Programs

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1. U.S. Army Takes Delivery of GM Fuel Cell Vehicle

The U.S. Army took delivery of a Chevrolet Equinox Fuel Cell Vehicle, an engineered prototype of the vehicle General Motors will use as part of its new 100-vehicle "Project Driveway," which seeks to place fuel cell vehicles with consumers in the United States. The Army's vehicle will be used for non-tactical transportation purposes, primarily on military bases in Virginia and California. The vehicle is powered by GM's fourth generation fuel cell propulsion system.

<http://media.gm.com/servlet/GatewayServlet?target=http://image.emerald.gm.com/gmnews/viewpressrelDetail.do?domain=2&docid=28809>

2. BNL Using Microbes to Generate Hydrogen

Researchers at Brookhaven National Laboratory are experimenting with *Thermotoga neapolitana* bacteria, which can generate large amounts of hydrogen gas when they are given a simple glucose feedstock at specific temperatures.

http://www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=06-93

3. NETL Testing Second SECA Prototype SOFC

Verification testing of a second prototype solid oxide fuel cell has begun at the National Energy Technology Laboratory. The Phase I unit, developed by FuelCell Energy and Versa Power Systems through the Solid-State Energy Conversion Alliance (SECA), uses natural gas to produce 3 kW peak power. http://www.ornl.gov/info/news/pulse/pulse_v217_06.htm

4. PNNL Presents Findings on New Hydrogen Storage Material

The Pacific Northwest National Laboratory presented findings on research into ammonia borane, which researchers say holds promise as a chemical compound to store and release hydrogen in fuel cell-powered vehicles. Experiments and calculations indicate that the material can remain stable for many days or longer in high temperatures.

<http://www.pnl.gov/news/release.asp?id=184>

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## RFP/Solicitation News

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5. NSF Grant Opportunity for Catalysis and Biocatalysis Research

The National Science Foundation is offering grants in support of fundamental and applied research on a variety of catalysis and biocatalysis topics, including: sustainability, environmental catalysis, and basic research related to green chemistry or utilization of biorenewable resources. Deadline for applications is October 2, 2006.

<http://www.grants.gov/search/search.do?mode=VIEW&oppld=10773>

6. Navy to Purchase Regenerative Fuel Cells

The Naval Air Warfare Center Weapons Division, China Lake (California) intends to purchase one or more hydrogen regenerative fuel cell systems that produce between 1 and 5 kW of power. The solicitation is expected to open on or about October 2, 2006, and will close 30 days later.

<http://www2.fbo.gov/spg/DON/NAVAIR/dept2/N6893606R0042/SynopsisP.html>

7. *Army Issues RFP for Desulfurization of JP8 for Fuel Cells*

The U.S. Army Life Cycle Management Command has issued an RFP for assessment of the feasibility of innovative approaches for desulfurizing JP8 fuel for use in fuel cell auxiliary power units. The closing date for the solicitation is October 13, 2006.

<http://www.fbo.gov/spg/USA/USAMC/DAAE07/W56HZV06R0859/SynopsisP.html>

8. *Ohio Third Frontier Fuel Cell Program Releases 2007 RFP*

Ohio's Third Frontier Fuel Cell Program has released its 2007 request for proposals, anticipating up to \$7 million in grants to be awarded for Research, Development and Commercialization Projects, and up to \$3 million for Market Readiness Demonstration Projects. Individual project awards will range from \$250,000 to \$1 million. Letters of intent are due October 12, 2006.

http://www.thirdfrontier.com/open_rfps.asp

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**Contract / Funding Awards**  
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9. *DOE Funds Six New Hydrogen Production Projects*

The Department of Energy has announced the selection of six projects to develop technologies to produce hydrogen. Projects focus on two different areas of interest: hydrogen production from coal; and demonstration of protocols for hydrogen or hythane mixtures and modifications to reciprocating ICEs for advanced engines. DOE will provide \$12.9 million toward the projects.

http://www.fossil.energy.gov/news/techlines/2006/06051-Hydrogen_Production_Projects.html

10. *USDA Awards \$17.5 Million in Grants for Renewable Energy, Energy Efficiency*

The U.S. Department of Agriculture has awarded \$17.5 million in grants through its Renewable Energy and Energy Efficiency Program. Eligible projects receiving grants include hydrogen from biomass or water via renewably-powered electrolysis.

