Developing a Binational Framework for Connected Homes

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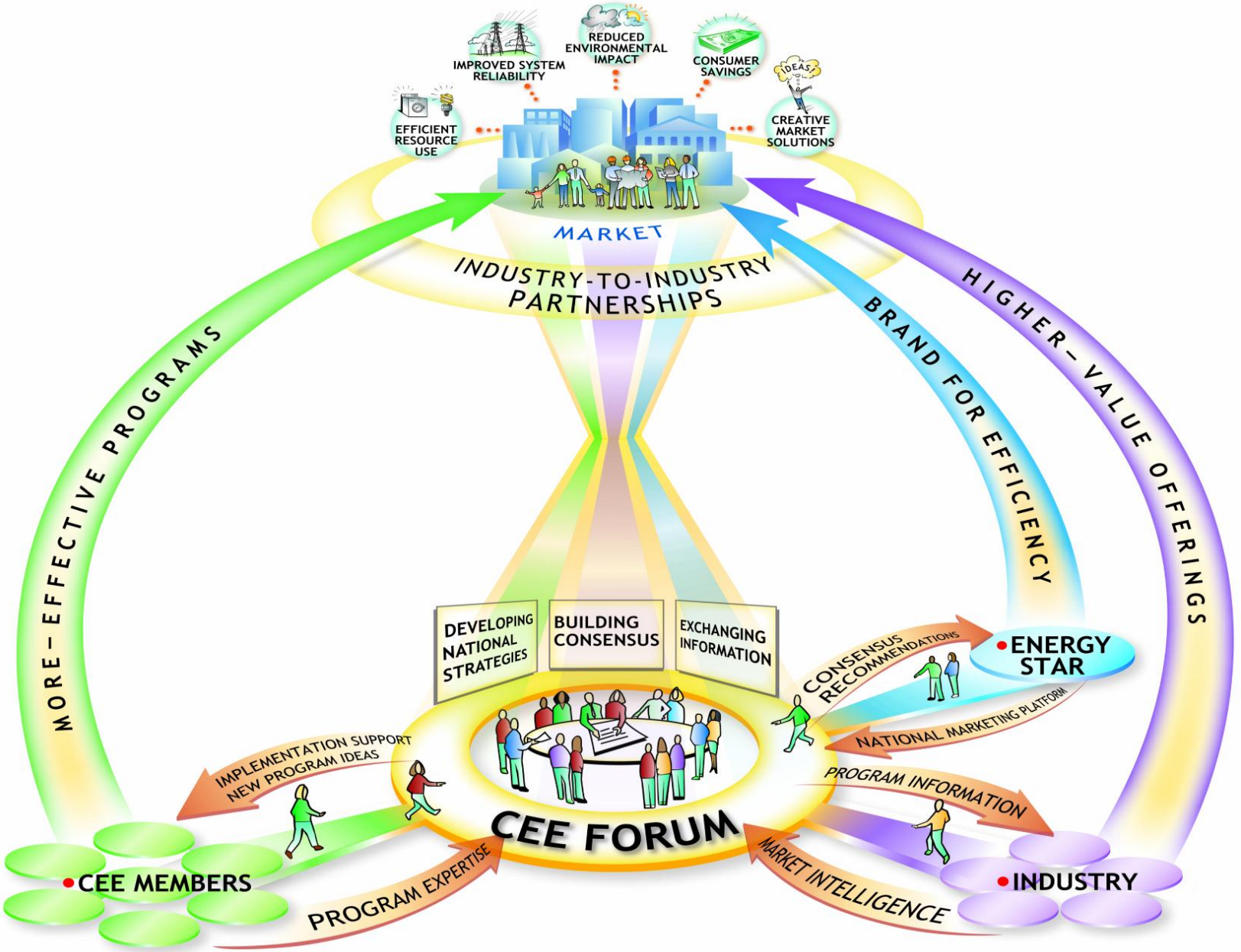
Executive Director

Stakeholders work together at CEE



Our working Definition of a "Connected Home"

- Networked products:
  - that are engineered to send and receive specific information with a specific purpose to enable new streams of value
  - that contribute the necessary data to a consumer engagement platform that enables end-users to capitalize on these new value streams

