

Living Off the Grid

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Photovoltaic cells top the roofs of the six smart houses in Rokkasho-mura. Families living in the smart houses each have a plug-in hybrid car which can be recharged at home.

One problem that is cited as an obstacle to the widespread adoption of renewable energy sources such as wind and solar power to generate electricity is the fact that the quantity of electricity generated by these sources is directly affected by weather conditions and other factors beyond anyone's control. A practical experiment aimed at overcoming this problem has been underway since September 2010 at Rokkasho-mura, a village that sits on the Pacific Ocean coast of Aomori Prefecture, in northern Honshu.

A beneficiary of strong winds year-round, Rokkasho-mura has been involved in the largest domestic effort at using wind power to generate electricity. Another reason that Rokkasho-mura was chosen as the site of the present experiment, one that would model a proposed environmentally friendly city to be built in the near future, is that its temperatures vary widely year-round, which would facilitate carrying out an experiment that envisions operating in environments that simulate a wide range of geo-

graphical regions.

Participants in the present experiment include Japan Wind Development, which is providing wind-powered electricity; Hitachi, which is in charge of photovoltaic systems as another source of electricity; Hitachi and Japan Wind Development jointly, in charge of building and managing the electrical supply/demand system; and, representing electricity users, Panasonic Electric Works, Toyota Motor and Eos Energy Management (Japan Wind Development Group), which are supplying HEMS (home energy management system), household appliances and plug-in hybrid cars to the experiment.

A total of six so-called smart houses have been built on the site where the experiment is being carried out in the North District of Obuchi Lake Town. These smart houses are equipped with a variety of technologies, including photovoltaic power generation panels, stationary batteries for household use, and heat pump operated hot water tanks, and are capable

of micromanaging information pertaining to household energy use. Families of employees of corporations participating in the project reside in these smart houses and go about their normal lives therein.

An experimental situation has been built here that is isolated from the external power grid: approximately 8 km of private distribution line has been laid between the Rokkasho-mura Futamata Wind Power Station, owned and operated by Japan Wind Development Group, and the site where the smart houses stand. The station is outfitted with 34 units of 1,500 KW windmills with a total capacity of 51,000 kW, and is equipped with large capacity NAS storage batteries of 34,000 kW. In addition, Hitachi provides a 100 kW photovoltaic power generation system.

"Nowhere else in the world has anyone attempted an experiment involving creating an enclosed area powered solely by renewable energies, and having people actually live in houses that are comprehensively outfitted with environmentally friendly technologies," says Atsushi Otsuka of EOS Energy Management, which is coordinating among the various participants. "This experimental facility has other features that can't be found anywhere else: large capacity NAS storage batteries, developed here in Japan, installed side by side with the wind power station, and technologies that maintain the



Touch panels in the smart houses help residents check and control how much electric power they are using.

electricity output while adjusting to demands via these batteries."

The present experiment will examine such factors as changes in electricity usage in different seasons and at different times of day on the one hand, and trends in electricity usage based on different family configurations, and will build a system that efficiently balances supply and demand of electricity. "Another factor that the experiment is set up to examine is how the electricity usage of each family is affected by information from electricity providers," Otsuka says. "For example, we will examine the changes in the amount of electricity each family uses in relation to changes in electricity prices. And later we will test electricity trading among smart houses to see what their potential is for balancing demand and supply."

