Efficient, Grid Integrated Household Products

Striving for an Integrated Home

John Taylor
Deputy Director
Consortium for Energy Efficiency
What I’ll Cover

- Regulatory and Market Context
  - Why IDSM
  - How might voluntary programs evolve

- Value Propositions
  - How can we ensure grid and customer benefit

- Tools and Infrastructure for Utilities
  - Today
  - Tomorrow
One (Representative) Utility's Vision

**Why**
- 60% of customers are interested in connected home solutions

**What**
- Integrated platform for connected devices

**How**
- Partnerships
- BYOD
- Integration with EE and Smart Grid

**Convenience**
- 24/7

**Control**
- Adjust settings from anywhere

**Savings**
- Reduce energy costs

**Future**
- Sustainable living
- Smart grid integration
Mega-Trends Affecting Integrated DSM

- From reducing system peak to enabling renewables integration
- From addressing wide-area issues (e.g. energy markets) to local issues (e.g. consumer peak demand)
- From economic optimizer to mission-critical role

- Time and location of energy saved matter!

![Typical Load Duration Curve](image)

- 20% of system capacity is needed only a few hours per year

![Site Demand Chart](image)
Concept

- Energy Efficiency
- Behavior Change
- Load Management
- Integrated Home Platform
Savings Potential

- **Maximum savings potential of up to 16%**
  NYSERDA pilot with deployment of HEMS in 50 New York homes

- **Up to 17% savings house wide**
  Assuming adoption of smart technology for all major end uses

- **Between 1-5% savings**
  Range of technical savings potential from 5 individual smart products

- **Reduced electricity demand by 14-20%**
  Estimate for integration of DR and EE programs to reduce demand below projected levels

- **Peak reduction savings from 16-19%**
  Pilot results from winter demand response events in the Southeast

- **Successfully changing people's energy use behavior can result in savings from 4-12%**

- **Connected devices help drive behavioral savings of 2%**
  Customers provided customized information about runtime and actionable tips to save energy
The Integrated Home as a DER

- Energy efficiency
- Load management, demand response
- Energy storage
Opportunities for the Consumer

Non-energy impacts and amenities
- Health
- Security
- Comfort
- Entertainment
- Safety
- Environment

Money saving potential

Control of personal products and data

Voice control features and capabilities
Industry Activities

- Development of AHAM CHA-1 standard for communication elements of connected appliances and AHAM SA-1 standard for common commands of connected appliances

- Development of ANSI Standard 1380 for demand response-ready variable capacity central air conditioners and heat pumps (in progress)

- ANSI C137 Lighting Systems Committee developed ANSI C137.0-2017, a standard for definitions. Other C137 standards in development include energy prediction and measurement, data modeling, user interfaces and security

- Development of ANSI Standard CTA-2045A
Opportunities for Programs Today

Non wires alternatives
- Targeting specific locations for voluntary DSM programs

Leverage existing service providers
- Enabling technologies consumers are purchasing independently
- Customized management services

Expanded performance requirements
- For example, heat pumps with HSPF @ 17F, EER @ 95F
- Tiered incentives, endorsement of leading edge products/services
Laying a Foundation for Tomorrow’s Programs

- Nimble, flexible connectivity
  - Preempt the risk of stranded assets
  - Require open standards, redundant connectivity
- Embedded automation within products
  - Focus on enabling energy services
- Find willing partners
  - Utilities have unique customer relationship
  - Regulated responsibility in service of society
  - Shared customer, shared responsibilities
CTA-2045

Any Network

- Paging
- Broadband BPL
- Wi-Fi
- Cellular

Any Communication Module

Any End-use Device

Examples:
- Water Heaters
- Heat Pump Water Heaters
- Thermostats
- Pool Pumps
- EVSE
- PV Inverters

Source: EPRI
Automobile Industry Dashboards

- Different designs, price points, and options
- Common metrics (mpg) and elements (odometer)
Energy Management Dashboards

- Different designs, price points, and options
- Can we have common metrics and elements?
Welcome to the CEE Directory of Efficient Equipment.

Whether you're a consumer or a contractor, use this site to search for the most efficient residential and small commercial equipment on the market. Manufacturers work with AHRI to verify that their equipment meets the criteria established by the federal ENERGY STAR® program and by the Consortium for Energy Efficiency.

When you choose efficient equipment for your home or small business, you may be eligible for a rebate. Your comfort and satisfaction will be greater, your operating costs lower, plus you're benefiting the environment. A Quality Installation of the equipment increases the benefits.

Using this Directory you have assurance that the equipment you find has the blessing of AHRI and achieves the stated efficiency levels.
Potential Program Application

PRODUCTS

CAPABILITY

BENEFITS

Integrated Home Platform

Energy Efficiency
+ Load Management
+ Behavior Change

Energy Efficient and Connected Specifications

Demand Response
- Direct Load Control
- Behavioral Price Signals or Messages

Energy Management Dashboards
- Consumer Engagement
Voice Control as a User Interface

Another means through which consumers can interact and engage with their homes

- Projected 1 billion devices in homes by 2021
- Interface is promising, though still nascent
- Players in the market:
  - Amazon
  - Google
  - Apple
  - Iris
  - Microsoft
  - Athom
  - Intel
  - Insteon
  - Alarm.com
  - Vivint
  - Comcast
  - Device manufacturers

1, 2 Parks Associates
Scope

Services, hardware, or software that serves to optimize overall energy use of a home

Fuel types that delivers these objectives, including:
  • Electric
  • Natural Gas
  • Other

Application levels that can achieve these benefits:
  • Product
  • System
  • Whole House
Questions? Discussion?
CEE Member Consensus Reached

- Use of **open, non-proprietary, communication standards** to achieve interoperability are required….

- Establishing **multiple pathways to connect** is likely necessary to ensure the majority of consumers realize benefits…

- Maintaining a **direct line of site** to connected products at the “substation level” will maximize the load management benefits…

- Acceptable communication pathways must **secure customer data** and adequately protect privacy…

- Products are “controllable” and **responsive to price signals**…

- Connected devices must be “discoverable” and **disclose their ability for a utility signal** (or equivalent) to reach the connected product consistently…

- Capability to share **basic energy data** is required
Creating the IDSM Platform—CEE View

COOPERATION WITH

ENERGY INTENSIVE PRIORITY PRODUCT CATEGORIES
- CENTRAL HVAC
- APPLIANCES
- POOL PUMPS
- WATER HEATING
- CENTRALIZED HEMS
- LIGHTING
- EVS AND CHARGING STATIONS

Managing for Grid Value
Managing for Customer Value
Managing for EM&V Value

CEE CONSENSUS CONNECTED PRINCIPLES
ENSURE SECURE DATA AND PRIVACY
MUTLIPLE CONNECTION PATHWAYS
STANDARD INFORMATION PROTOCOLS
UTILITY SPECIFIED DATA
CONTROLLABLE, RESPONSIVE

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Fundamental Components

- Cyber Security and Privacy Concerns
  - Minimum features

- Connectivity and Multiple Pathways
  - Interoperability across products and manufacturers
  - Locational, direct line of site

- Assurance of Desired Amenities
  - Third party certification; laboratory ratings or other

- Data Exchange Capabilities
  - Secure provision of minimal information required

- Enablement of Innovation and Flexibility
  - Cost-effective solutions that meet customer needs