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FUEL CELL CONNECTION - February 2008 Issue

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News on U.S. Government Fuel Cell Programs

1. DOE Announces New Approach for FutureGen Program

The U.S. Department of Energy (DOE) has restructured the FutureGen Program's approach toward the development of coal-fed power plants that would produce electricity and hydrogen while sequestering carbon. Under the new approach, FutureGen will demonstrate cutting-edge carbon capture and storage (CCS) technology at multiple commercial-scale Integrated Gasification Combined Cycle (IGCC) clean coal power plants. DOE intends to provide funding for the addition of CCS technology to multiple IGCC plants expected to be operational by 2015.

http://www.fossil.energy.gov/news/techlines/2008/08003-DOE_Announces_Restructured_FutureG.html

2. Navy Conducts Successful Test of SOFC for UUVs

The U.S. Naval Undersea Warfare Center (NUWC) has completed successful tests of an SOFC stack from Versa Power, integrated with a compact fuel processor by InnovaTek. NUWC is exploring use of SOFCs to power Unmanned Undersea Vehicles (UUV). Tests, which simulated the fuel flow that an operational UUV would use, found the electrical efficiency of the stack to be 70 percent for the duration of the test run.

<http://cts.businesswire.com/ct/CT?id=ftfLIWd9aZbF2NXfwppam3Bd664=&newsLang=en&newsId=20080226005804&div=973078938>

3. Portable Fuel Cell Successfully Demonstrated Using Military Jet Fuel

A portable, 5-kW fuel cell system was successfully demonstrated running on hydrogen derived from JP-8 military fuel, thanks to a fuel desulfurization system and a fuel reforming system developed by researchers at Pacific Northwest National Laboratory (PNNL). Researchers are also extending the desulfurization technology for use with diesel fuel. The desulfurization system was developed with funding from the U.S. Army Tank Automotive Research, Development and Engineering Center. <http://www.pnl.gov/news/release.asp?id=282>

4. Navy to Demonstrate New Hydrogen Separation Membrane Assembly

The U.S. Naval Surface Warfare Center received a hydrogen separation membrane assembly from Power+Energy as a deliverable under a project funded by the Office of Naval Research. The Navy will install the system and use it to demonstrate the conversion of diesel fuel into high-purity hydrogen for use in a hydrogen fuel cell.

http://www.powerandenergy.com/news_documents/press_release_01-29-2008.html

5. PNNL Scientists Study Behavior of Oxygen on Titanium Oxide Surfaces

Scientists at the Pacific Northwest National Laboratory (PNNL) are studying the unexpected behavior of split oxygen atoms on titanium oxide surfaces. Titanium dioxide is being explored for

use in hydrogen production for “solar fuel cells.” According to PNNL researchers, when oxygen atoms are split on a titanium dioxide surface, one atom remains stationary while the other moves away from it, possibly with energy “partially stolen” from the stationary one. More research is needed to determine if the “extra mobility” plays a role in chemical reactions, and to understand how the reaction may have an effect on hydrogen generation.

<http://www.pnl.gov/news/release.asp?id=294>

6. JP-8 Fueled SOFC Delivered to CERDEC for Demonstration

As part of a \$2 million multi-phase program to develop advanced SOFC technology compatible with common military hydrocarbon fuels, NanoDynamics delivered a 50-watt SOFC – fueled by desulfurized synthetic JP-8 fuel – to the U.S. Army Communications-Electronics Research, Development and Engineering Center’s (CERDEC) Communications Electronics Command. The next unit to be delivered as part of the ongoing program is a 250-watt portable technology demonstrator, also fueled by desulfurized JP-8.

<http://www.nanodynamics.com/viewer.php?page=press&item=2>

7. PNNL Chemists Research Ways to Control Chemical Reactions

Chemists at Pacific Northwest National Laboratory (PNNL) are using hydrogen chloride and ammonia to investigate how electrons affect how the two react to form the product ammonium chloride. The researchers believe understanding how to control chemical reactions like this could help them get hydrogen out of solid state storage for use in hydrogen vehicles.

<http://www.pnl.gov/news/release.asp?id=298>

8. President Bush Commits \$2 Billion for New International Clean Energy Technology Fund

In his final State of the Union Address, President Bush committed \$2 billion over the next three years for a new international clean energy technology fund as a tool to help confront global climate change. The fund was first proposed by President Bush in September 2007 at the First Major Economies Meeting on Energy Security and Climate Change.

