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The Power Play: Uniting Smart Devices for Home Energy Management

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The need for energy device interoperability

Rising energy costs, natural disasters, and more extreme weather have prompted consumers to seek ways to optimize their energy consumption. Providers, faced with rising demand and an aging grid, are seeking ways to better monitor energy consumption and reduce peak usage.

The percentage of households considering electricity costs as too high increased from 54% to 62% in 2022, according to Parks Associates ongoing quarterly consumer survey work of 8,000 US internet households.

Energy management technology can optimize usage to reduce costs and energy waste, but integration remains a challenge. Different brands and generations of products make data aggregation difficult, limiting unified control.

Devices on the market today can measure, monitor, and control energy consumption at the device, circuit, or whole-home levels but only if they can work together. Improved coordination and integration are needed, and all parties involved stand to benefit:

- Consumers seek a simple, seamless, unified experience with technology in their homes, but they will not shift from buying individual smart home devices to integrated systems overnight
- Retailers are working to drive device adoption (and sales)
- Energy companies want more information on how homeowners use energy, and they need consumers to participate in energy programs with the help of home energy technology

Manufacturers have recognized this reality, and the quest for interoperability is now a more crucial factor for smart home players. Smart home companies have come together to develop standards and protocols to help their energy devices work together. This white paper examines the progress toward interoperability and highlights the ways companies across this space are working to overcome barriers to a connected and interoperable home energy experience. It highlights barriers and opportunities for connected home technologies to make optimized whole-home energy management a reality. It also discusses the benefits to energy providers, device-makers, and retailers.

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Energy Costs and the Solutions

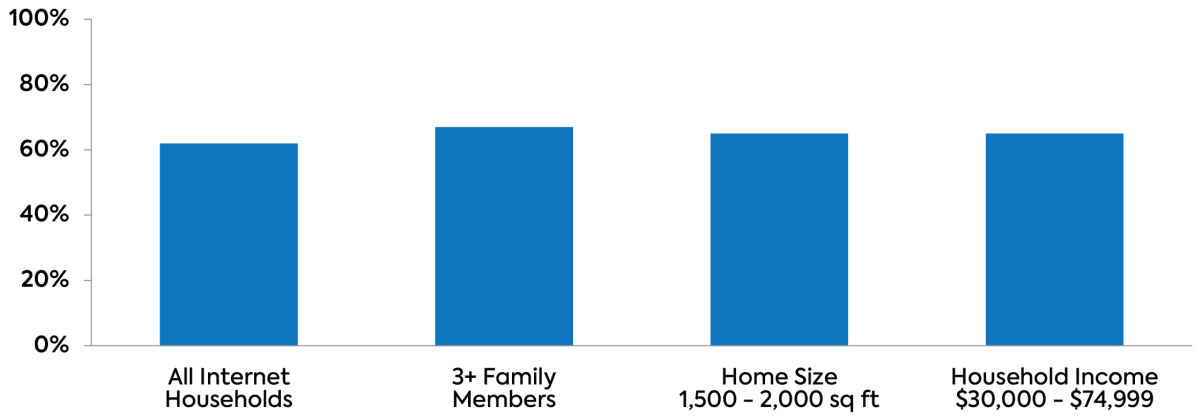
Consumers, especially in middle-income households, are feeling the pinch of a rising electric bill. However, they are uncertain about what they can do to lower costs.

Utilities traditionally have two types of programs to offer their customers that can shift load and reduce bills:

Time-of-use (TOU) rates are electricity rates that vary based on the time of day that the home uses electricity. Utilities institute TOU rates to induce a behavioral shift in energy consumption, driving consumers to adjust their energy usage away from peak periods when possible.

Demand Response (DR) programs are energy programs where, in exchange for incentives, the customer allows the energy provider to adjust or turn off the home's thermostat, water heater, or pool pump when too much energy consumption is straining the electricity grid. Program names include Rush Hour, On Call, Flex Hours, Power Manager, Connected Savings, and Power Partner. These programs are typically automated and shift load away on the most constrained days.

Households that Agree "Electricity Costs are Too High"



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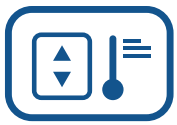
The earliest incarnations of these programs relied on whole-home meter data to understand energy consumption patterns, with limited ability to engage customers and learn more about energy usage in the home. The advent of the smart thermostat greatly enhanced these programs and gave utilities their first step "behind the meter." Now, with more home energy technology in the customer's home, electricity providers have a major opportunity to manage costs and resilience with precision through programs that actively engage their consumers. The recent acquisition of Vivint by NRG is evidence that electricity providers are looking for new and better ways to understand and control energy consumption behind the meter.