Key Considerations

Order of Focus

- Large Loads (HVAC, H_20 heater)
- Small Loads (appliances, STBs)
- Emerging Loads (electric vehicles)

Varying "Market" Factors

- Utility programs and pricing will vary
- Customer demographics
- Deployment of AMI
- Broadband penetration

Communication

- Open Source Language
- Support of Multiple Pathways
- Standard Data Parameters

Focused on Big Loads First, and Anticipating Emerging Loads

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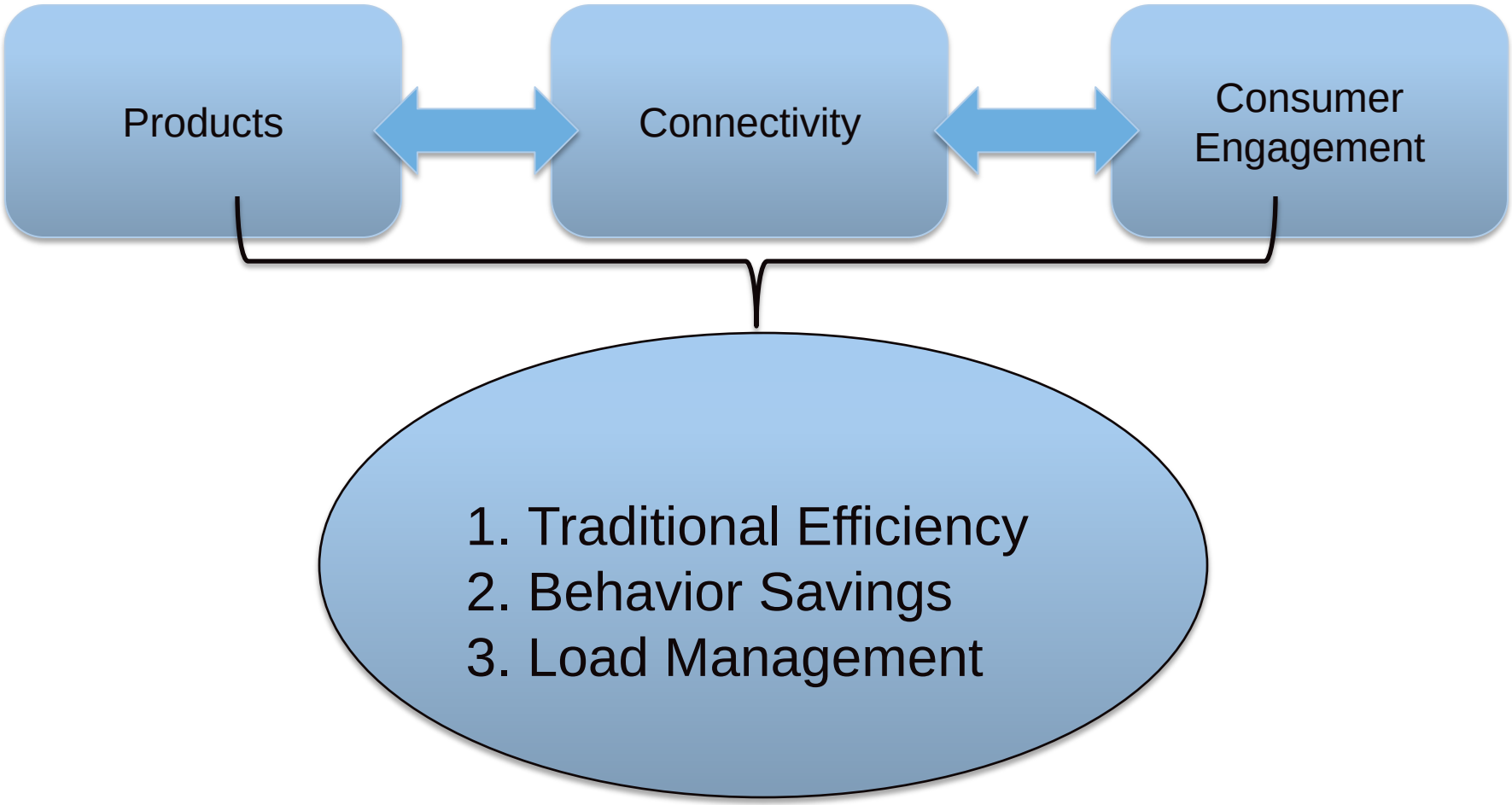
What Benefit Streams Can we Achieve?