<http://www.whitehouse.gov/stateoftheunion/2008/initiatives/energy.html>

9. GAO Publishes Progress Report on Hydrogen Fuel Initiative

The U.S. Government Accountability Office (GAO) has published a report on the progress of the Hydrogen Fuel Initiative. GAO says that while DOE has made important progress and has involved stakeholders, DOE needs to update what it expects to achieve by its 2015 target, given R&D budget constraints that have led to the Department pushing back some of its interim target dates. The report also notes industry representatives’ concern that DOE has been emphasizing vehicle fuel cell technologies, leaving “little funding for stationary or portable technologies that potentially could be commercialized before vehicles.”

<http://www.gao.gov/docsearch/abstract.php?rptno=GAO-08-305>

10. Proceedings of Fuel Cell Pre-Solicitation Workshop Available Online

Proceedings and presentations are now available for the January 2008 Pre-Solicitation Workshop DOE held regarding a planned Fuel Cell Funding Opportunity Announcement (FOA). Input from the workshop and a related Request for Information will be used to assist DOE in the development of the FOA, with awards anticipated in FY2009.

http://www1.eere.energy.gov/hydrogenandfuelcells/wkshp_fuelcell_jan08.html

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**RFP/Solicitation News**  
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11. DOE Issues Quick-Turnaround RFI for New FutureGen Approach

DOE issued a quick-turnaround Request for Information (RFI) that seeks industry input on the costs and feasibility associated with building clean coal facilities to achieve the intended goals of the FutureGen program. Comments will be considered for the development of a future Funding Opportunity Announcement for projects to equip clean coal commercial power plants with carbon capture and storage (CCS) technology. The deadline for responses to the RFI is March 3, 2008.
http://www.fossil.energy.gov/programs/powersystems/futuregen/final_futuregen_rfi0108.pdf

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**Contract / Funding Awards**  
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12. U.S. Army Awards Contract to Protonex for Soldier-Borne Power

The U.S. Army Research Office (ARO) has awarded a \$389,325 contract to Protonex Technology Corporation for the development of a tailored, soldier-borne power manager. The system will enable the military to more efficiently use available energy sources including fuel cells, batteries, and solar for a wide range of applications.
http://www.protonex.com/1-22-08_PowerManager_ASALT_FINAL.pdf

13. FTA Funds Launch of Five Fuel Cell Bus Development Projects

Funding from the Federal Transit Administration (FTA) has resulted in five new fuel cell bus technology development projects in California. CALSTART, an advanced transportation technology organization, received the funding from FTA and secured contracts with companies and transit agencies for the state-based projects.
http://www.calstart.org/aboutus/nl_detail.php?id=101

14. TreadStone Receives Edison Innovation Grant and Technology Fellowship

TreadStone Technologies received a \$500,000 grant from the Edison Innovation R&D Fund and the New Jersey Commission on Science and Technology. The funding will support further development of the company's LiteCell fuel cell technology and its HydroOSP hydrogen processing system. http://www.treadstone-technologies.com/images/Edison_Innovation.pdf

15. Fuel Cell Project Receives Funding from Renewable Development Fund

Xcel Energy Renewable Development Fund awarded \$2.9 million in funding to the Energy & Environmental Research Center at the University of North Dakota for three bioenergy projects, including a project to test – in a fuel cell power system operated by IdaTech – methanol converted from sawdust residues. The sawdust residue will come from the Valley Forest Wood Products Company in Marcell, Minnesota.
http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=1239

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**State News**  
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16. Hawaii Signs Agreement to Increase Use of Clean Energy Technologies

The State of Hawaii signed a Memorandum of Understanding (MOU) with the U.S. Department of Energy to establish the Hawaii Clean Energy Initiative, designed to put Hawaii on a path to supply 70% of its energy needs using clean energy by 2030. <http://www.energy.gov/news/5902.htm>

17. Four New Minnesota Clean Energy Initiatives Announced

Four new clean energy initiatives in Minnesota are geared to move the state closer to its goal of having 25 percent of its energy come from renewable sources by 2025. The Clean Energy Technology Collaborative was created by executive order to develop a roadmap for advancement of green technologies. A separate executive order established the Minnesota Office of Energy Security within the state's Department of Commerce to coordinate state policy, programs and information related to clean energy and energy security. The Minnesota Local Renewable Energy Initiative, a program to be proposed during the 2008 state legislature session, would provide financial assistance for homes, farms and businesses looking to install certain renewable technologies. The Carbon Market Planning Authority, also to be proposed in the 2008 state legislature session, would be housed under the new Office of Energy Security, and would explore the potential for a carbon credit market.

