



Efficient, Grid Integrated Household Products

Striving for an Integrated Home

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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



Convenience



Control



Savings

What



Integrated platform for connected devices



Future



How



Partnerships



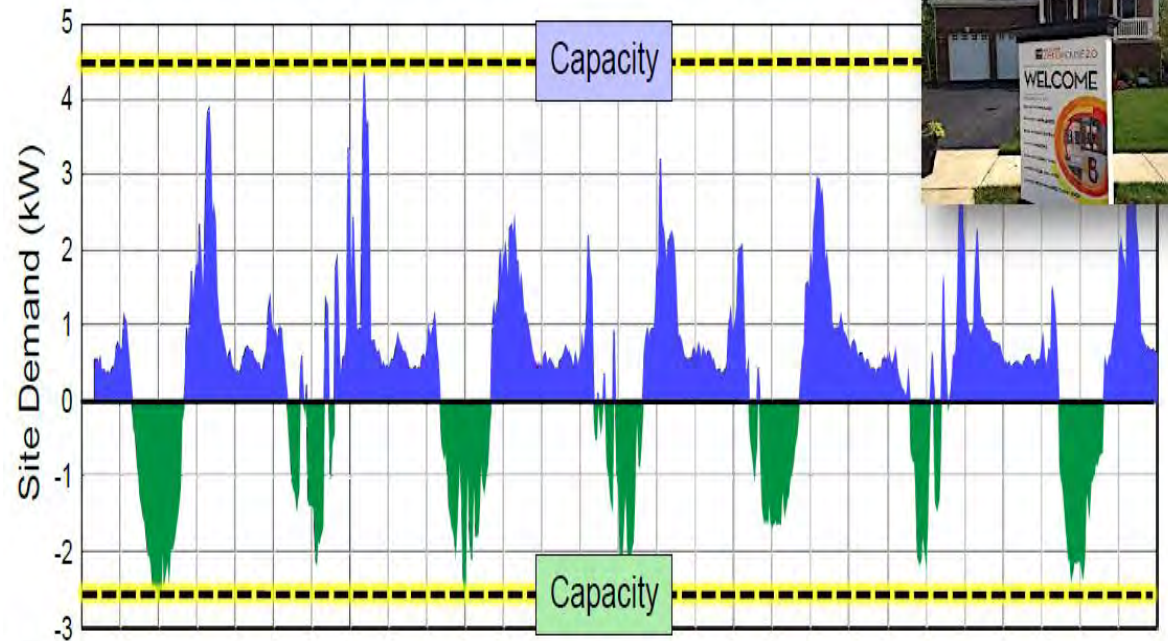
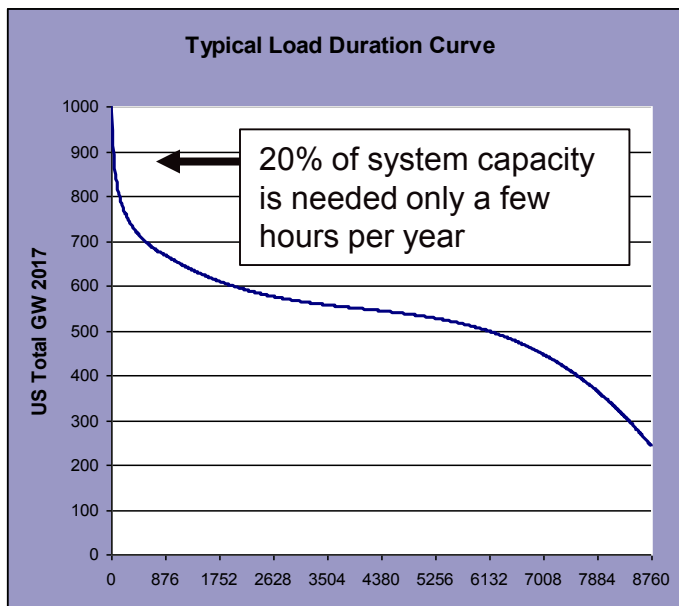
BYOD