<http://www.usda.gov/wps/portal/usdahome?contentidonly=true&contentid=2006/08/0329.xml>

11. *Pennsylvania Awards Funding for Hydrogen Demonstration Vehicles*

Pennsylvania's Ben Franklin Technology Development Authority – a state-funded network that fosters technological innovation – has awarded \$273,278 to the Pennsylvania Transportation Institute Hybrid and Hydrogen Vehicle Research Center at Penn State University for further development of a hydrogen bus, van and fuel cell vehicle to demonstrate a new hydrogen fueling station. <http://www.state.pa.us/papower/cwp/view.asp?A=11&Q=455738>

12. *Hartford Contracts with UTC Power for New England's First Fuel Cell Bus*

The Greater Hartford Transit District has contracted with UTC Power for a 40-foot hybrid electric fuel cell-powered transit bus that will be used in revenue service. The bus, supported by a \$2.9 million grant from the Federal Transit Administration, will utilize hydrogen from a refueling facility at UTC Power's headquarters in South Windsor, Connecticut.

http://www.utcpower.com/fs/com/bin/fs_com_Page/0,9235,04532,00.html

13. *ONR Awards Contract to SatCon for DC/DC Converter for Fuel Cells*

The Office of Naval Research has awarded a \$250,000 contract to SatCon Technology Corporation for the development of a Modular High Density Isolated DC/DC Converter for a fuel cell. The 100 kW fuel cell converter will be based on an advanced high voltage DC/DC capacitive charger developed for the U.S. Army Research Laboratory.

<http://investor.satcon.com/releasedetail.cfm?ReleaseID=209834>

14. Navy Awards Millennium Cell Phase I SBIR Contract

The U.S. Navy has awarded a Phase I Small Business Innovation Research Program contract to develop a novel, safe, high energy density hydrogen storage system for use in small, portable fuel cell-based power sources suitable for a variety of military applications.

<http://www.millenniumcell.com/fw/main/default.asp?DocID=92&reqid=907422>

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**Industry Headlines**  
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15. Jadoo Introduces Fuel Cell System for Emergency Responders

Jadoo Power Systems has introduced the XRT, a fuel cell system geared toward the emergency responders market. The XRT can be used for portable radio and laptop battery recharging as well as battery replacement for emergency lighting and satellite phones or modems. The system includes six n-Stor360 fuel canisters, which can provide up to 2200 Watt-hours of runtime.

http://jadoopower.com/pdfs/pdfs/Press%20Releases/2006_09-12_XRT.pdf

16. Millennium Cell Develops Fuel Cell-Powered Wireless Camera Prototype

Millennium Cell and Gecko Energy Technologies have developed a fuel cell-powered wireless camera prototype system with infrared sensing and audio capability. The device was shown at the Homeland Defense Conference at the U.S. Army's Picatinny Arsenal.

<http://millenniumcell.com/fw/main/default.asp?DocID=92&reqid=906278>

17. MTI Micro's Fuel Cell Exceeds LI-ION Battery Energy Density

MTI MicroFuel Cell announced it has developed a prototype fuel cell for the consumer market that exceeds the energy density of average lithium ion batteries. The prototype charger provides over 95 Watt-hours of continuous runtime.

http://www.newsandearnings.com/ViewFile.asp?ID1=21391&ID2=95935270&ssid=3&directory=4935&bm=0&filename=20060921_MTI_Micro_exceeds_Li-ion_battery.pdf

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**University Activities**  
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18. University Fuel Cell Roundup

(summaries contributed by Kathy Haq, Dir. of Outreach and Communications, National Fuel Cell Research Center, UC Irvine, khaq@nfcrc.uci.edu)

A series of computer simulations has identified a polymer material with a very large capacity for storing hydrogen that could be exploited in fuel cells. Jisoon Ihm and colleagues at Seoul National University in South Korea have discovered that polyacetylene with titanium atoms attached to the polymer chain can hold 63 kilograms of hydrogen per cubic meter — more than any other similar material in their survey. [24-Aug-2006, *PhysicsWeb*]

W.S. Winston Ho, a researcher at Ohio State University, received a two-year, \$1 million research grant from Shell Oil Co. to help expand hydrogen fuel cell technology. Ho is searching for a way to draw pure hydrogen out of waste from fossil fuels. The hope is that fuel cells could replace oil

and gas as the country's major energy source, said Shell President John Hofmeister, who visited the university to announce the gift. [25-Aug-2006, *The Columbus Dispatch*]