<http://www.governor.state.mn.us/mediacenter/pressreleases/PROD008626.html>

18. LIPA Solicits Public Comments on Draft Energy Master Plan for 2008-2017

The Long Island Power Authority (LIPA) has released an outline of its draft Energy Master Plan for 2008-2017, which identifies 40 energy efficiency, power generation, repowering, transmission and renewable energy technologies (including fuel cell stacks) for evaluation. A series of public hearings are planned for March but not yet scheduled. Public comments on the Draft Outline will be accepted until one week after the last hearing.

<http://www.lipower.org/company/powering/energyplan08.html>

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**Regulatory News**  
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19. Comments Sought on Draft CSA Hydrogen Standards

CSA America is inviting interested parties to review and comment on a number of draft standards related to hydrogen fueling stations and hydrogen dispensing systems. Six of the HGV 4 series standards are still open for comments, but deadlines are approaching fast. March 5, 2008, is the deadline for the standards still open for comment. <https://review.csa.ca/opr/>

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**Industry News**  
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20. MTI Micro Unveils Prototype Fuel Cell Digital Camera

MTI MicroFuel Cells unveiled a new prototype digital camera that uses the company's Mobion® direct methanol fuel cell (DMFC) for power. The DMFC "camera-grip prototype" is similar to and works the same as a "battery-pack grip" for digital single-lens reflex cameras, but the fuel cell version provides twice as much energy as the battery-pack version.

<http://www.mtimicrofuelcells.com/news/article.asp?id=315>

21. Hyundai Unveils Fuel Cell Vehicle Concept at Chicago Auto Show

Hyundai unveiled its i-Blue Fuel Cell Electric Vehicle concept at the Chicago Auto Show. The i-Blue is powered by a 100-kW electric engine and a fuel cell stack. The fuel cell is fueled with compressed hydrogen stored in a 115-liter tank. The car is capable of going 370 miles between fuelings and features a maximum speed of more than 100 mph.

http://www.hyundainews.com/Auto_Show_News/Chicago_Auto_Show/i-Blue/Press_Release.asp

22. GM Premiers Fuel Cell SUVs at Oscars

General Motors premiered a fleet of Chevy Equinox Fuel Cell vehicles and GMC Yukon Hybrids at the 80th Annual Academy Awards. As part of its Project Driveway program, Chevrolet will provide Chevy Equinox Fuel Cell vehicles to major entertainment celebrities for everyday use. The vehicles have a top speed of about 100 mph and a range of 150 miles between fuelings.

<http://media.gm.com/servlet/GatewayServlet?target=http://image.emerald.gm.com/gmnews/viewpressreldetail.do?domain=2&docid=43412>

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**University Activities**  
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23. 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)

By genetically modifying a strain of E. coli, Thomas Wood, a professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, has "tweaked" a strain of the bacteria so that it produces substantial amounts of hydrogen. Specifically, Wood's strain produces 140 times more hydrogen than is created in a naturally occurring process, according to an article in the journal *Microbial Biotechnology*. [5-Feb-2008, *Space Daily*]

<http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1751-7915.2007.00003.x>

Millennium Cell Inc. announced Feb. 7 that it will test market its new LED light and device charger with help from the University of South Carolina's technology incubator and the university's School of Business. The test will be conducted by Gecko Energy Technologies, Inc., a Millennium Cell subsidiary, and is supported with funding from the Greater Columbia Fuel Cell Challenge, which is sponsored by the USC Columbia Fuel Cell Collaborative. The charger uses Millennium Cell's PowerSkin™ fuel cells and Hydrogen on Demand® fuel.

<http://www.millenniumcell.com/fw/main/default.asp?DocID=159®id=1105725>

The Toronto Star reported that the province of Ontario planned to award CAN\$15 million in grants to six "transformative" clean energy projects aimed at establishing Ontario as a leader in solar, hydrogen and conservation technologies. The projects include a CAN\$6 million initiative involving the use of a solid oxide fuel cell to supply low-emission power to a large building. Kingston-based Acumentics Canada, a U.S.-owned company comprised of employees from now-defunct Fuel Cell Technologies, will lead the project as part of a consortium of academic institutions, including Queen's University. [11-Feb-2008, *The Toronto Star*]

Michael Daly, a professor of pathology at the Uniformed Services University of the Health Sciences in Bethesda, Md., has identified manganese complexes in the bacterium *Deinococcus radiodurans* that resist the damaging effects of radiation. The primary goal of the research is to investigate biomaterials that protect military personnel from various environmental hazards, such as radiation exposure. Daly also is pursuing practical applications of *Deinococcus* manganese complexes in radiation sickness protection, fuel cells and sensor systems. "One can imagine fuel cells whose enzymatic properties can be turned on and off for storage, and biomaterials that can operate in the harsh environment of space," said Maj. Jennifer Gresham of Air Force Office of

Scientific Research, which funds Daly's research.