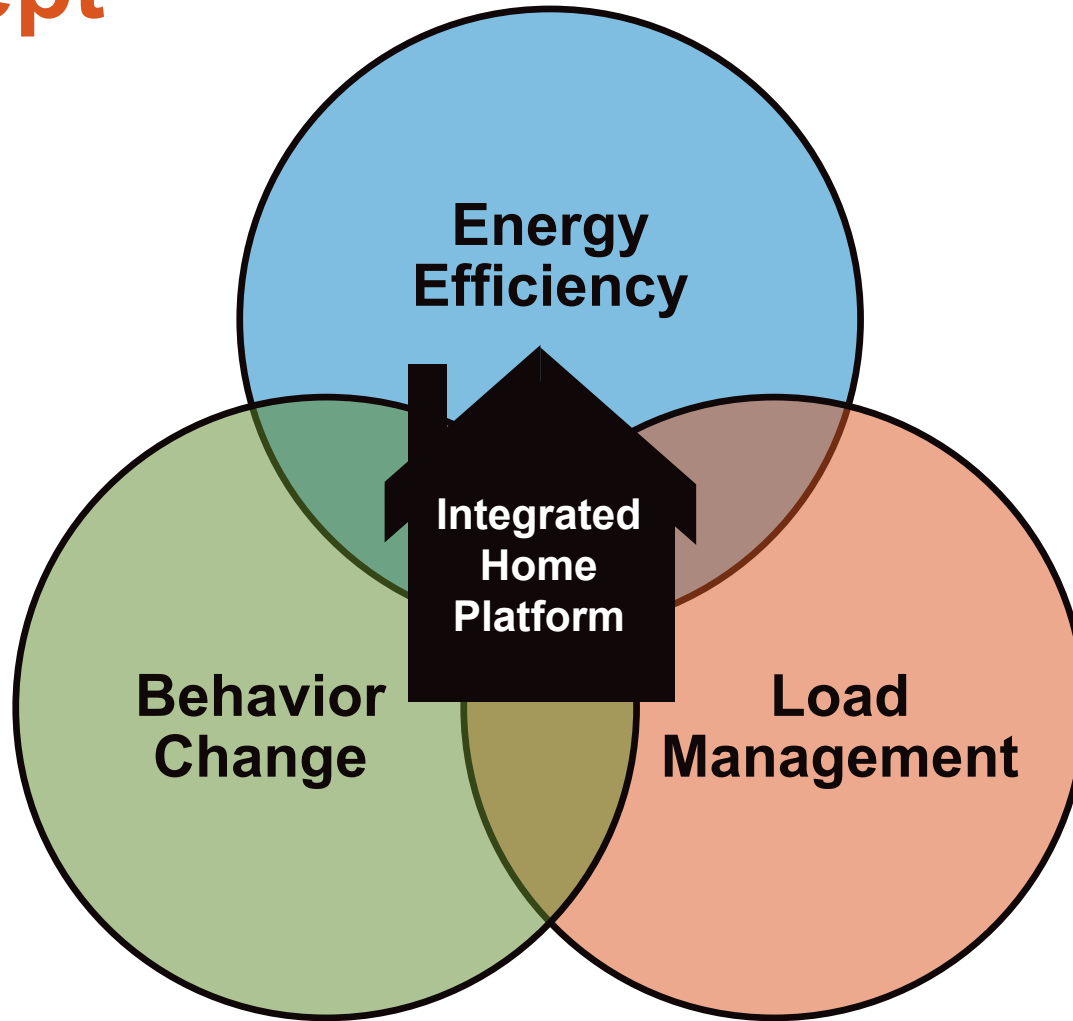
Integration with EE and Smart Grid

Mega-Trends Affecting Integrated DSM

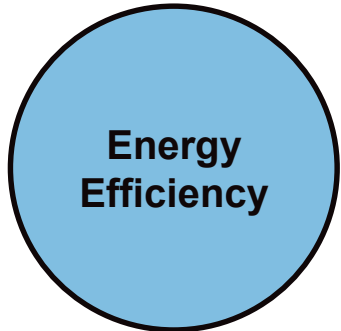
- From reducing system peak to enabling renewables integration
- From addressing wide-area issues (e.g. energy markets) to local issues (e.g. consumer peak demand)
- From economic optimizer to mission-critical role
- Time and location of energy saved matter!



