Utility Connected Home
The Value to the Cooperative and Use Cases

What has changed?

The Internet of Things (IoT) is an ever-growing list of technologies, apps, and devices that are connected to the Internet. A subset of IoT is the "utility connected home." The utility connected home refers to the partnership between the co-op and the end-use member to more effectively manage energy use. This would include enhanced insights into how members use energy and their enrollment of HVAC, pool pumps, water heaters, and electric vehicle chargers into co-op demand response programs. Focusing on these well-defined areas, instead of the entire IoT universe, promotes more successful co-op programs.

What is the impact on cooperatives?

The co-op motivation to engage in a utility connected home strategy can typically be characterized in terms of the following benefits:

- Operational improvement and stabilization
- Energy efficiency and demand reduction
- Member engagement improvements and partnership
- Integrated customer, system, and program management
- Savings on demand and transmission charges

The primary devices that most co-ops and other utilities will initially role out in a utility connected home strategy include:

- Internet connected thermostat
- Grid interactive water heater
- Swimming pool and hot tub pumps

Emerging technologies to include in an initial rollout include:

- Electric vehicle charger
- Residential battery
- Smarter inverter

It should be recognized that, as with all connected devices, cybersecurity is an important consideration for the utility connected home. For more information on cybersecurity resources available from NRECA, visit our cybersecurity topic on cooperative.com.

What do cooperatives need to know or do about it?

In order to understand the value of connected homes to a utility, it is important to consider what is required in terms of investment. Some of the communications technologies or infrastructure may be missing from a service territory and make a utility connected home program very challenging. For reference, a utility considering connected homes would generally require the following:

- A comprehensive utility-connected home strategic plan
- Existing competency in program and technology management
- A network of partnerships with expertise and service providers
- A reference technical architecture[1] incorporating both utility and end-user technologies
- Programs with specific goals defined to make best use of customer Home Energy Management Systems (HEMS) platforms
- A basic foundation of smart grid capabilities, such as smart meters and related communications

Potential Impacts to the Co-op

The utility-connected home is the interconnection of communications, monitoring, and controlling devices regulating a home's energy systems. These devices allow for automated control of energy use through the monitoring and management of specific appliances and features in the home.

There are several use cases associated with a utility connected home and the value to both the member and the co-op. Some are:

Use Case Example	Typical Technology Used	Value to Member	Value to Co-op
HVAC Control	Smart thermostat	Reduced Energy Costs, Energy Use, and Cost Visibility	Demand Response (DR), Energy Efficiency (EE)
Load Control	Smart thermostat, water heater, EV charger, pool pump, battery	Reduced Energy Costs	DR, EE, Grid Security
EV Charging Control	EV charger	Reduced Energy Costs, Energy Use, and Cost Visibility	DR, EE, Grid Security
Timely Usage Information	Mobile device	Energy Use and Cost Visibility	EE

Let's briefly look at the impact of one device… the smart thermostat. Smart thermostats represent the most recent evolution in thermostat technologies. They not only have Wi-Fi functionality like their digital

[1] "Reference technical architecture" provides a template structure and common vocabulary to map the relationships among program elements to ensure the consistency and applicability of technology use and information exchange within an organization or program.

predecessor, but also include occupancy-sensing and learning capabilities. Sensing features give households the ability to set back temperatures automatically, without any manual adjustments. Learning features utilize algorithms to auto-adjust thermostat settings based on the users' behavior, proximity to their home, local weather patterns, and other building and systems considerations. These new features have, in turn, introduced advancements in DR program design and customer engagement strategies.

A recent NRECA report compared 15 thermostat studies across the country to assess the potential heating and cooling savings and demand reduction associated with these programs. This research revealed that thermostats attached to gas furnaces or ductless heat pumps (DHP) reduce energy usage by 7.7 percent on average during winter months. The study's authors expect that thermostats attached to electric heating can obtain consistent energy savings of 12 percent during the winter season. For summer months, the average potential cooling savings equaled 14.3 percent, totaling 3.1 percent savings over the annual electric load. The report compared four additional studies to determine DR potential associated with these thermostat DR programs. Co-ops should anticipate an average demand reduction of 0.6 kW to 2.37 kW for each thermostat, based on this comparison. Details on the findings and advice for starting a program can be found in Do Smart Thermostats Make for Smart Demand Response Programs?

It is important to remember smart thermostat programs are still in their infancy. Utilities across the country have run several smart thermostat DR trials and pilots, which have demonstrated DR potential. Findings from these pilot studies suggest these programs have the potential to reduce load and save energy, but results vary based on the devices, occupant behavior, weather, and program software. And, no program to date has successfully deployed a large scale program and leveraged the sensing and learning features found in newer thermostat models.

The potential of the other devices contained within the utility connected home are also in their early stages. Additional demos and trials are needed. There is no one size fits all approach to the Utility Connected Home, and there is no one single way to design a program.

Further Research

NRECA is planning a field demonstration in conjunction with a national lab and a group of co-ops to test how these systems would function and member attitudes toward them. Information about this demonstration and insights gained will be available to members on our website and communicated through our newsletter *Business and Technology Update*.

Additional Resources

- Do Smart Thermostats Make for Smart Demand Response Programs?
- Distributed Energy Resources Compensation and Cost Recovery Guide
- Utility Connected Home (advisory, May 2018)
- Sign-up for our newsletter, Business and Technology Update

Contact for Questions

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