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FUEL CELL CONNECTION – August 2006 Issue

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**News on U.S. Government Fuel Cell Programs**  
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1. Scientists Use Advanced Imaging to Watch Fuel Cells at Work

Scientists can now conduct detailed surveillance of water inside hydrogen fuel cells using a new and improved imaging instrument at the National Institute of Standards and Technology's Center for Neutron Research. The Neutron Imaging Facility can image water quantities smaller than 1 microgram, so researchers can watch water being produced and removed inside the fuel cell's structure. The facility is open to scientists from industry, universities and government agencies.
http://www.nist.gov/public_affairs/techbeat/tb2006_0817.htm#advanced

2. Energy Department Releases Proposed SBIR/STTR Solicitation Topics

The Department of Energy has released a list of proposed technical topics for its Small Business Innovation Research/Small Business Technology Transfer solicitation. Among topics of interest are several hydrogen and fuel cell-related topics. The solicitation is expected to be introduced in September 2006. <http://www.science.doe.gov/sbir/>

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**RFP/Solicitation News**  
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3. Greater Columbia Fuel Cell Challenge Issues RFP

The South Carolina Research Authority has issued a request for proposals for projects involving fuel cell research, demonstration and commercialization. The RFP was developed based on the Greater Columbia Fuel Cell Challenge, issued in March 2006. Letters of intent are requested by August 31, 2006, and final proposals are due by September 29, 2006. Funding per project depends on the topic. See the full solicitation for details.
http://www.fuelcellchallenge.com/client_resources/Fuel%20Cell%20Challenge%20RFP_final.pdf

4. PIER-NG Solicitation to Support Advanced Generation, CHP Systems

The California Energy Commission's "Public Interest Energy Research – Natural Gas" program released a solicitation to support research, development and demonstration to advance CHP systems that are closely integrated with "prime movers" – such as engines and turbines – in the range of 60 kilowatts to 10 megawatts. Total available funding is \$750,000 for an anticipated one or two projects. Deadline for applications is September 14, 2006.
http://www.energy.ca.gov/contracts/PIER-NG-adv-gen/2006-07-28_PIER-NG_ADV_GEN_PACKAGE.PDF

5. DOD SBIR/STTR Includes Hydrogen, Fuel Cell Topics

Regenerative fuel cells for airships and SOFC anodes are among topics of interest in the latest Department of Defense Small Business Innovation Research/Small Business Technology Transfer solicitation. Phase I awards are typically \$70,000 to \$100,000 in size for a six-to-nine month period. Deadline for proposals is October 13, 2006.
<http://www.acq.osd.mil/osbp/sbir/solicitations/sbir063/index.htm>

6. Energy Innovations Small Grant Program Announces Solicitation

The California Energy Commission's Energy Innovations Small Grant (EISG) program announced its latest solicitation to fund projects that determine the feasibility of energy research and

development concepts relating to the state's Public Interest Energy Research (PIER) Program. A maximum of \$95,000 is available for individual hardware projects requiring physical testing and \$50,000 for individual modeling projects. Approximately \$2.6 million is allocated per year for EISG grants. Deadline for applications is October 13, 2006.

<http://www.energy.ca.gov/contracts/smallgrant/index.html>

7. NYSERDA Issues PON for Hydrogen Transportation Development Program

The New York State Energy Research and Development Agency (NYSERDA) has issued a Program Opportunity Notice (PON 1082) in support of its Hydrogen Transportation Development Program, seeking projects involving development of hydrogen fueling stations and hydrogen Internal Combustion Engines. A total of \$5 million is available. Individual project awards will not exceed \$1 million. Proposals are due October 31, 2006.

<http://www.nyserda.org/Funding/funding.asp?i=2>

8. DOE Issues Loan Guarantee Solicitation for Innovative Energy Projects

The Department of Energy has issued a solicitation for its Loan Guarantee Program, seeking projects that employ innovative technologies in support of the advanced energy initiative. The total amount of funding available under this initiative is \$2 billion. Pre-applications are required and due by November 6, 2006. Qualified pre-applicants will be invited to submit a full application.

<http://www.lgprogram.energy.gov/Solicitationfinal.pdf>

9. DOE to Award \$250 Million for New Bioenergy Centers

The Department of Energy announced it will invest \$250 million to establish two new Bioenergy Research Centers to accelerate basic research on the development of cellulosic ethanol and other biofuels, including biologically produced hydrogen. \$25 million in first-year funding will be awarded in 2007 for the establishment of each center. Deadline for proposals is February 1, 2007.

<http://www.doegenomestolife.org/centers/>

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**Contract / Funding Awards**  
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10. \$116 Million in SBIR Awards Announced by DOE

The Department of Energy announced \$116 million in Small Business Innovation Research (SBIR) awards, including several projects to research and develop hydrogen and fuel cell technologies. Two microbial hydrogen production projects are among awardees of Phase I funding and two SOFC projects are among Phase II awardees.