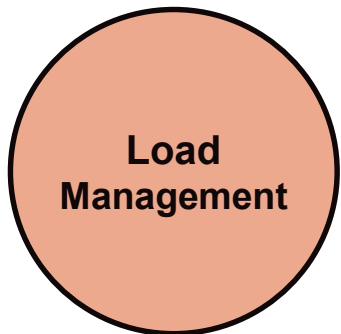
Concept



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



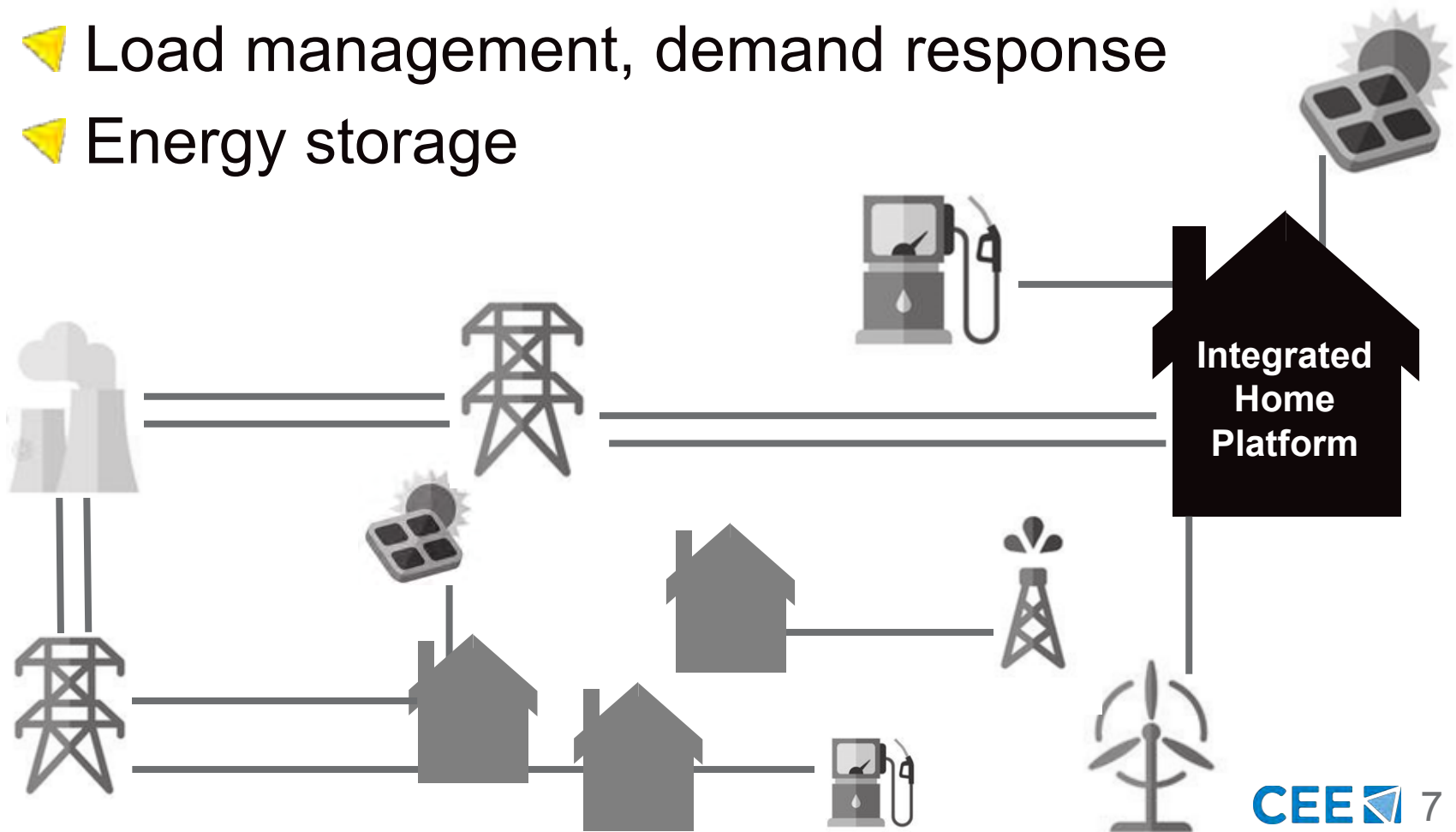
- **Reduced electricity demand by 14-20%**
Estimate for integration of DR and EE programs to reduce demand below projected levels
- **Peak reduction savings from 16-19%**
Pilot results from winter demand response events in the Southeast



- **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

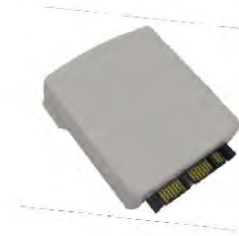
- For example, heat pumps with HSPF @ 17F, EER @ 95F
- Tiered incentives, endorsement of leading edge products/services

