Fuel Cells are a New York State of Mind

Home to Plug Power, a manufacturer of stationary and backup fuel cell systems, and close to Connecticut and other states active with fuel cell companies and research, New York has become a hotbed of fuel cell activity. Starting back in 1997 with an installation at 4 Times Square, New York has been leading the United States in stationary fuel cell installations.

Allied Business Intelligence (ABI) predicts that global stationary fuel cell cumulative shipments will rise to nearly 18,000 megawatts (MW) in 2013 from 55 MW in 2003. The early markets for stationary fuel cells are telecommunication backup centers and data centers, as well as wastewater treatment plants where fuel cells can use fuel “free of charge,” according to Stationary Fuel Cell Markets A Global Market Analysis, Growth Projections and Strategies, by ABI.

UTC Fuel Cells (UTC, formerly International Fuel Cells and ONSI) estimates that a typical fuel cell powered by anaerobic digester gas (ADG), a byproduct of wastewater treatment, generates about 1.6 million kilowatt-hours of electricity a year while releasing only 72 pounds of emissions into the environment. Compared to more than 41,000 pounds of pollutants from the average coal- or oil-fired plant, that is a drastic reduction.

New York has been on to that piece of information for years now. In 1997, the New York Power Authority (NYPA) installed a UTC fuel cell power plant at the Westchester County Wastewater Treatment Plant in Yonkers, making it the world’s first commercial fuel cell to use ADG to produce electricity. The Yonkers plant generates 17,400 square cubic feet (scf) of ADG a day. 70% of that ADG is used in boilers and engines and the other 30% (6,000 scf/hr) is flared. The fuel cell captures 3,000 scf/hr of flared ADG for power generation. The U.S. Environmental Protection Agency (EPA) measures the emissions of the fuel cell as Carbon Monoxide less than 1 parts per million (ppm); Sulfur Oxide less than 1 ppm; and Nitrous Oxides less than 0.37 ppm.

Because of the success of the Yonkers plant, NYPA purchased eight more fuel cell power plants from UTC in 2001, and installed them at four New York City Department of Environmental Protection (NYC DEP) wastewater treatment facilities in Brooklyn, Staten Island, the Bronx and Queens.

NYPA Projects
The North Central Bronx Hospital has a 200 kW UTC unit, mounted on a second-story rooftop at the hospital. The project demonstrates the suitability of fuel cell technology for mission-critical applications such as power in operating and...
emergencies, and for medical equipment and computers, places where no power outages can be afforded. The $640,000 fuel cell was financed and installed by NYPA and co-funded with a $200,000 grant from the U.S. Department of Energy (DOE).

Since April of 1999, the Central Park Police Precinct has had a UTC fuel cell providing electricity, and it has more than met expectations, operating at close to 98 percent availability, with minimal maintenance. The fuel cell also helps provide power to recharge four NYPA-supplied Honda electric patrol vehicles.

Organizational Effort
Other organizations are also helping to lead the fuel cell revolution in New York, such as the New York State Energy Research and Development Authority (NYSERDA), and the Long Island Power Authority (LIPA).

NYSERDA recently awarded $14.5 million to support 36 distributed generation (DG) and combined heat and power (CHP) projects throughout New York. Three natural gas and two propane-powered fuel cells manufactured by Plug Power will be tested at the Agway Energy Products Training Center in Syracuse, the Dormitory Authority headquarters in Albany, and the New Baltimore Service Area south of Albany. Also, the Wildlife Conservation Society (WCS) at the Bronx Zoo will install a UTC 200 kW natural gas powered CHP fuel cell during the renovation of its Old Lion House, to provide power and hot water. This would be the second fuel cell for the WCS, the first being at the New York Aquarium, installed in 2001. That unit supplies about 20 percent of the aquarium’s daily requirements. The fuel cell’s heat is used to preheat hot water for an aquarium boiler and support-system tanks.