Load Management

- 10% of our generation capacity & 25% of distribution capacity
  - is used only to meet the load during the top 5% (~400) hours of the year
- NETL found that **more than one-fourth** of the 713 GW of U.S. electricity demand in 2010 could be dispatchable *if only buildings could respond to that dispatch.*
- DR resource contribution represented 9.2% of U.S. peak demand (FERC, 2012)
  - Predicted DR contribution will be 12% in 2019
  - Largest gains in reducing peak demand are through full DR participation in the residential sector

Newly Enabled Savings

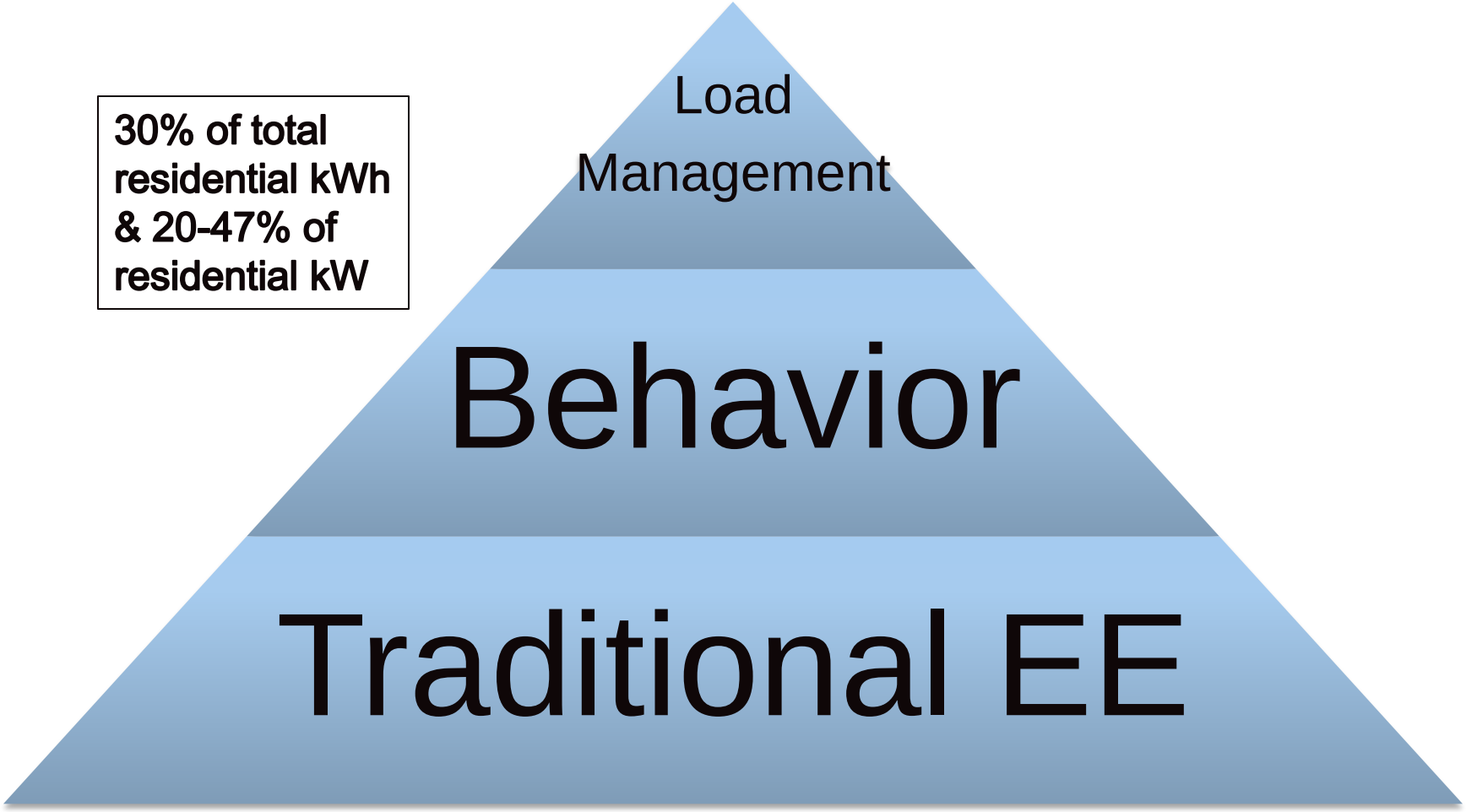
- Up to 20% of current residential load could be eliminated through behavior changes that didn't compromise lifestyle or comfort (McKinsey, 2013)
  - Thermostat set-backs
  - "Feedback" through gateway devices
  - New opportunities enabled by connectivity
    - Home automation could yield 7.8-10.5% savings in HVAC and lighting(McKinsey, 2013)
- Other examples
  - A/C Charge level out of manufacturer recommended tolerance
  - Compressor draw in a refrigerator indicates nearing end of useful life