Laying a Foundation for Tomorrow's Programs

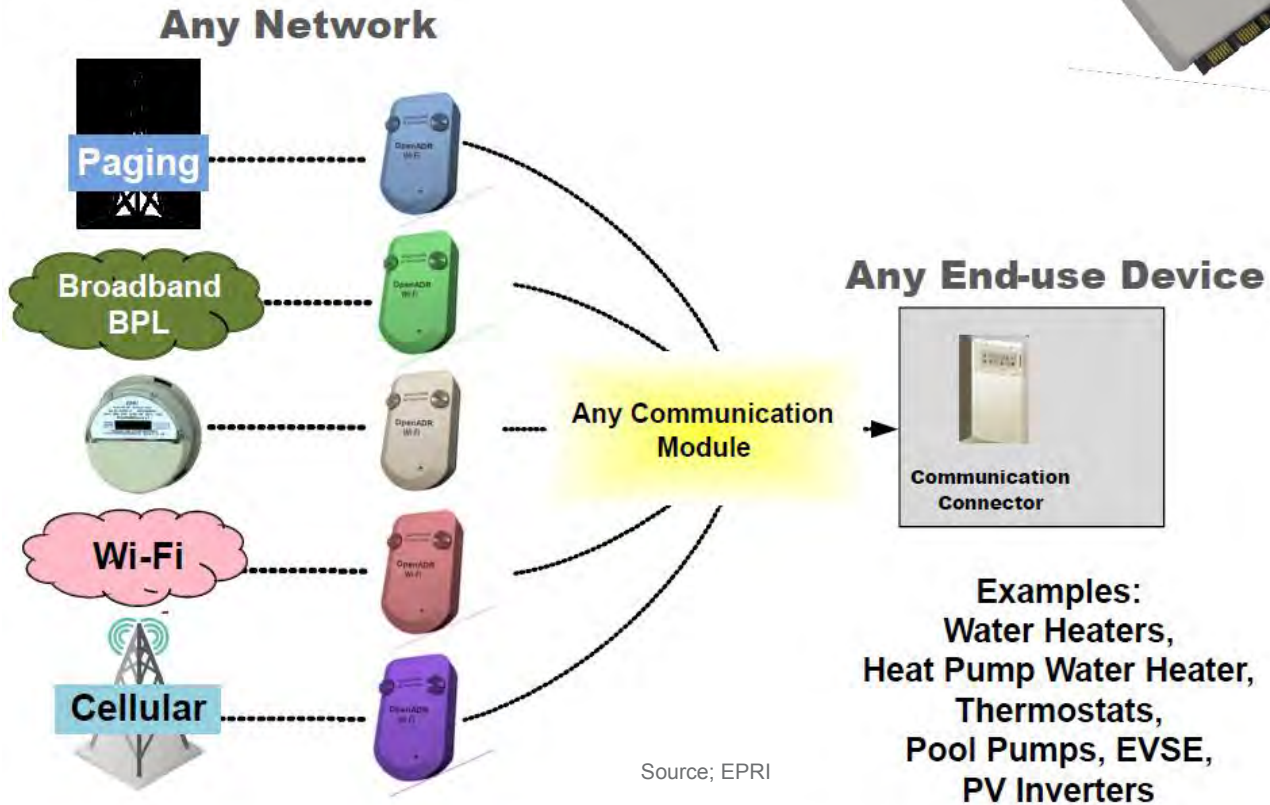
- ▶ Nimble, flexible connectivity
 - Preempt the risk of stranded assets
 - Require open standards, redundant connectivity
- ▶ Embedded automation within products
 - Focus on enabling energy services
- ▶ Find willing partners
 - Utilities have unique customer relationship
 - Regulated responsibility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

CTA-2045

DC Form Factor



AC Form Factor



Source; EPRI

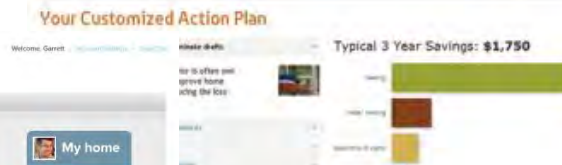
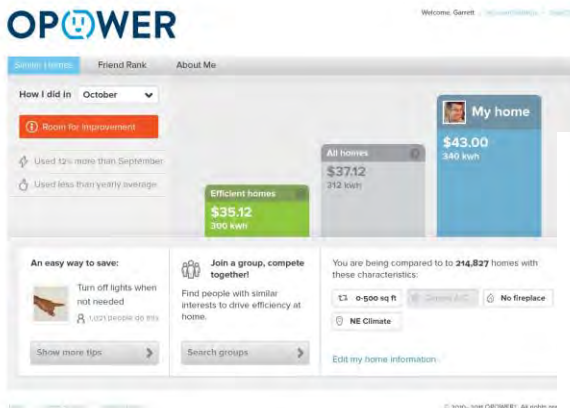
Automobile Industry Dashboards

- ▶ 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?