1 Optimize HVAC with Smart Thermostats



The smart thermostat was among the first smart home devices available to US households and was the leading device in terms of adoption for many years, based on Parks Associates' years of tracking data. Given the HVAC system is a major source of energy consumption in the home, smart thermostats are naturally the centerpiece of energy service strategies as they can help thermostat owners reduce consumption, shift energy usage to times when cost and demand are low, and coordinate HVAC loads with other energy-using devices in the household or neighborhood. With their user-friendly touchscreens, remote accessibility, energy monitoring capabilities, and customizable controls, smart thermostats empower homeowners to enhance heating and cooling efficiency.

Remote access through mobile apps and Wi-Fi compatibility empowers homeowners to monitor and control their HVAC systems from virtually anywhere. This capability offers considerable energy savings potential; users can remotely ensure their air conditioning or heating isn't active when the house is empty, regardless of their physical location.

One of the standout features of more sophisticated smart thermostats is the capacity to track and analyze energy usage. Best-in-class devices communicate energy usage to thermostat owners in multiple metrics that help users save energy and money while still maintaining comfort. By monitoring factors like HVAC system operation time and climate conditions, users gain insights into their energy consumption patterns. Online portals and mobile apps offer detailed usage data and personalized suggestions to improve energy efficiency. This awareness equips homeowners with the knowledge needed to identify areas for energy conservation.

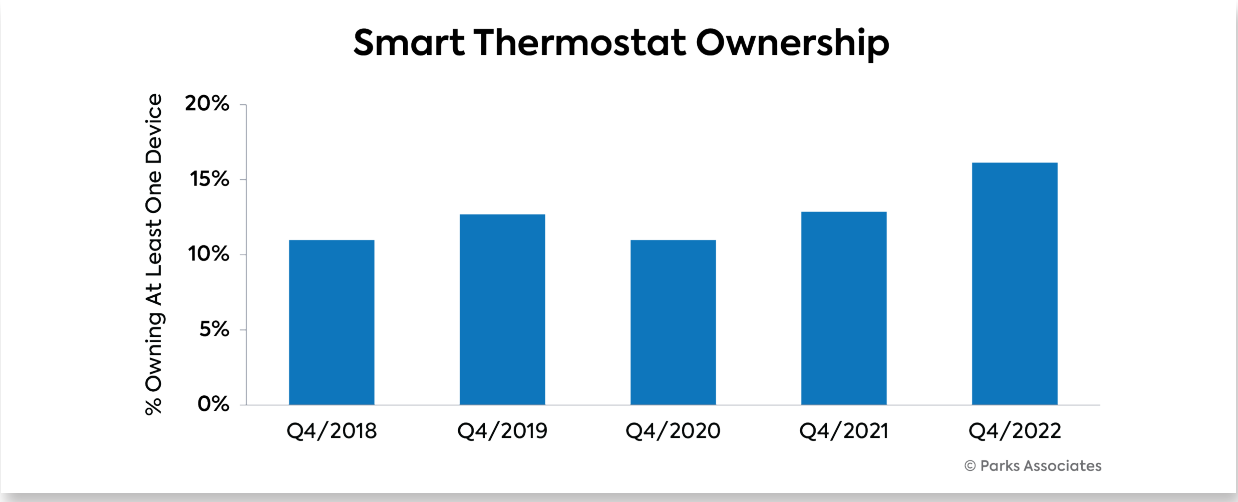
Smart thermostats provide adaptable timers and room-specific settings. This customization enables users to fine-tune their heating and cooling patterns according to their preferences and the unique requirements of each space. The result is a more efficient use of energy and a reduction in utility costs.

After several years of moderate growth, smart thermostat adoption finally nudged up to 16% in 2022.

[1] "NRG Energy, Inc. to Acquire Vivint Smart Home, Inc.," December 6, 2022, https://investors.nrg.com/news-releases/news-release-details/nrg-energy-inc-acquire-vivint-smart-home-inc

While current economic headwinds and a post-pandemic lull in household spending will likely temper the rate of smart thermostat adoption, a larger installed base of devices expands the number of potential participants for utility programs. Also, the key consumer benefits of smart thermostats — saving money by reducing energy consumption — can have even greater resonance among homeowners facing rising bills. Electricity providers should continue to drive consumers to adopt smart thermostats, with incentives such as rebates, rewards, and a subsidized or free device, especially one with an ENERGY STAR(R) certification, which is a well-known and respected designation.

