CEA Standard

Modular Communications Interface for Energy Management

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(Formulated under the cognizance of the CEA **R7.8 Modular Communication Interface for Energy Management Subcommittee**.)

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FOREWORD

This document was developed by the Consumer Electronics Association's R7.8 Modular Communications Interface for Energy Management subcommittee.

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Modular Communications Interface for Energy Management

1 Introduction

Utilities worldwide are investing heavily in smart grid infrastructure that extends to homes and businesses, with the goal of improving grid reliability and efficiency through increased consumer awareness and participation. High hopes abound for grid connected homes and buildings to be better prepared and more willing to react to changing grid conditions. But, how do we enable grid connectivity today and into the future, in the midst of an evolutionary wave of standards competition and innovation?

This standard provides a solution to this problem through a modular communications interface (MCI) enabling any product to connect to any type of demand response system (Advanced Meter Reading (AMI), Smart Energy Profile (SEP), OpenADR), and/or home or building network. The concept is simple; encourage manufacturers to build an MCI interface into their products that can accept a simple communications module. Consumers and program managers are then free to select whatever communication solution works best for their particular environment.

The concept is relatively straightforward. Utilizing the RS-485 and Serial Peripheral Interface (SPI)[1] supported by most silicon chips today, the MCI protocol is capable of simply passing through standard protocols including Internet Protocol (IP), OpenADR, and SEP from the communications module to the end-device. Network security is supported through the selected transport protocol, such as Wi-Fi, ZigBee, HomePlug, Z-Wave, LonWorks, etc., in addition to network or application layer security.

Communications messaging supported by this MCI standard supports direct load control, TOU, CPP, RTP, peak time rebates, all kinds of block rates, and a range of ancillary services. The functionality of the removable modules can be tailored by utilities or other load managing entities to provide support for the unique needs in a given region or service territory, without impacting the end-devices.

The CEA-2045 Modular Communications Interface for Energy Management standard will enable a new generation of "smart grid ready" products that limit risks and constraints of proprietary communications technologies and evolving standards. This approach simplifies Home Area Network (HAN) device and network interoperability, fosters program and product innovation, and opens DR programs to a broader range of consumer products while respecting customer choice and a competitive market landscape.

[1] See http://www.rs485.com/rs485spec.html and http://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus

2 Scope

This standard specifies a modular communications interface (MCI) to facilitate communications with residential devices for applications such as energy management. The MCI provides a standard interface for energy management signals and messages to reach devices. Such devices may include an energy management hub, an energy management controller, an energy management agent, a residential gateway, an energy services interface, a sensor, a thermostat, an appliance, or other consumer products.

The specific residential devices to use an MCI are not specified. For energy management the choice depends on the system and the network topology. If a hub topology is chosen, the MCI may be located on the hub. The connection between the hub and end devices such as appliances is not specified.

The MCI specifies a physical connection from a communication module to residential Smart Grid Devices and a communications protocol with OSI (Open System Interconnection) layer specifications including application layer messaging. An optional translation function is specified for connection to another communications medium. Examples include power line carrier or radio (RF), depending on the home area network installed or the connection to an energy management system access-network supplied by a service provider. This second medium is outside the scope of this standard. The MCI also specifies a pass-through mechanism through to allow for an alternate architecture in which the Smart Grid Device terminates the passed-through protocol (e.g., SEP, OpenADR, etc.).

CEA-2045 details the mechanical, electrical, and logical characteristics of a socket interface that allows communication devices (hereafter referred-to as UCMs – universal communication modules) to be separated from end devices (hereafter referred-to as SGDs – Smart Grid Devices). Although the potential applications of this technology are wide-ranging, it is intended at a minimum to provide a means by which residential products may be able to work with any load management system through user installable plug-in communication modules. Figure 1-1 illustrates the general concept.

Figure 2-1 – Illustrations of the Modular Communications Concept on a controlled device (left) or Energy Management Console (right)

CEA-2045 identifies the physical and data-link characteristics of the interface, along with certain higher-layer and application layer elements as needed to assure interoperability over a broad range of device capabilities. In addition, it defines a mechanism through which network, transport and application layer messages (pass-through; defined in other standards) may be passed across the interface.

The scope of this standard is limited to the socket interface between the UCM and the SGD. It does not address the technology or protocol associated with the communications system of which the UCM is part.

The scope of this specification does not include safety related construction, performance, marking or instruction requirements. UCM products should additionally comply with applicable product safety standard(s). Examples of such standards are noted in Informative Annex E.

2.1 References

2.1.1 Normative References

The following specifications and documents contain provisions that, through reference in this text, constitute normative provisions of this standard. At the time of publication, the editions indicated were valid. All specifications and documents are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the specifications and documents listed here.

2.1.2 Normative References List

RS-485 – also TIA/EIA 485 - Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems

2.1.3 Normative References Acquisition

RS-485 – also TIA/EIA 485 - http://www.tiaonline.org/standards/buy-tia-standards

2.1.4 Informative References

The following documents contain provisions that, through reference in this text, constitute informative provisions of this document. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed here.

2.1.5 Informative References List

1. ClimateTalk Specification, various revisions