<http://www.science.doe.gov/sbir/newweb/awards.htm>

11. USAF Awards Contract to UltraCell for Methanol Fuel Cell System

The U.S. Air Force Research Laboratory has awarded a contract to UltraCell Corporation for the delivery of its XX25™, a 25-watt reformed methanol fuel cell system for use as an airman power device. Delivery is scheduled for September 2006.

<http://www.ultracellpower.com/assets/pdf/UltraCell-Airforce.pdf>

12. \$1.4 Million Awarded for Study of Nuclear Production of Hydrogen

The Department of Energy has selected two projects to study the use of nuclear energy to produce hydrogen. The teams will be headed by Electric Transportation Applications and GE

Global Research. Both teams are partnered with DOE national laboratories and nuclear utility companies. <http://nuclear.gov/home/08-14-06.html>

13. ONR Awards \$2.5 Million Contract for Ship Service Fuel Cell Power Plant

The Office of Naval Research awarded \$2.5 million to FuelCell Energy for completion of a land-based demonstration of its ship service fuel cell power plant, and to begin design work for a next generation ship-based prototype. The fuel cells would run on naval liquid fuels.

http://www.corporate-ir.net/ireye/ir_site.zhtml?ticker=FCEL&script=410&item_id=896271&layout=23

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**State Activities**  
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14. Connecticut's Project 100 Bid Deadline Extended

The Connecticut Clean Energy Fund's deadline for bids under Round II of Project 100 has been extended for a second time. The due date will be determined following the decision of the Department of Public Utility Control regarding long-term renewable energy contracts.

<http://www.ctcleanenergy.com/investment/Project100.html>

15. North America's First Solar/Hydrogen Home Nears Completion in NJ

North America's first solar/hydrogen home is scheduled to be completed in fall 2006, in Hopewell, New Jersey. The home uses solar power to meet immediate household requirements, and the excess power is used to convert water into hydrogen. The hydrogen can be used to generate electricity using a fuel cell when demand exceeds solar capacity, and can also be used to fuel hydrogen powered vehicles.

<http://media.prnewswire.com/en/jsp/latest.jsp?sessionId=3D58C5534EC35170F4B05BE8C4EA957B.tomcat2?resourceid=3271450&access=EH>

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**Industry Headlines**  
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16. General Atomics Contracts with Jadoo Power for Advanced Fuel Canister

General Atomics has awarded a contract to Jadoo Power for development of an advanced fuel canister for use with hydrogen fuel cells. The new canister uses Jadoo's N-Stor digital fuel interface with a chemical hydride derived from ammonia borane.

http://home.businesswire.com/portal/site/home/?epi_menuItemID=989a6827590d7dda9cdf6023a0908a0c&epi_menuID=c791260db682611740b28e347a808a0c&epi_baseMenuID=384979e8cc48c441ef0130f5c6908a0c&ndmViewId=news_view&newsLang=en&div=973078938&newsId=20060821005017

17. Protonex Introduces UAV Fuel Cell Power System

Protonex Technology Corporation is introducing its ProCore™ unmanned aerial vehicle (UAV) fuel cell propulsion system, which is geared toward the segment of military UAVs designed for surveillance, chemical-biological monitoring, border patrol, and other specialty missions. The system is being unveiled at Unmanned Systems North America, the largest unmanned systems symposium, August 29-31, 2006, in Orlando, Florida.

<http://www.protonex.com/08-23-06%20AUVSI.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 group at the Tokyo University of Science has developed a more efficient means of generating hydrogen from water via photocatalysts and visible light. By using a special pair of photocatalysts and adding a small amount of iron, the water can be completely dissociated, and hydrogen can be generated in quantities up to 10 times greater than current processes. The two photocatalysts are bismuth vanadate and strontium titanate with added rhodium. The strontium titanate is also surface-coated with ruthenium. When combined, the two photocatalysts can absorb light in wavelengths as great as 520 nanometers. Harnessing more of the light spectrum for the dissociation of water yields more hydrogen. The iron assists in the exchange of electrons, helping to completely dissociate the water molecules. [26-Jul-2006, *Asia Pulse* via FuelCellWorks.com]

Tareq Abu-Hamed of the University of Minnesota and colleagues at the Weizmann Institute of Science in Rehovot, Israel, are developing a fuel cell car that relies on hydrogen fuel generated from a tank of water. By reacting water with the element boron, their system produces hydrogen that can be burned in an internal combustion engine or fed to a fuel cell to generate electricity. "The aim is to produce the hydrogen on-board at a rate matching the demand of the car engine," says Abu-Hamed. "We want to use the boron to save transporting and storing the hydrogen." The only by-product is boron oxide, which can be removed from the car, turned back into boron, and used again. What's more, Abu-Hamed envisions doing this in a solar-powered plant that is completely emission-free. [30-Jul-2006, *New Scientist* via FuelCellWorks.com]