New York Schools Showing How it’s Done
Natural gas-powered fuel cells are installed at numerous colleges and universities throughout New York. Hofstra University in Hempstead has three fuel cells, Farmingdale State University of New York (SUNY) also has three, SUNY Stony Brook, SUNY - College of Environmental Science and Forestry in Syracuse, Southampton College, Nassau Community College all have one, and Adelphi University weighs in with five fuel cell units. These 5 kW Plug Power CHP fuel cells provide electricity and heat on-site, and enable evaluation of the integration of fuel cells at the specific point of need.

The U.S. Merchant Marine Academy at Kings Point has three hydrogen powered fuel cells designed for back-up, uninterruptible power supply (UPS).

A UTC fuel cell system is operating at the computer center of the Onondaga-Cortland-Madison Board of Cooperative Educational Services (OCM BOCES), in upstate New York since 1997. OCM BOCES serves more than 100,000 students at 52 locations, and serves as the Internet gateway for the public schools, providing administrative support, data and payroll processing.

Strong Island
Long Island has more fuel cells installed than the entire United States combined right now. The Long Island Power Authority (LIPA) has been making great strides with the Clean Energy Initiative (CEI), a $355 million, ten-year project that encourages use of promote clean new electric generation technologies such as solar photovoltaics, wind turbines and fuel cells. Through this initiative, 75 fuel cells have been connected to the grid at LIPA’s West Babylon substation. This ‘microgrid’ could produce enough electricity to power about 100 average-sized homes over a twelve-month period. More fuel cells have been purchased and will be installed at the West Babylon site as well as in residential homes.

Farmingdale State University recently held “GlobalTech 2004: The Hydrogen Economy: Becoming Self-Sufficient in Energy - What Resources Do we Already Have? What Resources Must We Build?” where many speakers highlighted Long Islands’ commitment to renewable energy through solar, wind and fuel cells. Aside from its installed fuel cells, the university is home to the Center for Fuel Cell Development at the Institute for Research and Technology Transfer (IRTT) which has successfully developed new metal treated bipolar plates for PEM fuel cell power stacks.

UTC Fuel Cells sold seven fuel cell power plants to Verizon Communications to provide primary power to a critical call-routing center in Garden City. The 332,000 square-foot facility houses 1,000 employees and delivers local phone service to 40,000 Verizon customers. The fuel cells generate a combined 1.4 megawatts of electricity and provide primary electrical power for the facility. Verizon is very interested in fuel cells for back-up power to replace batteries at telecommunications towers, installing several Plug Power units in Ronkonkama and at the Albany Airport.

There are over 20 other units installed and running throughout New York. California may be the leader with transportation fuel cell demonstrations, but New York is definitely setting the pace with stationary installations. For the city that never sleeps, their power never has to.

For a complete listing of fuel cell installations in New York, go to http://www.fuelcells.org/info/maps.html#install.
Hydrogen Fueling Stations and the Fuel Cell Cars Who Love Them

Recently there have been many advancements with fuel cells and hydrogen with respect to transportation and fueling stations. $350 million in nationwide funding was recently awarded for science and research projects to help establish a hydrogen economy. The projects awarded involve 30 lead organizations and include over 100 partners and subcontractors that include academia, industry and Department of Energy (DOE) national laboratories.

California, Here We Come

Many states are trying to get involved in creating the hydrogen infrastructure, but California currently leads the U.S. in both vehicle demonstrations and hydrogen refueling stations. It is also home to the California Fuel Cell Partnership, which has car manufacturers, fuel cell developers and fuel suppliers all working together under one roof. Honda, which already has five FCX hydrogen fuel cell vehicles in Los Angeles, delivered two FCXs to San Francisco, to lease for one year for $500 a month, with an option for a second.

Recently, California governor Arnold Schwarzenegger announced the California Hydrogen Highways Network and signed an executive order creating a public and private partnership to build a hydrogen highway in the state by 2010. Up to $50 million has been awarded to California laboratories by DOE for the research and development of new hydrogen and fuel cell technologies that will help achieve the goal of an early network of 150 to 200 hydrogen-fueling stations.

