

# FUEL CELL QUARTERLY

## Funding Fuel Cells in the Classroom

There are a lot of fuel cell education kits on the market today, but for teachers with tight budgets, purchasing them for the classroom is wishful thinking. Luckily, there are several programs and grants that help provide materials and funding to support hydrogen and fuel cells in the classroom.

Many high profile companies have foundations or programs that award teachers with money and materials to supplement their lesson plans with fuel cell kits and curriculum. Toyota and the National Science Teachers Association have teamed up to run the Toyota TAPESTRY grant program, the largest K-12 science teacher grant program in the nation. Toyota TAPESTRY provides annual grants of up to \$10,000 each to fifty K-12 science teachers, as well as a minimum of 20 mini-grants of up to \$2,500 each for projects smaller in scope. These grants are awarded for creative, innovative classroom projects in the fields of environmental education, physical science, and literacy and science education.

Toshiba also has a foundation, the Toshiba America Foundation, which invests in science and mathematics education around the United States. A teacher in Streamwood, Illinois used his grant to purchase five fuel cells to study energy efficiency.

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To read complete newsletter, please go to [www.fuelcells.org/info/newsletter.html](http://www.fuelcells.org/info/newsletter.html)

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## Fuel Cells Step up When Power Goes Down

In the aftermath of Hurricane Katrina, electric power was unavailable to 2.7 million people. The disaster response was immediately hindered when essential services – hospitals, police, fire fighters, and emergency shelters – were unable to function due to lack of an adequate backup power supply. Traditional diesel generators could not meet energy expectations when the electric grid failed. Flooding and the conjoined destruction made refueling many generators next to impossible, compounding the crisis unfolding after the hurricane. To improve emergency preparedness and energy security in the future, reliable, efficient, durable independent backup power systems are needed to provide clean and uninterrupted electricity to essential services. A distributed generation system comprised of multiple energy inputs is the most effective means to secure sustainable power, and hydrogen fuel cells will play an important part in this process.

Fuel cells provide many benefits over traditional diesel generators. Their track record shows that fuel cells provide increased reliability and durability, essential for the harsh conditions of a natural disaster. Fuel cells exhibit more fuel efficiency as well, often utilizing the excess energy from the electric generation for heating purposes. Longer lifespan, low refueling and maintenance costs, not to mention nearly zero emissions make fuel cells an attractive and cost-effective backup power solution.

Fuel cells already have an impressive record during and after massive electric failures. UTC Power's PureCell™ 200 installed at the Central Park police station kept operating during the 2003 blackouts. A quarter of a million people in Germany experienced widespread power outages this past winter during a colossal ice storm, but the PureCell power output remained uninterrupted despite the

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BP's [A+ for Energy](#) has two programs – one in Texas and the other in California. These programs award up to \$1 million in grants to pre K-12 Texas teachers for innovative classroom, after-school, extra-curricular, or summer activities focused on energy and/or energy conservation. Grants of \$5,000 or \$10,000 are awarded directly to teachers and winning teachers also receive a scholarship to attend a three-day energy training conference hosted by the [National Energy Education Development \(NEED\)](#) Project. In Houston, Texas, 93 teachers in 69 schools received funding, and many purchased fuel cell car kits with the money. NEED also provides an Energy Kit valued at \$500 that includes helpful classroom tools and materials for teaching energy that are aligned to the Texas Essential Knowledge and Skills.

In addition to assisting with BP's program, NEED's website offers free downloadable materials to help educators teach fuel cells and hydrogen in middle school. They have [H<sub>2</sub> Educate Teacher](#) and [Student](#) Guides with an accompanying hands-on kit. The H<sub>2</sub> Educate program is supported by the U.S. Department of Energy's Hydrogen Program and the New York State Energy Research and Development Authority (NYSERDA).



Heliocentris FC car kit

In the Northwest, Bonneville Power Administration runs a very active program with funding from U.S. Department of Energy and the U.S. Department of Defense. The [Fuel Cell Education Program](#) was created to develop fuel cell curriculum and disseminate it through teacher workshops in the state of Washington. Since then, the workshops have expanded into California and Oregon and so far, two hundred Washington, 60 Oregon and 42 California science teachers received training, a [fuel cell curriculum](#) and car kit targeted at 9th – 12th grade science classes. The small car uses a photovoltaic module and a reversible PEM fuel cell to generate hydrogen, and the kit includes eight hands-on experiments.

The National Renewable Energy Laboratory located in Golden, Colorado, hosts the U.S. Department of Energy's Junior Solar Sprint/Hydrogen Fuel Cell (JSS/HFC) Car Competitions. Middle School teams from the area build solar and/or hydrogen fuel cell cars to compete in race and design categories.

The primary goal of the JSS/HFC program, as with all of these programs, is to spark enthusiasm for science and engineering in young students. By helping teachers with funding, materials and contests, it allows for more interactive lessons and deeper understanding of renewable and energy efficient technologies. This leads to greater outreach with the students talking to parents about what they learned and also steers young people towards technical careers which boost the industry.