The benefits of smart thermostats can also extend to builders, multifamily property owners, and multifamily property managers, who are looking to fulfill ESG initiatives. With more new construction and multifamily units coming with new smart thermostats pre-installed, more consumers will see these connected devices as a standard component of the modern household.



2 Reduce Consumption Across the Home

Home energy technology can help consumers minimize costs by reducing consumption. Efficient appliances reduce energy usage on a per-task basis while other devices work to reduce energy consumption by eliminating unnecessary energy use or counterproductive conditions.

- Smart blinds can open blinds automatically to optimize sunlight during the winter and close them during the summer to save on heating/cooling costs.
- Smart lighting can be operated or automatically turn off lights when the residents are away. When armed with additional sensors, they can turn off when no presence is detected.
- Smart electrical panels better manage how the home uses electricity and even allow users to pre-program which circuits to turn on and off, allowing for better load management and energy storage.
- Many smart appliances come with an eco-mode option owners can activate to save water and energy during usage.

3 Shift Consumption for All Electrical Loads

Home energy technology can help consumers minimize costs and providers to avoid issues due to excess demand (DR programs) when tasks can be automatically shifted from expensive and high-demand time periods to times when energy is plentiful, such as early in the day, when solar power availability is high, or late at night when most households are consuming less power than during waking hours.

- Smart water heaters can pre-heat water in anticipation of high-demand periods.
- Smart EV chargers can delay charging while ensuring the car is ready when needed. Advanced solutions can also avoid overwhelming the home's capacity for energy usage by pausing charging when homeowners activate another device that draws a large amount of energy (i.e., clothes dryers).
- Smart appliances can delay the performance of the most energy-intensive tasks such as washing or drying a load of laundry or making ice.
- Smart panels can act as a traffic cop in reporting energy hogging culprits while providing some centralized control over these electrical loads.

4 Generate and Store Electricity

Solar panels serve a dual purpose by generating home energy and sharing excess power with the grid. Although a significant upfront investment of over $10,000 is required, anticipated savings can recoup this cost within 7-12 years. Solar systems with contemporary inverters can provide the control and flexibility to sell energy to the grid, power the household, or charge backup batteries. The top drivers for solar adoption are cost savings and energy independence.

48% of internet households value energy bill reduction and 34% prioritize energy autonomy, especially during outages.

The forthcoming increase in battery storage availability is expected to amplify these motivations. This technology not only benefits homeowners with lower bills and grid credits but also empowers utilities to manage grid loads effectively.

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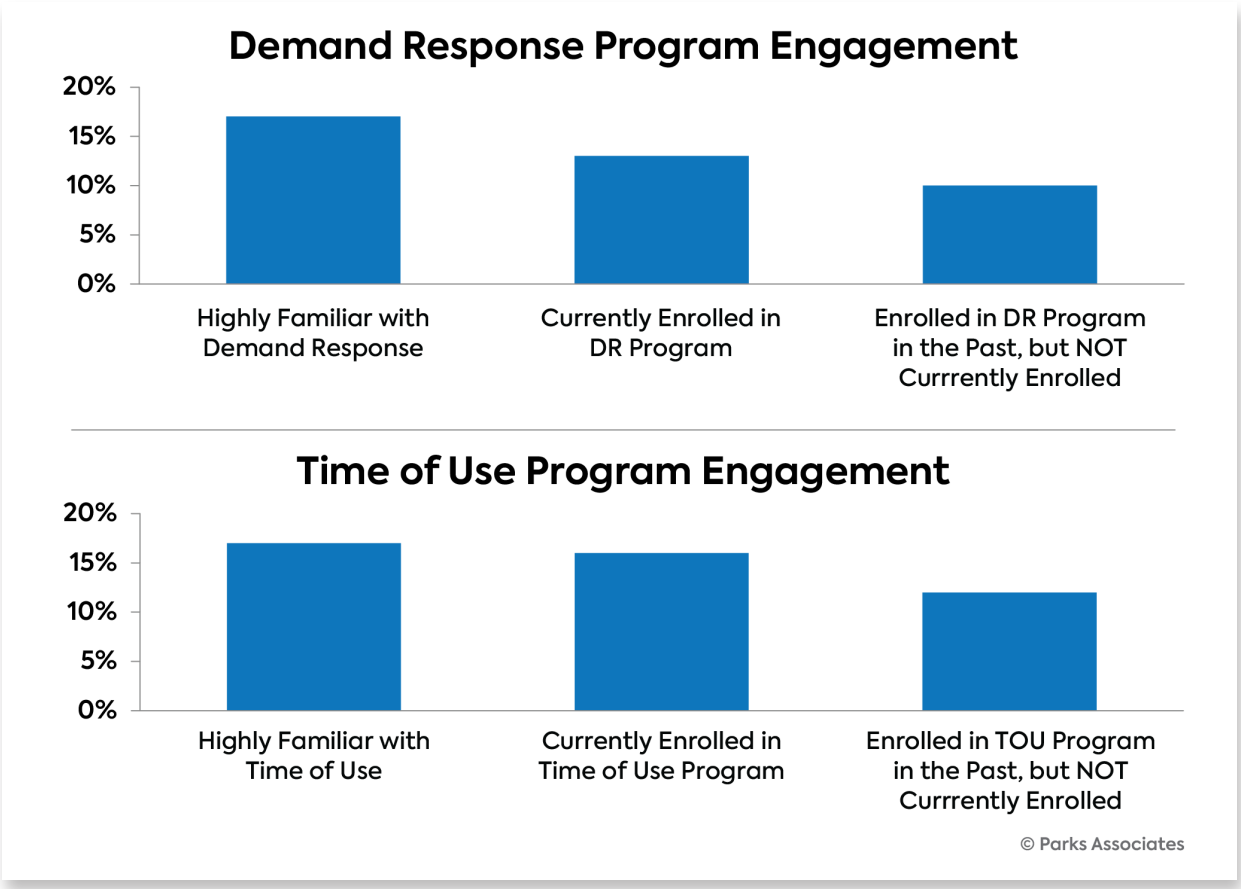
Consumer Adoption and Participation