One of the upcoming DOE-funded projects is led by Air Products and includes four automakers - Toyota, Honda, Nissan, and BMW. The rest of the team consists of ConocoPhillips, the National Fuel Cell Research Center at the University of California at Irvine, the University of California at Davis, and the California South Coast Air Quality Management District. The project aims to build up to 24 fueling station locations in five years using multiple approaches to producing hydrogen, including a fueling station located on a pipeline and mobile stations placed at existing retail gasoline stations. These fueling stations will produce hydrogen from both natural gas and renewable energy sources. Toyota, Honda and Nissan plan on providing up to 65 fuel cell vehicles to this project, and BMW will contribute up to 15 hydrogen-fueled internal combustion engine (ICE) vehicles.

Station Identification

To help increase the number of stations and vehicles in the state of California, ChevronTexaco is joining with the Alameda-Contra Costa (AC) Transit District to develop and construct a new hydrogen energy station in Oakland that will provide hydrogen for AC Transit’s future fleet of fuel cell-powered buses and light-duty vehicles. The station is scheduled for completion by August 2005 and will use small-scale, onsite steam reforming of natural gas to produce approximately 150 kilograms of hydrogen per day.

The Los Angeles International Airport (LAX) plans on opening the nation’s first compressed-hydrogen fueling station for public use. Praxair, Inc. will be designing, engineering, equipping, building and operating the $1.5-million, 600-square foot facility. Praxair is providing $550,000 of its own money, and will receive the additional funding from California’s South Coast Air Quality Management District, DOE and British Petroleum (BP).

Stuart Energy Systems Corporation has received an order for a small scale Stuart Energy Station for vehicle fueling (SES-f), which will be placed at the National Fuel Cell Research Centre (NFCRC) located at the University of California, Irvine. The SES-f will provide clean hydrogen fuel to the Toyota Fuel Cell Hybrid Vehicles (FCHV) managed by the NFCRC. (cont’d on page 4)
Ford Motor Company and BP plc are working together to place 30 hydrogen-powered vehicles on the road, with a network of fueling stations to support them – in Sacramento, California; Orlando, Florida; and Detroit, Michigan.

Other Places Fueling Up for Cars
DTE Energy, in Michigan, is planning on opening a Hydrogen Technology Park in the fall that will be capable of delivering 100,000 kilowatt-hours of electricity per year – enough to power a small office complex or about 20 homes – and meet the fueling needs of 3 passenger vehicles per day. DTE has selected a Stuart Energy SES-f to produce and deliver 30 Nm³/h of hydrogen at 5000 psi to vehicles.

DTE is also working with DaimlerChrysler, BP America and DOE on a demonstration project that will focus on the co-development of hydrogen fuel cell vehicles and a supporting hydrogen infrastructure. The project will test at least 20 DaimlerChrysler fuel cell vehicles in Michigan and California, among others.

In Washington, DC, Shell Hydrogen broke ground on its upcoming hydrogen fuelling station. Hydrogen pumps will be integrated into an existing retail outlet and will offer both gaseous and liquid hydrogen to a fleet of six General Motors fuel cell vehicles.


There are a lot of vehicle demonstration projects underway, and everyone is racing to build the stations to help keep the cars fueled. With the automakers, fuel providers, fuel cell companies and federal and state governments all working together, the hydrogen economy and fuel cell future may be sooner than we all think.

Industry Watch
Breakthrough Technologies Institute and the Department of Energy have released Fuel Cell Vehicle World Survey 2003 which can be downloaded for free at www.fuelcells.org and www.eere.energy.gov/hydrogenandfuelcells/.

Los Alamos National Laboratory (LANL) has created the Institute for Hydrogen and Fuel Cell Research (IHFCR) to address technical issues and create solutions for critical aspects of the hydrogen economy and fuel cell use. www.lanl.gov

A fuel cell produces electricity by harnessing the chemical reaction of oxygen and hydrogen. Inside the fuel cell, hydrogen combines with oxygen from the air to produce electricity, useful heat and pure water.