Transformative Binational Impact

CEE Directory of Efficient Equipment



Search the **CEE Tiers** for efficient equipment for your home or business.

Commercial Boilers

Split or Packaged Heat Pumps

Split or Packaged Air Conditioners

Residential Furnaces

Variable Speed Mini-Split and Multi-Split Heat Pumps

Variable Speed Mini-Split and Multi-Split Air Conditioners

Residential Boilers

Residential Water Heaters

Commercial Water Heaters

Home

Find an Incentive Program

Why Choose ENERGY STAR

How and Why of Certified



we make life better®



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.

During this Directory you have assurance that the equipment you find has the backing of AHRI and achieves the stated

Potential Program Application

PRODUCTS

CAPABILITY

BENEFITS

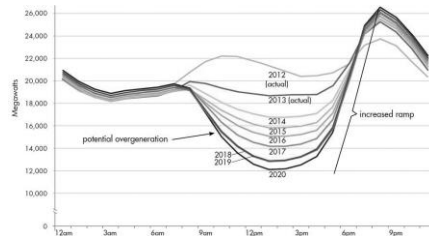
Integrated Home Platform



Energy Efficient and Connected Specifications

Demand Response

- Direct Load Control
- Behavioral Price Signals or Messages



Energy Management Dashboards

- Consumer Engagement

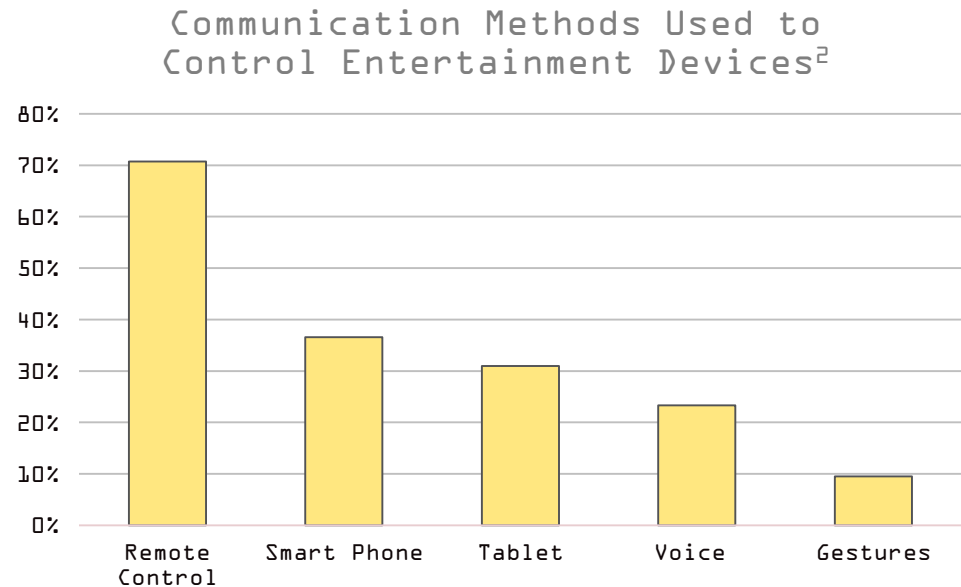
Energy Efficiency
+
Load Management
+
Behavior Change

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 2021¹
- Interface is promising, though still nascent
- Players in the market:

- Amazon
- Google
- Apple
- Iris
- Microsoft
- Athom
- Intel
- Insteon
- Alarm.com
- Vivint
- Comcast
- Device manufacturers



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



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CEE CONSENSUS CONNECTED PRINCIPLES
ENSURE SECURE DATA AND PRIVACY

MULTIPLE
CONNECTION
PATHWAYS

STANDARD
INFORMATION
PROTOCOLS

UTILITY
SPECIFIED
DATA

CONTROLLABLE,
RESPONSIVE

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**



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