For Fuel Cells 2000's list of teacher and student resources, please visit our [Fuel Cell Career and Education Center](#). (JG)

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harsh conditions. ReliOn installed their Independence 1000 fuel cell backup power system in the Bahamas and it successfully provided power following a massive Category 4 Hurricane. Several high schools around the United States have fuel cells installed and are doubling as emergency shelters because there is always power when needed.

Other companies feature backup power systems of various outputs. Plug Power, Inc.'s GenCore 5 kW systems cater to the needs of telecommunication companies that completely depend on reliable interruptible power supplies. IdaTech LLC introduced its ElectraGen 3 kW backup power system for telecommunication electricity needs as well. Ballard Power Systems, Inc., Hydrogenics Corporation, and Ceramic Fuel Cells Limited are also currently providing commercial backup power solutions.



Idatech's ElectraGen

For more information please refer to the Energy Security and Emergency Preparedness report by the Clean Energy Group: [http://www.cleanenergystates.org/library/Reports/CEG\\_Clean\\_Energy\\_Security\\_Oct05.pdf](http://www.cleanenergystates.org/library/Reports/CEG_Clean_Energy_Security_Oct05.pdf). It outlines crucial areas of energy vulnerability, government agencies employing clean energy backup solutions including fuel cells, and policy recommendations for legislators to move emergency preparedness into a more sustainable and reliable direction. Fuel Cells 2000 also has a comprehensive, searchable database of stationary fuel cell installations at <http://www.fuelcells.org/info/databasefront.html>. (RM)

## New Hydrogen Stations Open Around Country

Six new hydrogen refueling stations were opened in the US so far this year.

Five of the six stations are located in Southern California, and include four openings in January 2006 (Burbank, Ontario, Riverside and Santa Ana) with a Santa Monica station opening in June. The hydrogen stations are part of the South Coast Air Quality Management District's (SQAQMD) "5 Cities Project" to demonstrate five hydrogen-fueled Toyota Priuses per city for a period of five years.



Riverside Hydrogen station

The modified Priuses can be fueled with up to 1.6 kilograms of compressed hydrogen fuel instead of gasoline, qualifying them as Super Ultra Low Emission Vehicles by virtue of the fact that they produce no carbon monoxide, carbon dioxide or hydrocarbon emissions. Each modified Prius has a driving range of up to 80 miles between refuelings, and stations will be capable of filling up to 10 of the city-operated hydrogen vehicles per day.

The SQAQMD stations are part of the California Fuel Cell Partnership's (CaFCP) vehicle and fueling infrastructure demonstration program of fuel cell vehicles under real day-to-day driving conditions. The stations also support California's Hydrogen Highway Initiative to develop a hydrogen infrastructure in the state, which envisions 250 hydrogen fueling stations and 20,000 hydrogen-fueled vehicles. These new openings bring California's total number of hydrogen refueling stations to 22, the most yet of any state.

The sixth new hydrogen station is located in Columbus, Ohio, and is the first hydrogen station in that state. Located at Ohio State University (OSU) and built by the university's Center for Automotive Research, the hydrogen station will support a hydrogen-powered Ford Focus to be loaned to the university during Summer 2006. The demonstration program was developed and funded through a partnership between OSU and Honda, with additional funding provided by the state's Third Frontier Project. The station debuted in May 2006.

Additionally, both public and privately-operated stations are operable in Arizona, Connecticut, the District of Columbia, Hawaii, Indiana, Michigan, Nevada, New York, North Carolina, and Pennsylvania. Check out Fuel Cells 2000's Hydrogen Fueling Station chart at <http://www.fuelcells.org/info/charts/h2fuelingstations.pdf>. (SC)

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## What Else is New...

### DOE Appoints Members of Hydrogen Technical Advisory Committee.

The Department of Energy has appointed 25 members of a new Hydrogen Technical Advisory Committee, which will advise DOE Secretary Samuel Bodman on issues related to the development of hydrogen and fuel cell technologies. The committee will give recommendations to the Secretary regarding DOE's programs, plans and activities, as well as safety, economic and environmental issues related to hydrogen.

<http://www.energy.gov/news/3758.htm>

### USFCC 6<sup>th</sup> Annual Congressional Fuel Cell Expo.

The U.S. Fuel Cell Council's 6<sup>th</sup> Annual Fuel Cell Congressional Expo will be held in the Cannon House Office Building in Washington, DC. on July 20, 2006. Fuel Cells 2000 will be there, as well as a fuel cell vehicle, lots of fuel cell developers, hydrogen suppliers and technology. If you are around the Washington, D.C. area, come by and say hello.

<http://www.usfcc.com>

**[The Bumpy Road to Hydrogen](#)** - a paper by Daniel Sperling and Joan Ogden, Institute of Transportation Studies, University of California, Davis. Presented at World Hydrogen Energy Conference, Lyon, France, June 15, 2006. The accompanying presentation can be found **[HERE](#)**.

Check out [www.fuelcells.org](http://www.fuelcells.org) for great fuel cell and hydrogen resources. We are currently developing a searchable database of State Fuel Cell and Hydrogen Policies and Demonstrations, so be on the look out. Also register for our free Fuel Cell Match Maker message board. It is a great place to go with questions, company announcements, collaboration or networking opportunities and job or resume postings. You can check it out at <http://www.fuelcells.org/dc/dcboard.php>.