<http://www.globalsecurity.org/military/library/news/2008/02/mil-080214-afpn03.htm> [14-Feb-08]

Auto Business News reported on Feb. 15 that Morgan Car Company, a United Kingdom-based automaker, will unveil its LifeCar concept vehicle at the Geneva Motor Show scheduled to be held in March 2008. The vehicle design is based on the company's Aero 8 model. It operates on a hydrogen fuel cell drive train and covers a range of 200 miles. The vehicle is a collaborative effort involving various companies, including the Department for Trade and Industry, BOC, OSCar, Oxford University and Cranfield University.

A new process for catching gas from the environment and holding it indefinitely in molecular-sized containers has been developed by a team of University of Calgary researchers, who say it represents a novel method of gas storage that could yield benefits for capturing, storing and transporting gases more safely and efficiently. "These materials could help push forward the development of hydrogen fuel cells and the creation of filters to catch and store gases like CO₂ or hydrogen sulfide from industrial operations in Alberta," said Professor David Cramb. [15-Feb-2008, *Biotech Business Week*]

<http://www.nature.com/nmat/journal/v7/n3/full/nmat2101.html>

Researchers at The Pennsylvania State University have a proof-of-concept device that uses sunlight to split water and produce recoverable hydrogen. "This is a proof-of-concept system that is very inefficient. But ultimately, catalytic systems with 10 to 15 percent solar conversion efficiency might be achievable," said Thomas E. Mallouk, the DuPont Professor of Materials Chemistry and Physics. "If this could be realized, water photolysis would provide a clean source of hydrogen fuel from water and sunlight." Mallouk and W. Justin Youngblood, postdoctoral fellow in chemistry, together with collaborators at Arizona State University, developed a catalyst system that, combined with a dye, can mimic the electron transfer and water oxidation processes that occur in plants during photosynthesis. They reported the results of their experiments earlier this month at the annual meeting of the American Association for the Advancement of Science in Boston. <http://live.psu.edu/story/28853> [18-Feb-2008]

Purdue University engineers have developed a new aluminum-rich alloy that produces hydrogen by splitting water and is economically competitive with conventional fuels for transportation and power generation. The new alloy contains 95 percent aluminum and 5 percent of an alloy that is made of the metals gallium, indium and tin. Because the new alloy contains significantly less of the more expensive gallium than previous forms of the alloy, hydrogen can be produced less expensively, said Jerry Woodall, a distinguished professor of electrical and computer engineering at Purdue who invented the process.

<http://news.uns.purdue.edu/x/2008a/080219WoodallAluminum.html> [19-Feb-2008]

A video describing how the hydrogen-producing technology works is available online at <http://hydrogen.ecn.purdue.edu>

The government of India plans to set up a National Hydrogen Energy and Fuel Cell Center that will work with academic research organizations and public and private sectors, especially the automobile industry. V Subramanian, secretary of the Union Ministry of New and Renewable Energy, said the center would be located at Gwalpahari near Gurgaon in Haryana and act as the national testing facility for hydrogen energy and fuel cell-based devices. He said the high-level National Hydrogen Energy Board, constituted by the center for accelerated development and commercialization of hydrogen energy and fuel cell technologies in the country, had drawn a road map to provide pathways for development of those technologies. India will install its first hydrogen station in New Delhi this year. [22-Feb-2008, *The Press Trust of India*]

A research team headed by Professor Masahiro Oshima of Kyoto University in conjunction with Mitsubishi Plastics has announced the development of a plastic sheet covered with minute, evenly sized holes measuring 40-500 nanometers in size. The holes are produced in the polypropylene fiber and rubber sheet by first having the rubber absorb supercritical pressure CO₂

gas. The individual molecules of the gas align themselves between the rubber molecules and when the pressure is lowered and heat applied the CO₂ vaporizes to create a myriad of minute, evenly sized holes. The size of the holes can be adjusted by changing heating conditions or the amount of super critical CO₂ gas absorbed by the rubber, etc. According to Masahiro, possible applications include its uses as an electrolytic membrane in fuel cells to improve their efficiency. [22-Feb-2008, *Financial Times Information*]

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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.

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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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