Georgia Institute of Technology researchers have conducted successful test flights of a hydrogen-powered unmanned aircraft believed to be the largest to fly on a proton exchange membrane fuel cell using compressed hydrogen. The fuel cell system that powers the 22-foot wingspan aircraft generates only 500 Watts. "That raises a lot of eyebrows," said Adam Broughton, a research engineer who is working on the project in Georgia Tech's Aerospace Systems Design Laboratory. "Five hundred watts is plenty of power for a light bulb, but not for the propulsion system of an aircraft this size." In fact, 500 Watts represents about 1/100th the power of a hybrid car like a Toyota Prius. A collaboration between ASDL and the Georgia Tech Research Institute, the project was spearheaded by David Parekh, GTRI's deputy director and founder of Georgia Tech's Center for Innovative Fuel Cell and Battery Technologies. In November, the researchers will present details of the project at the Society of Automotive Engineers' Power System Conference in New Orleans. [28-Aug-2006, *Georgia Institute of Technology*]

FCC Co. plans to join with researchers at Japan's Kyushu University with the aim of commercializing a new paper-like catalyst that can be used to generate hydrogen in fuel cells. A copper/zinc oxide-based methanol reforming catalyst is added to a matrix containing pulp fibers, ceramics, metals, glass, and polymer fibers. The resulting composite is produced as paper-thin films and sintered. In the autothermal reforming of alcohol to produce hydrogen, the new product enabled a 75 percent reduction in catalyst volume, and a 90 percent reduction of carbon monoxide concentration compared to commercial pellet catalysts. The reaction temperature was also lowered by 60 degrees Celsius. Ongoing research is aimed at the production of hydrogen via a carbon monoxide-free one-step reforming process. [30-Aug-2006, *Japan Chemical Week*]

The University of St. Andrews in Scotland has developed hydrogen-generation technology based on high-temperature electrolysis that it now wants to commercialize. It says the proton-conducting electrolyzer technology offers a "step-change reduction in the capital and operating costs." The technology comprises a steam electrolyzer based on a micro-electrolyte concept. The electrolyte is a proton-conducting thin solid film (10-50 microns) deposited on a redox-stable porous substrate. The assembly operates in the range of 400-600°C and at steam partial pressures of 0.1-10 atmospheres. [5-Sept-2006, *Aberdeen Press & Journal*]

Fraser Armstrong, a chemistry professor at Oxford University, believes that enzymes known as hydrogenases are more effective than platinum at converting hydrogen into electrons, but that the chemistry is not fully understood. So far he has managed to create a fuel cell in his laboratory capable of powering a wrist watch — but only for two days. Still, he hopes this might lead to bigger and better things. "If we can perfect this we might have an alternative to platinum," he told the annual meeting of the British Association for the Advancement of Science. [6-Sept-2006, *Reuters*]

Kettering University's dream to partner with Delphi Corp. to commercially produce fuel cells appears to be up in the air after the school failed to get an \$8 million state grant. "We're really not sure about our direction right now," said K. Joel Berry, director of Kettering's Fuel Cell Center. "I'm very surprised. (The proposal) seemed to meet the criteria of the program and supported the direction the state of Michigan wanted to go in establishing a national center of R&D (research and development) and alternative energy." Gov. Jennifer M. Granholm on Sept. 6 announced that 61 applicants will receive more than \$100 million from the 21st Century Jobs Fund, a 10-year, \$2 billion initiative designed to help diversify the state's economy. State officials say Kettering's project possibly could get funded in the future. An independent scientific board highly recommended 24 additional projects and recommended 50 others. State officials declined to reveal how Kettering was rated as they ponder how to allocate the next \$70 million that's available. [7-Sept-2006, *The Flint Journal*]

Scientists at the University of Illinois at Urbana-Champaign have designed and built ceramic micro-reactors for the on-site reforming of hydrocarbon fuels, such as propane, into hydrogen for use in fuel cells and other portable power sources. Applications include power supplies for small appliances and laptop computers, and on-site rechargers for battery packs used by the military. The research team includes Paul Kenis, a professor of chemical and biomolecular engineering, and two graduate students. Funding was provided by the U.S. Department of Defense, Army Research Office, National Science Foundation and the University of Illinois. [9-Sept-2006, *Technology News Daily*]

