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KEN WACKS' PERSPECTIVES

The MCI Standard for Energy Management

By Ken Wacks

On July 26, 2013, the *New York Times* published an article, "On Rooftops, a Rival for Utilities," that portends the direction of electric power. Even though solar rooftop panels generate less than 1% of the power consumed in the United States now, the *Times* reported:

> For years, power companies have watched warily as solar panels have sprouted across the nation's rooftops. Now, in almost panicked tones, they are fighting hard to slow the spread.

Alarmed by what they say has become an existential threat to their business, utility companies are moving to roll back government incentives aimed at promoting solar energy and other renewable sources of power. At stake, the companies say, is nothing less than the future of the American electricity industry.

As hydraulic fracturing has begun to deliver new sources of fossil fuels, short-term energy prices have stabilized. Nevertheless, the growth of renewable sources will likely continue because of tax and rate incentives worldwide and concerns about greenhouse gas emissions. As I explained in the 2013 summer issue of *iHomes & Buildings*, the proliferation of renewables requires the adaptation of customer loads to supply fluctuations. The Department of Energy, with the technical guidance of the GridWise® Architecture Council, is developing Transactive Energy techniques that combine market and control methods to achieve grid balance.

For loads to participate in Transactive Energy, they need real-time communications with supplies and service providers on the grid. Device communications is provided by an electronic interface module embedded in end-devices or in controllers that manage such devices. The consumer electronics industry recently completed work on an American National Standard for a flexible, but practical, communications interface called the "Modular Communications Interface for Energy Management." I chaired the committee that developed this standard and will provide an overview in this article.

MCI objective

The Consumer Electronics Association (CEA) is authorized by the American National Standards Institute (ANSI) to develop standards for consumer electronics and home systems. In January 2013, the "Modular Communications Interface for Energy Management" was approved as both a CEA and ANSI standard. This standard is officially named ANSI/CEA-2045, and informally called the MCI standard. The specification document was published in February 2013 and is available for purchase at www.techstreet.com.

This standard specifies a modular communications interface (MCI) for energy management signals and messages to be exchanged among customer devices. These devices might include consumer products such as sensors, thermostats, and appliances; and energy-related equipment such as an energy management hub, an energy management controller, an energy management agent, a residential gateway, and an energy services interface. An Energy Management Agent is described in an international standard (ISO/IEC 15067-3) that was published in 2012 and illustrated in Figure 1.

Utilities worldwide are investing heavily in smart grid infrastructures to ensure a reliable supply of electricity and to accommodate new technologies for power production. Smart grid programs are being offered to consumers for energy conservation and for energy management to align demand for power with available supplies. Consumer devices equipped with ANSI/CEA-2045 interfaces can participate in energy management programs such as demand