Bruce E. Logan, professor of environmental engineering and director of the Penn State Hydrogen Energy Center & Engineering Environmental Institute, announced development of a teacup-sized microbial fuel cell in the July 19 edition of *Energy & Fuels*, an American Chemical Society journal. The fuel cell uses common bacteria to turn corn stover, under pressure, immediately into an electrical current. The bacteria digest plain sugars, producing protons and electrons, the latter of which are captured and turned into electrical current. Logan, Yi Zuo and Pin-Ching Maness in Penn State's Department of Civil and Environmental Engineering, completed the research and produced the study under grants from the National Science Foundation and the U.S. Department of Agriculture. To date, the research team has created a fuel cell that produces enough electricity to run a small fan. [2-Aug-2006, *Pittsburgh Post-Gazette* (Pennsylvania)]

Crijn Bouman, an industrial design engineering graduate from Delft University of Technology in Holland, has designed and built a working prototype of a hydrogen-powered scooter. It has an electric in-wheel motor that derives its power from a lithium ion battery. This is charged—mainly when the scooter is stationary—by a compact fuel cell system. The Fhybrid is said to have performed better than petrol-powered scooters during test drives. It has a top speed of 40 mph (65 kmph), fast acceleration and can travel about 125 miles (200 km) on a full tank. The scooter is designed to be hydrogen-powered, but the prototype is powered by batteries with a fuel cell simulator. Its complete drive system and energy management system were built by Epyon—a TU Delft spin-off, of which Bouman is a founder—and the Delft Design Institute. [7-Aug-2006, *The Engineer*]

A research team led by Professor Ihm Ji-soon of Seoul National University's School of Physics and Astronomy has developed a new compound that can store hydrogen not as a gas or a liquid, but as a solid. The material consists of titanium attached to polyacetylene, an organic polymer

formed by a series of acetylene molecules linking together. Several titanium atoms bind at regular intervals along the polyacetylene molecules and form highly stable bonds. The team developed the material using a supercomputer that simulates reactions and calculates energy changes within the given parameters. The new material developed by Ihm's team has a potential hydrogen storing capacity that exceeds the U.S. Department of Energy's goal set for 2010 by 25 percent. "This material binds hydrogen with absolutely no energy input, and the hydrogen can then be extracted using relatively small amounts of energy," said Lee Hoon-kyung, a Ph.D. student who played a major part in Ihm's research. The material developed by Ihm and his team needs to undergo more research before it is used on an industrial scale. [15-Aug-2006, *The Korea Herald*]

ITM Power, based in Saffron Walden in England, announced a joint development program with the University of Hertfordshire to develop a cost-saving electrolyzer refueling system for use in fuel cell cars. ITM will own all intellectual property rights including any new discoveries made during the course of the program. Producing hydrogen from existing electrolyzers costs about \$2,000 per kilowatt, according to ITM. The U.S. Department of Energy's 2010 target is \$300 per kilowatt for an electrolyzer stack. ITM Power says it has achieved costs as low as \$164 per kilowatt. *Automotive News Europe* says the breakthrough comes from eliminating expensive platinum from the ITM Power system's electrodes, and from using a liquid form polymer rather than conventional proton exchange membrane. [18-Aug-2006, *Auto Industry* (UK) Web site]

Scientists at the Technical University of Denmark (DTU) have invented a technology that may be an important step toward the hydrogen economy: a hydrogen tablet that effectively stores hydrogen in an inexpensive and safe material. "Should you drive a car 600 kilometers using gaseous hydrogen at normal pressure, it would require a fuel tank with a size of nine cars. With our technology, the same amount of hydrogen can be stored in a normal gasoline tank," said Professor Claus Hviid Christensen of the DTU's chemistry department. "The hydrogen tablet is safe and inexpensive. In this respect it is different from most other hydrogen storage technologies. You can literally carry the material in your pocket without any kind of safety precaution. The reason is that the tablet consists solely of ammonia absorbed efficiently in sea-salt. Ammonia is produced by a combination of hydrogen with nitrogen from the surrounding air, and the DTU-tablet therefore contains large amounts of hydrogen. Within the tablet, hydrogen is stored as long as desired, and when hydrogen is needed, ammonia is released through a catalyst that decomposes it back to free hydrogen. When the tablet is empty, you merely give it a 'shot' of ammonia and it is ready for use again," he explained. [Technical University of Denmark]

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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 @ comcast.net](mailto:fuelcellconnection@comcast.net).

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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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