

Opinion Paper on Basic Specifications for Smart Meter Communications Issued by TEPCO

Society for Smart Meter Study

Introduction from GEPR

GEPR is advancing smart grid research together with the Smart Meter Research Group (Chair: Norio Murakami) composed of private-sector opinion leaders. TEPCO has solicited opinions over its pending orders for smart meters, which will be in quantities of 3 million units for the current year, and 17 million units over the next five years. The written opinion of the Research Group is disclosed here. Readers with further views to this GEPR disclosure are encouraged to reply to info@gepr.org. Additional analysis associated with this opinion paper is [here](#) (Japanese).

Opinion on Basic Specifications for Smart Meter Communications

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Smart Meter Research Group

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Overview

This Society considers the specifications for smart meters that TEPCO is presently studying procurement under to have the following four drawbacks.

1. The specifications entrench the vertically integrated, regionally monopolistic structure currently in place for electric power, and run contrary to the direction of electric power reform set forth by the national government.
2. The smart meter is expected to assume a crucial position during a period when the power grid and telecom networks are converging. The current specifications, however, entertain no such developments, and above all lack interoperability with the Internet.
3. The telecommunications standards are proprietary TEPCO specifications with neither compatibility to other companies, nor consideration toward international standards. The situation confers the smart meter with a “Galapagos” spec that drives downward the competitiveness of Japanese electronics manufacturing and telecommunication industries.
4. Under national policy, the government plans to use the smart meter as a device for demand response (DR), but current specifications offer no DR feature.

1. Contrary to Liberalization of Electric Power

Policy that will enable new power generating businesses other than the electric power companies to enter the industry has been decided, but residential rates (subscriptions of 50 kW or less) are still regulated. In December last year, Yukio Edano, Minister of METI announced full liberalization, separation of power generation and power transmission, and review of the regional monopoly structure. The smart meter must be consistent with these reforms.

But the current TEPCO specifications present minimal functionality, where conventional manual metering is simply automated and data is transmitted every 30 minutes. Moreover, only TEPCO can exploit this data. If data is transmitted every 30 minutes, other power generation businesses cannot meet the reference standard of “supply of 30-minute average demand within a 3% error range.”

The rapid introduction schedule, furthermore, calls for finalizing the specifications in June, while prototypes have already been

built via orders placed to four companies. This situation is nothing more than maintaining exclusivity among the “family” of corporations to whom TEPCO has previously ordered meters on a negotiated contractual basis, making the international call for bids a formality, and thwarting the efforts of new entrants.

If a smart meter under the current specifications is installed to a residential account, the separation of power generation and transmission contemplated by the government will be impossible. In fact, without installing another new meter, no power generation business other than TEPCO will be able to enter the residential power market. The price of the TEPCO meter, furthermore, can be charged through mandatory inclusion in the electricity rates under the full cost principle. On the other hand, if a customer selects a new power generating business, or purchases a different meter singly or as a set with HEMS from an appliance store or HEMS business or as part of a smart home, the possibility of any proportionate refund from TEPCO upon returning its meter is completely unclear at the moment.

The low-tech design under proprietary technology articulated at this time suspiciously appears to protect the vertical integration and regional monopoly of TEPCO and to erect entry barriers to the liberalization of residential power.

2. No Consideration for Convergence of Power Grid and Telecom Networks

The nature of the smart grid, as the name indicates, provides for “smart,” efficient electric power management through the convergence of the power grid and telecom networks. By providing visualization of power consumption and interlinked control of electric devices, energy management is expected to become a center around which new industries can be expected to emerge. The smart meter comprises the fulcrum in this future scenario.

In February 2012, the Japan Smart Community Alliance (JSCA) comprised of public and private sectors established the HEMS (Home Energy Management System) task force and smart meter task force under the Smart House Standardization Study Group amidst a backdrop of the expectations noted above. The interfaces between smart meter and HEMS are under study. With respect to infrastructure and large-scale services in the U.S. and Europe, incidentally, the future scheme of society as a whole is envisioned in connection with the telecom infrastructure called the Internet of Things, and then design work proceeds atop this scheme.

Although the current specifications do indicate IP conformance for the interface between smart meter and HEMS (the so-called ‘B’ route), the communications protocol between TEPCO is proprietary, such as “Multi hop” (no TCP/IP implementation). This protocol is not open to telecom businesses, and also has no interoperability with existing networks. TEPCO, therefore, is apparently planning to construct a proprietary RF network and fiberoptic network.

Amidst a financial crisis where nationalization is essentially taking effect through massive public funding, TEPCO’s construction of a self-styled communication network in the Tokyo Metro where communication networks are already advanced is not only rash, but also a waste of tax money. The network specifications should comply with international standards in consultation with telecom businesses and electronics manufacturers, adopt existing common 3G or 4G networks, and relate to open standards for Internet connectivity.

3. Concerns toward Proprietary, “Galapagos” Standards

The crux of the issue is open standards that enable participation by many vendors. The U.S. has developed smart grid infrastructure known as AMI (Advanced Metering Infrastructure), and released SEP (Smart Energy Profile) 2.0, which assures interoperability among energy devices with standardization from the physical layer to the application layer. Integration between the power grid and telecom networks is anticipated in the future through products complying with such international standards.

In contrast, the TEPCO smart meter specifications and HEMS standard ECHONET Lite represent “Galapagos” standards with no international currency. Japanese electronics manufacturers may find themselves biting the dust amidst global competition, as experienced previously with mobile telephones. We must comply with international, open standards, and depart from insistence on “Rising Sun” standards and proprietary power-company standards.

4. Lack of Demand Control

As one of its purposes a smart meter can offer demand response (DR) under critical power supply conditions. In order to curtail power consumption particularly during mid-summer peak times and to circumvent scheduled outages, the government earmarked 30 billion yen of the third amended Fiscal 2011 budget for the promotion of BEMS and HEMS. The smart meter is a vital tool for DR, and must align with this fiscal policy. Yet the basic specifications currently provided lack consideration toward DR. The functions to be achieved in the smart meter cover the collection of 30-minute readings and remote activation and control, but not real-time data transmission or automated control of home appliances.

TEPCO apparently considers the control of demand every 30 minutes with time-banded rates as the achievement of DR, but the effectiveness seems questionable. In the U.S., the construction of telecommunications infrastructure to enable RTP (real-time pricing), near real-time metering of power consumption, and RTP information delivery is eyed, as well as the usage of BEMS and HEMS.

For effective DR that executes peak demand cuts, the premise (collection of 30-minute readings, accumulated 30-minute values of power used for HEMS interface) of the smart meter network currently contemplated by TEPCO is inadequate. At a minimum, 5-minute intervals for measuring power consumption and a network that can transmit such readings each time must be considered.

This type of specification is expected to receive opposing views, such as residential demand having low price elasticity and excessive performance requirements resulting in high cost. Once in the field, however, these smart meters will be in service for at least 10 years. Deployment under a low-tech, closed standard will impede any future modifications.

Although all of the functions noted above do not need to be immediately implemented, the smart meter's design needs to be open and flexible and appropriate for the Internet Age—extensible when new technology is developed in the future. There is no need to hurry the deployment of the low-tech meters called for now. The current specifications should be rescinded in favor of a full, top-to-bottom re-examination.