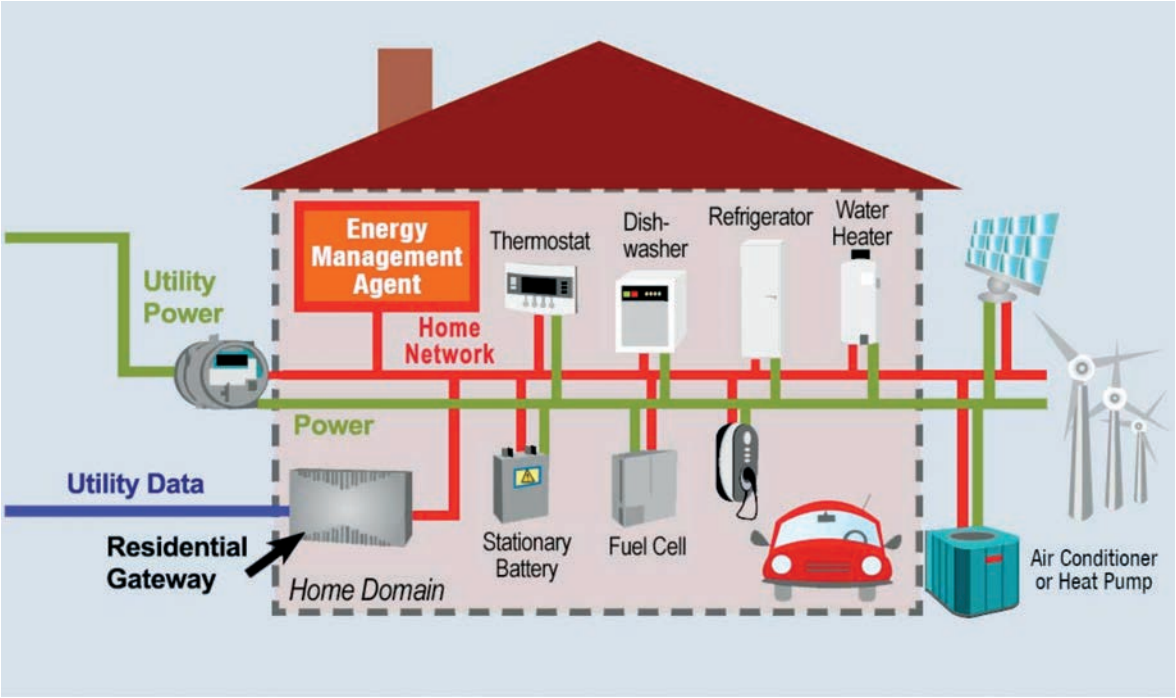

Figure 1 – Energy Management Agent

response and can interconnect with distributed energy resources including local generators (wind and solar) and energy storage devices.

What is MCI?

The MCI specifies a plug-in module that includes a physical wired connection into a residential device plus external communications. Communication links may be provided for power line carrier (PLC) and radio (RF), depending on the home area network installed or the connection to the access network of an energy-management service provider. The MCI plug-in module may be user-installable into a consumer product marketed as smart-grid ready. Figure 2 presents the plug-in MCI module for adapting the communications interface in a thermostat. Provision for an MCI in a new water heater is shown in Figure 3.

Two physical form factors are defined. One provides a low-voltage DC supply and a serial peripheral interface (SPI). This option might be attractive in cases where the end-device has no AC power source or when a smaller socket size is required. The second form factor provides AC service (120/240V) and an RS-485 serial interface. This option might apply where the end-device does not provide a DC power supply or where PLC communications is desired. For both form factors, the communication messages across the socket interface are the same.

The standard specifies a base and an intermediate message set for demand response. The MCI is also capable of simply passing through application messages from ClimateTalk, Echonet, generic IP (Internet Protocol), KNX, LonTalk, Open ADR, SEP, and USNAP between the communications module and the end-device. The choice of message set depends on the program offered by the energy and equipment suppliers. Message sets may be added to accommodate future protocols. This standard affords manufacturers, consumers, and service providers flexibility to select the best solution for the local environment.

MCI development

The CEA cooperated with a U.S. government smart-grid committee on the development of ANSI/CEA-2045. The need for this standard was identified by the Home-to-Grid Domain Expert Working Group (H2G DEWG), which I chair. The H2G DEWG was established in 2008 by the GridWise Architecture Council (U.S. Department of Energy) and the National Institute of Standards and Technology (U.S. Department of Commerce). We invited various organizations to present interface proposal for the

H2G DEWG. The Electric Power Research Institute (EPRI) and the USNAP (Universal Smart Network Access Port) Alliance offer similar concepts. At the suggestion of the H2G DEWG, they combined their specifications into one document, which was then reviewed in detail by the H2G DEWG members and offered to CEA for consideration as an American National Standard. The CEA R7 Home Networks Committee created the R7.8 committee to focus on MCI and appointed me as the chair.

MCI extensions

CEA R7.8 is now considering companion standards for smaller interface form factors and device profiles, including message sets, for:

- Thermostats
- Lighting control
- Distributed energy and storage resources
- Solar inverters
- Energy management controllers and agents
- User interface devices
- Stationary and portable appliances
- Sensors and actuators

Figure 2 – MCI Options for a Thermostat (Courtesy of Comverge)

Figure 3 – MCI Module for a Water Heater

MCI adoption

ANSI/CEA-2045 provides consumer electronics companies and appliance manufacturers with flexibility to adapt products for smart grids by reducing the risks and costs of using proprietary communication technologies. Manufacturers can focus on competitive product features and applications while incorporating standard interfaces. This approach should expedite product design and encourage product innovation, while facilitating energy management and conservation features in a wide range of consumer products. ●

Dr. Kenneth Wacks has been a pioneer in establishing the home systems industry. He advises manufacturers and utilities worldwide on business opportunities, network alternatives, and product development in home and building systems. In 2008, the United States Department of Energy appointed him to the GridWise Architecture Council. For further information, please contact Dr. Wacks at 781.662.6211; kenn@alum.mit.edu; www.kenwacks.com.