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CEE Residential Integrated Home Specification

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The *CEE[SM] Integrated Home Initiative* represents the CEE portfolio of residential initiatives that include specifications with associated test procedures, verifications processes, and qualified product lists and are considered essential to future IDSM programs. The Integrated Home Minimum Requirements are a set of enabled capabilities that CEE members seek of connected products to deliver safe and reliable energy to consumers. They establish the common functionality necessary to seamlessly operate an Integrated Home using load management enabled products for both the customer and the utility. For requirements that apply to specific product categories, please refer to Table 3.

Minimum Requirements

Table 1. **CEE Integrated Home – Minimum Requirements of Products**[1]

Minimum Requirement	Description of Requirement
Laboratory Rated Energy Efficiency	For products where there is a CEE Initiative, they must meet CEE Tier 1 or higher, unless otherwise specified. CEE Tiers are typically based on industry standard test procedures and laboratory rated or third-party certified metrics. Products that do not have a CEE Initiative have further guidance on efficiency requirements provided in Table 3.
Load Management	Products must support a finite set of load management capabilities and run-time status information that support the functional objectives below: • **Load Shed**: the reduction of load to serve grid or distribution system needs in either peak load or contingency periods. • **Load Shift**: the change in timing, or scheduling of energy consumption from expected times to times of less overall demand in response to utility signals, such as time-of-use rates, to serve grid and distribution system value streams such as avoided curtailment of renewable generation. Load shifting incorporates DSM strategies that shifts energy in intentional and planned ways. Three distinct strategies are outlined below: • The incremental decrease or increase of a product operating capacity; • Storage capacity, or the ability for a product to perform its operation prior to the typical need of the amenity and still provide the amenity, e.g., precooling; and • Delay in amenity, or the staggering of the typical operation of an amenity by delaying and potentially shortening the operation. Products must also be capable of providing operational or demand response information to energy management systems and other consumer authorized devices, services, or applications via a communication link. Examples of operational status include off or standby, energy saver mode, low cool, max cool, delay product load, temporary product load reduction. Load management capabilities and information for products may be defined further in individual CEE product specifications.

[1] Lighting represents an important consumer engagement category, and when a connected lighting system interacts with large loads (e.g., HVAC), these requirements are relevant. Stand-alone lighting systems will not be required to meet load management requirements due to the inconsequential nature of today's lighting load.

Open, Nonproprietary Communications Standards	Communication with entities outside the product that enable connected functionality must use, for all communication layers, at least one of the standards: • Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards • Included in the NIST Smart Grid Framework Release 4.0 Table 23 • Adopted by the American National Standards Institute (ANSI), the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE) or Internet Engineering Task Force (IETF) • A certification from an industry accepted[2] connected home open communication protocol such as Zigbee or Z-wave A modular interface approach based on an open standard communication protocol, such as CTA-2045-B or equivalent, is one option to address this diversity and provide consumers, utilities, manufacturers, and third parties with flexibility and may be further required for certain products.
Actionable Savings Through Energy Consumption Reporting	Products must be capable of communicating measured or estimated data representative of interval energy consumption to consumers via the physical communication device to provide actional behavioral opportunities for the customer to save energy where available. Products must be able to collect and transmit this data per the requirements that include energy use data outlined in the "Load Management and Energy Consumption Data Sharing" element.
Load Management and Energy Consumption Data Sharing	Products must be able to facilitate the transmission of load management and energy consumption data to consumer authorized third parties. The transmission of data can be local (in home) or via an enterprise-to-enterprise connection. Details should be provided for; local interface specifications, application programming interfaces (APIs), or similar documentation. **Load Management Data**: With respect to Load Management Capabilities, products must, at a minimum, be able to send/receive/act upon the following information to/from utilities or utility associated third parties with consumer authorization: • Operational Status • Load Up • Shed Load • Return to Normal Operation **Energy Consumption Reporting Data**: Energy consumption reporting and messaging requirements specified in the "Actionable Savings through Energy Consumption Reporting" element, must be made available to consumer authorized third parties.
Operational Savings Capabilities	Products must be able to utilize connectivity to monitor energy use and adjust normal product settings in response to consumer input, feedback from devices (such as occupancy sensors) in the home, or energy management and automation system requests in order to directly reduce energy use through efficient operation.
Consumer Override Capabilities	Consumers must be able to temporarily override their product's response to any current and future load management signals. The override status must be made available through the open communication interface. A consumer override status will expire within 72 hours of the initial override action. Upon expiration of the override, the product shall automatically return to user-selected operation
On-Premise Connection	Products must enable economical and direct, on-premise, open standards interconnection. Manufacturers may also choose to provide additional means to connect, including proprietary architecture and protocols.
Consumer Data Security	Products must be certified to a cybersecurity industry standard such as UL 2900, CSA T-200, or equivalent for that given product category. Products must also allow for over the air updates of firmware associated with normal product operation.

