

Sapporo, Hokkaido Proving research of stationary fuel cells

Estimated energy savings in the range of 20 - 30 percent at the test site of actual use by a family of five



The home in Sapporo that is one of the test sites. The fuel cell system is installed in the wooden hut in front.

* Utility power costs cut basically in half

The New Energy Foundation is promoting a project of proving research for stationary fuel. Based on the actual operation of prototype polymer electrolyte fuel cell (PEFC)



Left photo: The system, a quasi-commercial Model 2 that boasts a total efficiency of 93% (35% power generation efficiency and 58% waste heat recovery efficiency).

Right photo: The system was operated with the door open even in winter. The testing proved there were no problems even at temperatures down to minus 13 degrees.

systems in ordinary homes, the project was aimed at obtaining all sorts of data, and was under way at 31 test sites across the country as of October 2004. We paid a visit to one such site - a detached dwelling in the city of Sapporo, where the testing has been going on since December 2003. (Sapporo is located in the northern part of the Japanese archipelago, and is situated in a cold region where January temperatures average minus 4 degrees centigrade.) Mr. A, the head of the household, said he had learned of the request for test sites at his company and immediately responded to it.

Asked about the test, Mr. A made the following comments: "My wife was fairly interested, and we decided to do it. My thoughts about using the fuel cell? I don't have the feeling of actually using it; the supply of hot water and electricity is the same as usual, and we never even touch the system. But I am always surprised by the monthly electricity bill. As compared to last year, our charges have been only about half as high in almost every month. Although we are using a little more gas, the combined heat and power cost is much lower. Our family of five includes two teenaged daughters who frequently shower and use a lot of electricity. The overall cost reduction is therefore a big help."



The wooden hut also houses a 200-liter hot water tank and a computer for collecting data.

* No worries about freezing even at 13 degrees below zero

The system installed in Mr. A's home is a quasi-commercial Model 2 system manufactured by Ebara Ballard Corporation. Ranging from 300 watts to 1 kilowatt, its output can be adjusted in correspondence with the load. It achieves a high total energy efficiency of 93 percent. It produces almost no noise; its operation is so quiet, that even someone standing close to it might think it is off. This quiet is a big plus in cold regions, where heavy snowfalls will presumably motivate installation indoors in almost all cases.



Mr. Ryuichiro Goto, who is engaged in research in the fuel cell and hydrogen project group in the Technology Development Department of the Japan Gas Association as of October 2004.

"For the testing, however, we set the system up in a hut outdoors in order to investigate its resistance to cold," said Mr. Ryuichiro Goto of the Japan Gas Association, which was commissioned to do the research. "Even in the depths of winter, we kept the system running with the hut open. There was no problem even when the temperature dropped to 13 degrees below zero. We had been apprehensive about the pipes freezing up when the system was shut down, but we found this could be resolved with a built-in heater that stays in operation," he

continued.

The operation is completely automatic and follows the load of demand for power and heat at the time. The system supplies about 60 percent of the family's electricity and hot water. Thanks to the full-auto operation, the residents do not have to flip any switches themselves. In this mode of operation, the system is anticipated to bring a reduction of 20 - 30 percent on average in CO2 emissions, primary energy consumption, and yearly power and heat costs.

The key in this connection is the operating program. With the wrong program settings, the reduction effect reportedly may be almost totally lost.



Turn the faucet on, and out comes hot water (above). Turn the switch, and the lamp goes on (at left). Family members do not have to do anything with the system and are unaware of its existence in ordinary use.



* Importance of not starting the system up at night

Mr. Goto explained this area: "In putting the program together, we set values for several conditions. For example, the system starts up if the power load persists for a prescribed number of minutes, and it operates at a lower output if there is a certain amount of hot water in the tank even if the load remains. We acquire the necessary data by operating with the same program for at least half of a month. In any case, the bottom line is to avoid having the system start up any time from late at night to early in the morning. Waste results if the system is started up or repeatedly started and stopped at night, when the power load is low. The basic principle of fuel cell cogeneration is to generate power only when needed, and only in the amount needed."

Through the testing, it was confirmed that the fuel cell is a suitable system for power generation even in cold regions. In some regions, there was negligible demand for heat during the summer of 2004, which was hot enough to make cold tap water lukewarm.

In Hokkaido, which has a relatively stable demand for heat throughout the year, the system could be efficiently operated in any season. "Since the fuel cell system was installed in our home, our two daughters have become more interested in energy conservation and environmental problems, which now even come up in family conversations," said Mr. A.

Tomorrow's revolution in energy conservation could very well begin in the home. Residential-use fuel cell systems have the potential to ignite it.

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