Chemistry Professor James McGrath of Virginia Tech has developed a proton exchange membrane, or PEM, material that retains conductivity even in low humidity settings. "Up to now, a lot of water has been needed to assist the proton transfer process," said McGrath. "But, in the desert, that is pretty inefficient." McGrath, Chemical Engineering Professor Don Baird and their students have demonstrated a method for creating a material with improved conductivity even at low humidity. [11-Sept-2006, *United Press International*]

Chemists at Arizona State University in Tempe have created a tiny hydrogen gas generator they say can be developed into a compact fuel cell package that can power electronic devices from three to five times longer than conventional batteries of the same size and weight. The generator uses a special solution containing borohydride, an alkaline compound that has an unusually high capacity for storing hydrogen. In laboratory studies, a prototype fuel cell made from this generator was used to provide sustained power to light bulbs, radios and DVD players, the researchers say. The study was led by Don Gervasio, an associate research professor at the Biodesign Institute's Center for Applied Nanobioscience at Arizona State University in Tempe. Funding for this study was provided by the National Science Foundation, the National Aeronautics and Space Administration and the Korean Institute of Technology. [12-Sept-2006, *American Chemical Society*]

Zhili Xiao, a physicist at Argonne National Laboratory and associate professor at Northern Illinois University, led the development of an ultra-fast hydrogen sensor that has been named one of the world's top 100 scientific and technological innovations of 2005. The distinction is presented in this month's *R&D Magazine*, which has put out the highly respected annual list since the 1960s. The sensor is the result of four years of research by a team, including Xiao, at Argonne. Through nanotechnology, the device can be made to be smaller than a grain of sand. Its purpose is to improve safety, by way of a shut-off valve, for future hydrogen-powered vehicles. The sensor also can be used in space stations, mining and medical devices, according to Argonne, which produced four other inventions on this year's top 100 list. [12-Sept-2006, *Chicago Daily Herald*]

Lisa Weiland, assistant professor of mechanical engineering, recently joined the faculty of The University of Pittsburgh's Gertrude E. and John M. Petersen Institute for NanoScience and Engineering. Weiland's nanoscale research is focused primarily on multiscale analysis and design of ionic polymers, which lately have received widespread attention for their application in fuel cell vehicles. Weiland's group is developing and experimentally validating an IP multiscale modeling method to first predict mechanical properties of known systems, but ultimately for use as a virtual material design tool. [18-Sept-06, *University of Pittsburgh*]

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**Administration**  
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Press releases and story ideas may be forwarded to Bernadette Geyer, editor, for consideration at [fuelcellconnection @ yahoo.com](mailto:fuelcellconnection@yahoo.com).

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## About *Fuel Cell Connection*

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The Sponsors

US Fuel Cell Council -- The US Fuel Cell Council is the business association for anyone seeking to foster the commercialization of fuel cells in the United States. Our membership includes producers of all types of fuel cells, as well as major suppliers and customers. The Council is member driven, with eight active Working Groups focusing on: Codes & Standards; Transportation; Power Generation; Portable Power; Stack Materials and Components; Sustainability; Government Affairs; and Education & Marketing. The Council provides its members with an opportunity to develop policies and directions for the fuel cell industry, and also gives every member the chance to benefit from one-on-one interaction with colleagues and opinion leaders important to the industry. Members also have access to exclusive data, studies, reports and analyses prepared by the Council, and access to the "Members Only" section of its web site. (<http://www.usfcc.com/>)

National Fuel Cell Research Center -- The mission of the NFCRC is to promote and support the genesis of a fuel cell industry by providing technological leadership within a vigorous program of research, development and demonstration. By serving as a locus for academic talent of the highest caliber and a non-profit site for the objective evaluation and improvement of industrial products, NFCRC's goal is to become a focal point for advancing fuel cell technology. By supporting industrial research and development, creating partnerships with State and Federal agencies, including the U.S. Department of Energy (DOE) and California Energy Commission (CEC), and overcoming key technical obstacles to fuel cell utilization, the NFCRC can become an invaluable technological incubator for the fuel cell industry. (<http://www.nfcrc.uci.edu/>)

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