Fuel cell systems for the home take advantage of the heat created during the generation of electricity to provide hot water for sinks and baths.

Matsushita and Ebara are both developing fuel cell systems generating around 12 W, which meets the basic power demand of the average household. Their systems are designed to extract hydrogen from city gas, so both firms plan to market their products via gas utilities. Tokyo Gas Co. will begin sales in the greater metropolitan area in the first quarter of 2003, and Osaka Gas Co. will follow by March 2006.

The Ministry of Environment plans to cover one-third of the cost of household fuel cell systems after fiscal 2004. The subsidies will be handled by local municipalities.

**JCI Interior Designed for Electric Vehicles**

Johnson Controls Inc. has developed its 3E concept interior around the new demands of an electric car that draws its power from fuel cells.

The proposed passenger compartment will meet ergonomic, ergonomic, and environmental demands, said Keith Wendell, president of JCI's Plymouth, Michigan, automotive group.

Performance demands will differ, noted design group member Brian Dexter. Carmakers now use each sound-absorbing materials to deaden engine noise to the interior. A fuel cell vehicle, with nearly silent operation, will not need this extra, although road sound would be an issue.

"You won't need a layer of padding and fabric to absorb noise, making it easier to recycle," he said. When possible, these materials could be made from recycled feedstock, Dexter added.

**ValTech Receives CE Certification**

IdaTech has received CE (European Conformity) certification for its SW natural gas, combined heat and power, proton exchange membrane fuel cell system.

Currently there are no homal CE certification standards in place for fuel cell systems in this power range.
ternational Ltd. of Singapore; Methanex Corp. of Vancouver, Canada; and ROBRADY Design of Sarasota, Florida.

Engineers of the electric vehicle battery division of GP Batteries worked closely with Vectrix to develop a special NIMH battery for optimal performance in this hybrid scooter. Regenerative technology will allow battery recharging whenever the scooter is decelerating.

The Parker-designed and manufactured high-torque electric motor and controller accelerate from 0 to 50 km/hr in 3.6 seconds, a rate comparable to an equivalent weight gasoline-powered scooter. Performance characteristics include a top speed of greater than 100 km/hr, a range of over 250 km on a single charge, and a low center of gravity that enhances handling and cornering. The product's cost of ownership over four years is an estimated 26% less than a 400cc gasoline-powered scooter.

The consortium partners plan to commercialize the hybrid scooter's onboard 800W direct methanol fuel cell battery charging system. The scooter is expected to be commercially available in major metro areas in Europe, Asia, and the United States in 2006.

Amnvu Tests First Fuel Cell Ferry in SF Bay

After testing its 30-foot, 18-passenger, hydrogen-powered water taxi on the San Francisco Bay, Sacramento fuel cell maker Amnvu Inc. finalized paperwork to be the Bay Area Water Transit Authority's contractor for the world's first fuel cell-powered commuter ferry. With $2.6 million in federal grants, the WTA is building a 149-passenger ferry from San Francisco and Treasure Island by 2005.

Designed by John J. McMullen Associates Inc. of Hilton Head, South Carolina, the zero-emission double-decker ferry will be about 79 feet long, says Mary Cullnane, WTA's manager of marine engineering.

The ferry's fuel cell will be fed hydrogen via a metal hydride battery—a sponge-like metal that can absorb and store hydrogen. When the ferry is docked, the battery will be restocked with hydrogen via a tube. The fuel cell will be housed in a metal container on top of the boat near the pilot house, while the battery will be stored at the stern and doubles as ballast.

Amnvu's approach to the ferry project is to stack small fuel cell modules to create enough power for the boat. "Just like putting multiple batteries in a flashlight, we can build the 240kW power plant with 20 individual 12kW fuel cell stacks wired together," explains Rex Hodge, Amnvu's president and CEO. These modules enable the boat to keep running even if an individual fuel cell stack has a problem.

"But the new ferry will serve as a demonstration vehicle only," Cullnane says, "and will likely transport commuters only twice a day rather than on a regular, more frequent ferry schedule." She hopes that the public will support federal funding to build additional vessels.

RESEARCH AND DEVELOPMENT

Microbial Fuel Cell Cleans Wastewater

Penn State environmental engineers have shown that a microbial fuel cell (MFC) (shown on page 1) can generate electricity while cleaning the wastewater flushed down the drain or toilet.

Dr. Bruce E. Logan, the Kappe professor of environmental engineering and director of the project, says, "MFCs may represent a completely new approach to wastewater treatment. If power generation in these systems can be increased, MFC technology may provide a new method to offset wastewater treatment plant operating costs, making advanced wastewater treatment more affordable for both developing and industrialized nations."

The experiments have produced between 10 and 50mW of power per square meter of electrode surface or about 5% of the amount needed to run one mini-Christmas tree light, while removing up to 78% of organic matter as measured by biochemical oxygen demand (BOD).

The project is described in a paper, "Production of Electricity During Wastewater Treatment Using a Single Chamber Microbial Fuel Cell," released on-line and in Environmental Science and Technology. The authors are Dr. Hong Liu, postdoctoral researcher in environmental engineering; Ramamathan Ramnarayan, doctoral candidate in materials; and Logan.
Logan notes that in MFCs currently under investigation in other laboratories, various kinds of bacteria are typically added to the system. However, in the Penn State approach, no special bacteria are added. The naturally occurring bacteria in wastewater drive power production via a reaction that allows them to transport electrons from the cell surface to the anode. In addition, the oxidation that occurs in the interior of the bacterial cells lowers the biochemical oxygen demand, cleaning the water.

The current Penn State MFC is about 6 inches long and 2.5 inches in diameter. It contains eight anodes, composed of graphite, that are about 36 square inch of surface area to which the bacteria can adhere and pass electrons. The cathode is a carbon/platinum catalyst/proton exchange membrane fused to a plastic support tube.

Scientists Develop Prototype Hydrogen Reactor

The Tri-Valley Herald reports that researchers at the University of Minnesota have produced hydrogen from ethanol in a prototype fuel cell reactor small and efficient enough to be used at small homes and power cars. The reactor is two feet high and creates hydrogen from corn-based ethanol ("white lightning").

Researchers say the reactor will economically produce hydrogen from ethanol. They also believe that the technology could convert ethanol to hydrogen at fuel stations as hydrogen-based vehicles enter the mass market. This development holds economic potential for Midwest farmers, who are leaders in the production of corn-based ethanol.

Minnesotans envision people buying ethanol to power the small fuel cell in their basements. The cell could produce 1 kW of power, enough to power the average home during off-peak usage.

UPCOMING EVENTS

Call for Papers

Deadline: April 16
H2Expo, September 15-17, Hamburg Messe und Congress GmbH, Hamburg, Germany.
Submit abstract including title and contact information at www.h2expo.de.

Meetings and Symposia

April 7-9 – 6th China International Battery Fair, Beijing International Convention Center, Beijing, China.