Examples of Energy Saving "Feedback"

- A home energy management system that can accurately estimate the consumption of each appliance using signals sent out by the collection of smart appliances may suggest:
  - washing clothes in warm water (not hot) would save you $30 a year
  - The air conditioner needs service – it is running twice as much as last year in the same type of weather, and costing $200 a year extra.

What do the Potential Savings Add Up To in the Residential Sector?

30% of total residential kWh & 20-47% of residential kW



What's Needed for Society to Realize Such New Levels of Benefit?

- Critical mass of industry, feds, utilities, others supporting a standard approach

  - Define product specifications to enable savings across the three value streams
  - Define common language and standard data requirements across end uses

Initial Products Within Scope

Primary EE Targets

- HVAC
- Water Heaters
- Pool Pumps

Other EE Targets

- Appliances
- Lighting
- Electronics

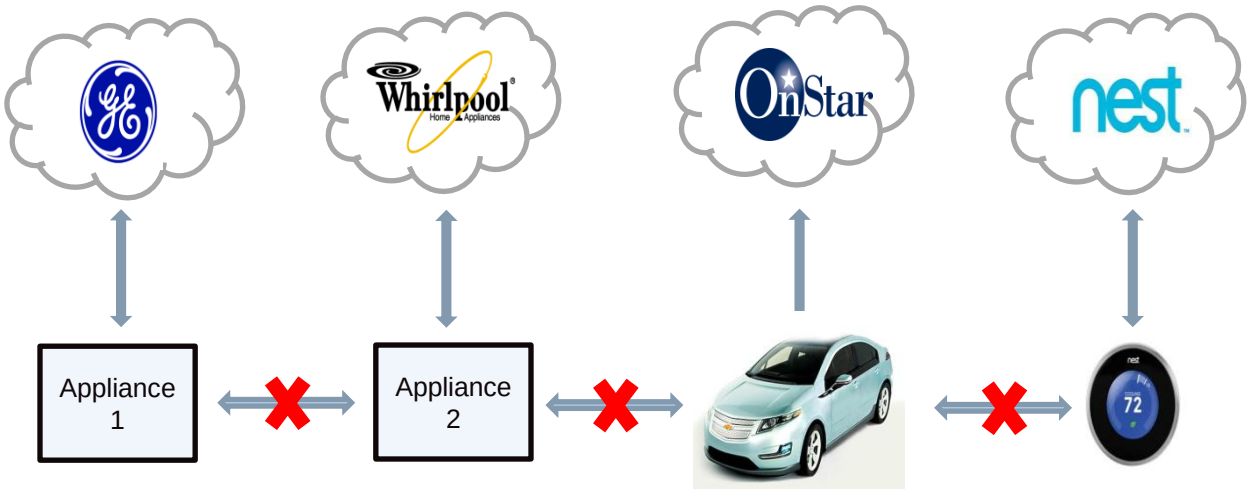
Related Categories

- Electric Vehicles
  - Charging stations
- Renewables
- Micro grids
- Distributed generation