While the benefits for these energy solutions are far-reaching, with direct benefits to the household's energy bills, getting consumers to adopt and participate has been a challenge in the energy industry. Familiarity with and participation in utility rate plans are low nationwide, despite their relatively long history.



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Energy devices such as smart thermostats, used in coordination with the right incentives to drive program participation, can deliver insights to utilities on how energy is used in the home. However, despite the universal need to control electricity budgets, a minority of households consider themselves to be highly familiar with energy devices. The current state of the energy markets has not yet delivered on the potential, and utilities don't have much insight into household energy usage behind the meter.

- Currently 16% of US internet households have a smart thermostat, and 25% plan to buy one in the next six months.
- Among households who do not have and do not plan to purchase a smart thermostat, inertia is a key factor: 72% feel that their traditional thermostat works well enough.

Other key barriers include data privacy concerns regarding devices connected to the cloud and reluctance among consumers to cede control to their energy provider.

This type of resistance may lessen with more consumer education and familiarity about how programs work. Indeed, besides hesitance to having a third-party control their devices, the top reason for not participating in demand response programs is simply a lack of awareness.

> 28% of households not currently enrolled in a DR program would not enroll in one because they do not like the idea of an outside entity controlling devices in their homes.

Notably, the experience of those who have enrolled in DR programs is relatively positive. Among those who were enrolled, more than 40% barely noticed DR events being called, and another 30% report that the experience was not as unpleasant as they expected. Utilities need to emphasize the minimal impact of these events, plus the user's ability to override an event, when promoting these programs.

Home energy management technology can optimize usage, but integration remains a challenge. Different brands and generations of products make data aggregation difficult, limiting unified control.

Manufacturers recognize the importance of interoperability as consumers expand their smart home device collections, and the biggest names are joining together to develop standards to make it happen.

Value of Integration

Utilities and energy providers would gain extensive insight and the ability to optimize energy usage if energy devices such as solar inverters, smart thermostats, room sensors, and smart blinds work together. However, many of these devices on the market and in home today are not designed to communicate actions and share data on conditions.

High-end home automation systems and systems built-out by professional integrators can coordinate energy devices with each other and with other connected devices in the home, but down market, sellers and installers are more focused on their sector rather than the whole-home concept. Solar installers, for example, are more interested in attaching EV chargers and home batteries to connect and work with the panels that are core to the business, but support for control ends at the inverter's app. Even when the solar installer is motivated and knowledgeable about smart home devices, interconnection with smart home devices is limited today to a select few platforms and families of devices.

The lack of integration restricts the value of devices to their specific use case, rather than multiple benefits that emerge through coordination, which limits their utility among end users and utilities. With better coordination and integration, users can buy bundles of products that provide superior value to those available with single devices.

