

Effective application of ECO-Cutes (heat pump water heater) as a VPP energy resource

Nobuhisa Sakai

Senior research engineer, R&D Center, The Kansai Electric Power Co., Inc.
 Osaka, Japan

Keywords: VPP, ECO-Cutes, ECHONET Lite, weather forecast

Abstract

Now under the electricity system reform in Japan, self consumption of PV surplus power is expected to increase especially after 2019 when FIT purchase term begins to expire in large quantities, while problems of the influence on power systems operation arising from PV surplus power have explicitly begun surfacing. Load shedding using VPP is expected as a solution to these problems under such circumstances. Above all, ECO-Cutes (heat pump water heater) is expected to contribute as a VPP resource because its power consumption is relatively large and already popular all over Japan.

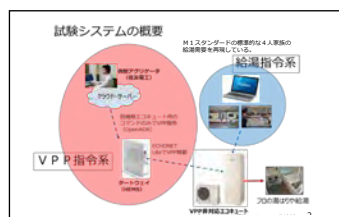
We conducted researches on the following two points with the aim of making the most use of ECO-Cutes as a VPP resource.

- (1) VPP control of existing ECO-Cutes conforming to older ECONET Lite standards not compatible with VPP
- (2) Optimum control of daytime start-up time of new ECO-Cutes reflecting weather forecast information

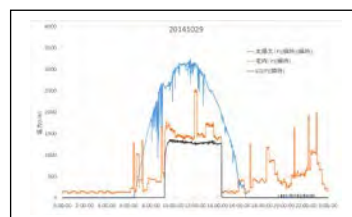
Regarding (1), ECO-Cutes conforming to the release I (announced in December, 2016) and later versions of the most popular HEMS protocol in Japan or ECHONET Lite are compatible with VPP, but existing ECO-Cutes corresponding to the older versions can't be utilized as a VPP resource under ordinary control although there as many as 530,000 such ECO-Cutes in Japan. We demonstrated that ECO-Cutes conforming to older versions can be controlled as a VPP resource as well as new ECO-Cutes through devising to combine control commands of older versions.

As for (2), we conducted field tests controlling daytime start-up time of ECO-Cutes reflecting solar radiation forecast information and demonstrated that purchased power can be reduced in order to reduce the influence of PV surplus power on the grid and to optimize in-house consumption of PV surplus power expected to increase after 2019.

Based on these results, we will proceed to study technical problems accompanying large scale commercialization of VPP and settlement system of VPP rewards using block chain in addition to more precise control of ECO-Cutes by domestic load prediction reflecting atmospheric and water temperature forecasts.



Testing System Scheme



daytime operation of ECO-Cute