Open Standards and Coordination Across Industries is Essential

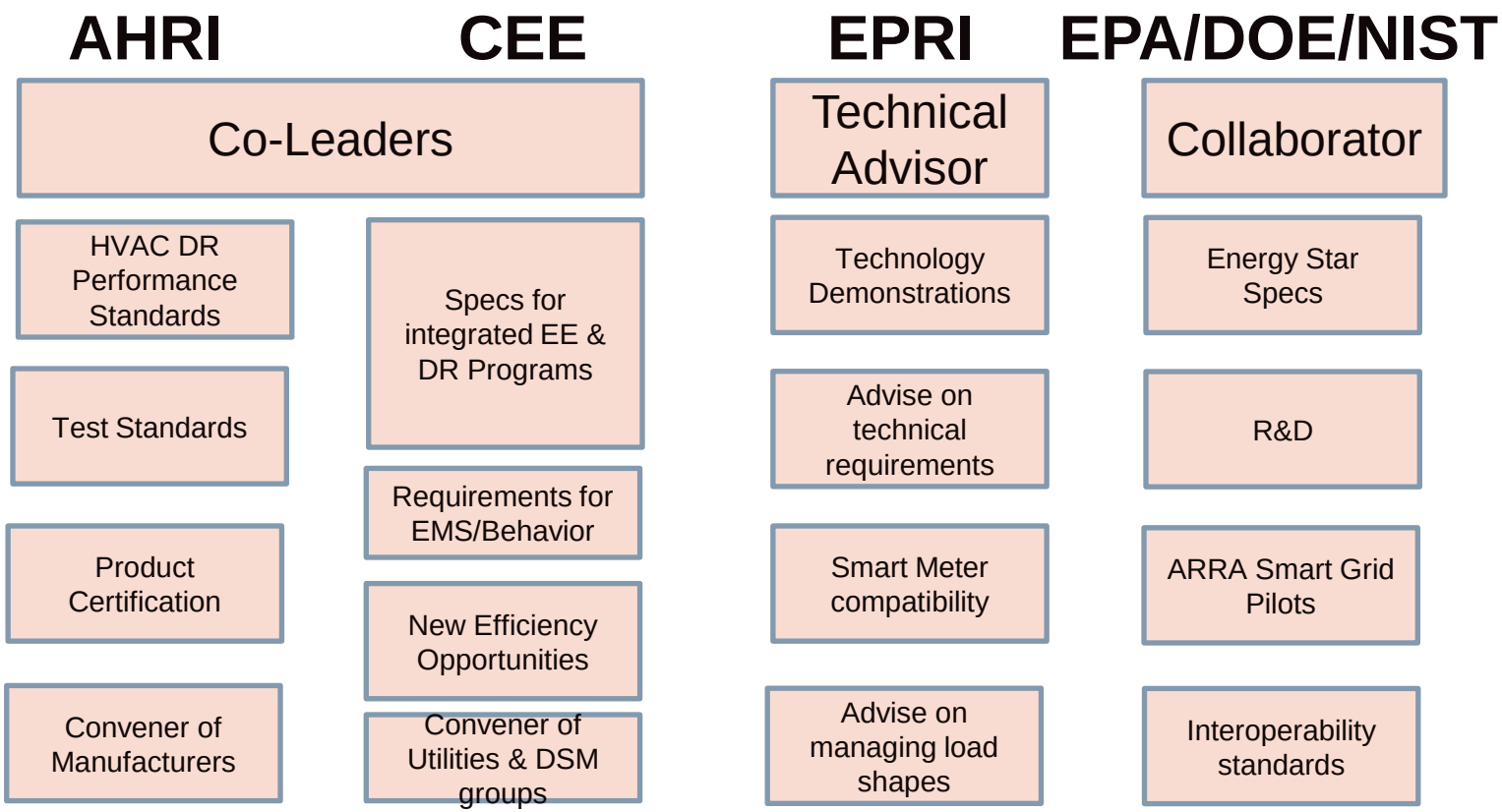
It will be difficult for most utilities to effectively manage demand response programs and maximize distribution-level optimization if doing so requires the utility to interface with multiple proprietary architectures (which may also lead to stranded or redundant systems resulting in higher costs for all customers)

- Kevin Bright, Duke Energy and CEE Director



"Proprietary" architectures do not allow devices to easily "talk" with those from other brands. They also require customers and utilities to interact with multiple "clouds" or user interfaces.

Roles in Collaboration: HVAC/Water Heating



Open Communications

Timeline for HVAC and Water Heaters