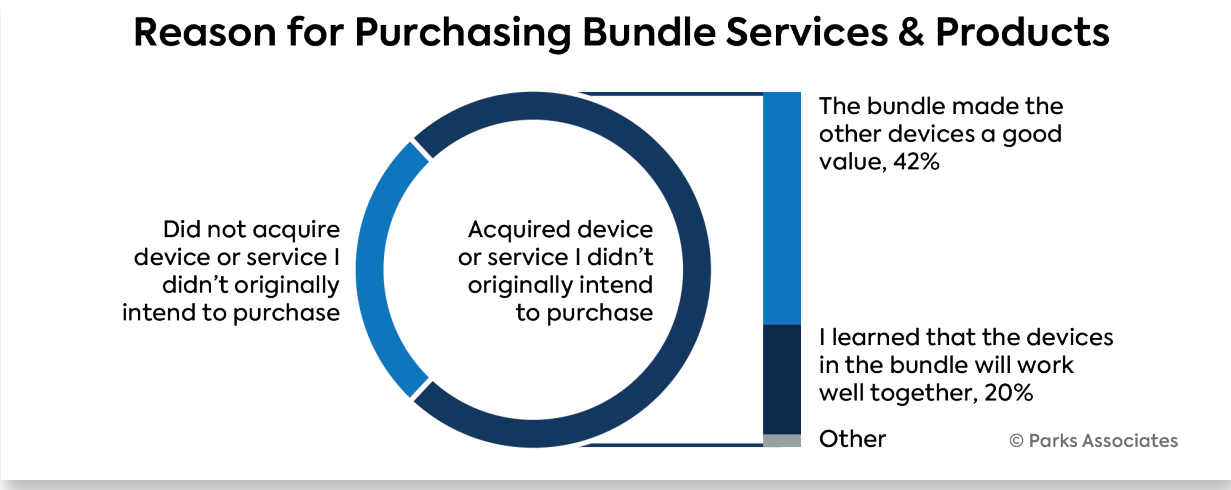
Power of the Bundle and Unified Control

The average internet household now has 16.2 connected devices, and consumers seek a simple, seamless, unified experience with this technology. Today, control of all smart devices via a single app is not the norm. The primary method by which most smart home devices are controlled is via an app that is specific to a single type of product. Consumers primarily use stand-alone apps because that follows how they purchase devices: primarily as stand-alone devices at retail. About two-thirds of recent smart home device buyers report purchasing a single device as a stand-alone product or purchasing multiple products over a 12-month period but that were not part of a bundle.

Among the 36% who did buy smart home products as part of a bundle or larger system, like a security system, the vast majority (65%) ultimately purchased devices they didn't originally intend to purchase.

One-fifth of these consumers report that they picked up additional devices in a bundle because they were confident they would work together.

This is great news for utilities, HVAC dealers, and security dealers who are offering a portfolio of smart solutions. Not only is a bundle of smart home devices an upsell opportunity, they also can be designed to work together and be controlled via a single unified app that provides dealers and utilities insight into system functioning and household behaviors. It naturally signals to consumers that the bundle or system will work together.



The quest for interoperability is now a more crucial factor for smart home players. As consumers expand the number of smart home devices and capabilities in their homes over the next few years, preferences will lean towards devices that can be part of an easy-to-install, interoperable ecosystem.

What is Interoperability, and How Does it Work?

Interoperability can be defined as the seamless interaction and data processing between diverse apps, devices, and systems, transcending the constraints of brand origins. Devices can therefore work together without user intervention. Multiple systems, possibly from unrelated domains, are choreographed to exchange, access, and interpret shared data. This is achieved through the employment of a standardized language of data formats, structured protocols, and metadata. Devices intended to collect and report the data to an app that serves a single purpose can share that data with other devices with different purposes.

In one example, home energy technology can learn home/away status from security technology such as access point sensors and smart door locks. In another example, smart appliances can ingest the availability of solar energy or battery storage available and start or delay operation accordingly. By leveraging sensors and operational status from the entire home connected device ecosystem, a smart energy device can determine why the operational state of a device changed, not just that it did. With this coordination, energy use and user experience can be optimized by interoperability.

Interoperability Efforts Are Under Way

1 Home Connectivity Alliance

The HCA was formed in 2021 and members now include GE Appliances, Electrolux, Haier, Samsung, Trane, and Resideo. The goal of the group is to create a great connected living experience for device owners by facilitating "open collaboration and innovation to provide a safe, secure and interoperable connected home experience." In January of 2023, the release of HCA Interface Specification 1.0 established an industry standard for Cloud-to-Cloud (C2C) interoperability across appliances, HVAC systems, TVs, and the smart home. C2C offers an opportunity for backwards compatibility, which is especially helpful for long-life whitegoods already in many people's homes.