[2] An "industry accepted" connected home open communication protocol is a protocol managed by an active organization focused on maintaining, updating, and certifying the open standard and furthering the shared value of interoperability.

Response to Loss of Connectivity to Utility	If there is a loss of connectivity between the product and utility during a load management event, defined as the product's lack of response to the utility load management system within the bounds of response time set by the utility, or vice versa, the product will: • Complete the load management event dictated operation as planned if participating in an event with a messaged set duration • Return to normal operations within 30 minutes of the start of the load management event dictated operation if no set time duration was messaged.
Local Storage of Schedules	Products shall be capable of storing operating schedules and consumer settings locally at the device should there be a loss of connection from the communication pathway utilized for internal or external communication, or otherwise disrupted.

Supplemental Requirements

CEE also identifies additional capabilities that are not required of all products categories at this time. These Supplemental Requirements are applicable to space heating and cooling, water heating, electric vehicle supply equipment (EVSE).

Table 2. **CEE Integrated Home – Supplemental Requirements of Certain Products**

Optional Requirement	Description of Requirement
Energy Consumption Reporting Intervals	Energy consumption data must be reported in watt-hours for intervals of 15 minutes or less, unless otherwise stated. Products must also provide energy use feedback on the product itself in a format chosen by the manufacturer (i.e., $/month).
Responsiveness to Dynamic Utility Rates	Products must be able to react to dynamic or time-based price signals from the utility per user defined settings within the product or set by a consumer authorized third party.
Multiple Pathways to Connect	For communication external to the Integrated Home, products must be capable of utilizing at least two of the communication standards outlined in the "Open, Nonproprietary Communication Standards" element.
Sustainable Operations	In order to facilitate sustainable use of the product, defined as the product being operable and supported over at least five years after installation by the consumer, functionality of the product must be accessible to the customer via the local product interface or consumer authorized third parties.

Product Specific Specifications

The following product Initiative specifications will outline specific energy efficiency and connected criteria for the product category.

Table 3. **Product Initiative Specifications for Efficiency and Enabled Load Management**

Product Initiative	Specification
Residential HVAC	Electric Variable Capacity HVAC Systems
	Connected Thermostats
Residential Water Heating	Heat Pump Water Heaters
Super Efficient Home Appliances	Clothes Washers
	Clothes Dryers
	Room ACs

Residential Swimming Pools	Swimming Pool Pump
Residential Lighting	Integral Replacement Lamps
	ENERGY STAR® Lamps
	ENERGY STAR® Fixtures
Residential Electric Vehicle Supply Equipment (EVSE)	EVSEs must comply with the Minimum Requirements as well as the Supplemental Requirements. Further, EVSEs must meet the following requirements: • Must meet the energy efficiency requirements outlined in ENERGY STAR's Program requirements for Electric Vehicle Supply Equipment Version 1.1 Sections 3.3, 3.4, and 3.5. • Must meet the further load management capabilities that allow consumers flexibility in when and how the vehicle is charged. These capabilities might include: • Schedule charge timeframe or charge by time. • Be capable of enabling consumers to set a minimum charge level. • The EVSE may additionally utilize Open Charge Point Protocol (OCPP) open communication standard.

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