Preparation of Abstract for
2014 IERE-GDF SUEZ Brussels Workshop
"Energy at home"

HEMS Control Technology for Self-power Operating House in Disaster

TADAYOSHI KOSAKA[1], MASAHIRO WATANABE[1] KATSUHIRO MATSUDA[2] EITARO OMINE[3]

(*1)Hitachi, Ltd., Yokohama-shi, Japan.   (*2)Tohoku Electric Power Co., Inc., Sendai-shi, Japan.
(*3) Central Research Institute of Electric Power Industry, Komae-shi, Japan

Keywords: **HEMS, PCS, Self-operating, PV, Battery, Echonet**

Abstract

We developed the HEMS (Home Energy Management System) control technology to maintain daily life in house, even when the power black-out occurs by a disaster like a heavy earthquake. We classified consumer appliances as important or unimportant. And the HEMS can keep the power supply for the important appliances as priority, by means of PVs (Photovoltaic), batteries, and EVs (Electric Vehicle). If user had enough capacity of batteries, it can be achieved easily by controlling the power demand as SOC (State of Charge) of battery. But, in this time, the batteries are too expensive to introduce enough capacity to houses for the emergency use. So, our target is how to manage the energy flow to maintain the power supply for the important appliances by low capacity batteries and self-operating PVs. To achieve this system, we investigated some items below.

1) HEMS control technology that controls demand in house as self-operating PV generation was developed. We developed a test system that consisted of a controller, electric power meter, solar power meter, an infrared commander, controllable appliances, and controllable circuit breakers. When the HEMS recognized the solar power reduction, it sends a command to reduce the power of the lower priority appliances. HEMS can operate multi protocols, for example, the Eechonet Lite[1] protocol, the Modbus[2] on TCP/IP, and infrared protocols that depend on makers. We examined the continuity of test system in unstable solar radiation circumstance for few days.

2) To improve our HEMS control technology, a method of calculating accurate maximum generation power based on DC voltage and current in PCS (Power Conditioning Subsystem) was proposed. It can reduce fabricating costs for solar power meter. The new method's mean error rate is measured as 6.7 % by intensity data of solar radiation in summer, in winter, and in intermediate seasons, while that of conventional method with solar power meter is 10.5 %.

This work can be adopted not only for houses, but also for regional shelters, public halls, disaster prevention centers, commercial buildings, and gas stations.

*1)Echonet Lite is a registered trademark of the ECHONET CONSORTIUM.
*2)Modbus is a registered trademark of SCHNEIDER ELECTRIC USA, INC..
_____