2 The Matter Initiative

In late 2019, the Connectivity Standards Alliance (CSA) introduced the Matter smart home standard as a concerted effort to mitigate the prevailing issue of fragmentation and competing standards within the smart home industry. Matter aspires to establish a single communication standard that streamlines the development processes and makes it easy for smart home adopters to use devices together. Smart home adopters can mix and match brands, so long as all devices are Matter compatible, and smoothly integrate them into their existing smart home solution.

A key distinguishing feature of the Matter standard is the remarkable support it has garnered among many pivotal industry stakeholders. Despite prior endeavors to standardize smart home technologies such as the Zigbee Initiative and Z-Wave Alliance, none have managed to truly overcome the barrier of interoperability often due to inadequate backing from key industry players and the limited array of products adhering to the standard. Matter, meanwhile, has engendered support from giants of the industry including Amazon, Apple, Google, and Samsung, alongside notable device manufacturers such as Philips, ecobee, August, and iRobot, who are collectively championing its implementation. Projections within the industry foresee the shipment of over 5.5 billion Matter-compliant smart home devices by the close of the decade. Provided robust post-launch support, Matter holds the potential to fundamentally reshape the industry landscape by diminishing switching costs and lowering entry barriers for new players.

What Should Happen Next

The opportunity for energy automation is considerable, as evidenced by the 25% of US internet households without a smart thermostat who plan to purchase one in the next six months. Further, there is strong consumer demand for energy consumption details and real-time data, and the energy insights gleaned from this data could save money and energy.

Utilities and technology providers are collaborating to deliver accurate consumption information, enhancing its impact by linking it to energy bills. As more consumers recognize the potential for technology to save them money on their electricity bill, more will become more interested in energy tech – but with this demand will also come an expectation for ease of use and extensive, real-time information. The more the devices and solutions can work together to deliver on these expectations, the better the experience will be for consumers – and the faster the space will grow.

Get the word out.

Leading industry players must put their weight behind initiatives like HCA and Matter. Prominent brands can use their marketing reach and leverage over channel partners and retailers to push information to consumers so they are better educated on the benefits of interoperability.

Use the savings to innovate.

Manufacturers and software developers invest time and money in making their products compatible with as many others as possible. The players must divide their investment across all the options in the current situation of no dominant standard. With standards and connectivity alliances in place, OEMs can instead focus on making better products through R&D or including more high-quality components or features.

Break out of silos.

From the consumer's perspective, the electrical panel, kitchen, laundry room, yard, and doors are all part of the home. While products from different categories are located in each of these areas, the goal is the same for consumers: have a safe and comfortable home that doesn't cost too much to manage. Solution providers need to take the same perspective in working to leverage the technology in each of these areas to improve their solution while saving energy and expanding use cases.

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About Parks Associates

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Parks Associates, a woman-founded and certified business, is an internationally recognized market research and consulting company specializing in emerging consumer technology products and services. Founded in 1986, Parks Associates creates research capital for companies ranging from Fortune 500 to small start-ups through market reports, primary studies, consumer research, custom research, workshops, executive conferences, and annual service subscriptions.

The company's expertise includes new media, digital entertainment and gaming, home networks, internet and television services, digital health, mobile applications and services, consumer apps, advanced advertising, consumer electronics, energy management, and home control systems and security.

About Resideo

Resideo is a leading global manufacturer and developer of technology-driven products and components that provide critical comfort, energy management, and safety and security solutions to over 150 million homes globally. Through our ADI Global Distribution business, we are also a leading wholesale distributor of low-voltage security and life safety products for commercial and residential markets and serve a variety of adjacent product categories including audio visual, data com, wire and cable, and smart home solutions. For more information about Resideo, please visit www.resideo.com.

About the Author

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Jennifer manages the research department and Parks Associates' process for producing high-quality, relevant, and meaningful research. Jennifer also leads and advises on syndicated and custom research projects across all connected consumer verticals and guides questionnaire development for Parks Associates' extensive consumer analytics survey program. Jennifer is a certified focus group moderator, with training from the Burke Institute.

Jennifer earned her PhD in religion, politics, and society and an MA in church-state studies from Baylor University. She earned her BA in politics from the Catholic University of America in Washington, DC.

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