



Building Net Zero Homes with Home Management Systems

IN PARTNERSHIP WITH:

Nice



Introduction

According to the US Department of Energy, approximately 130 million residential and commercial buildings consume 39% of the nation's energy and 74% of the electricity. This energy usage significantly contributes to peak demand in certain regions during high-demand seasons. These buildings are responsible for about 35% of the country's carbon emissions. These emissions stem from direct sources, such as heating homes and offices with fossil fuels, and indirect sources, like power plants generating electricity for these buildings.

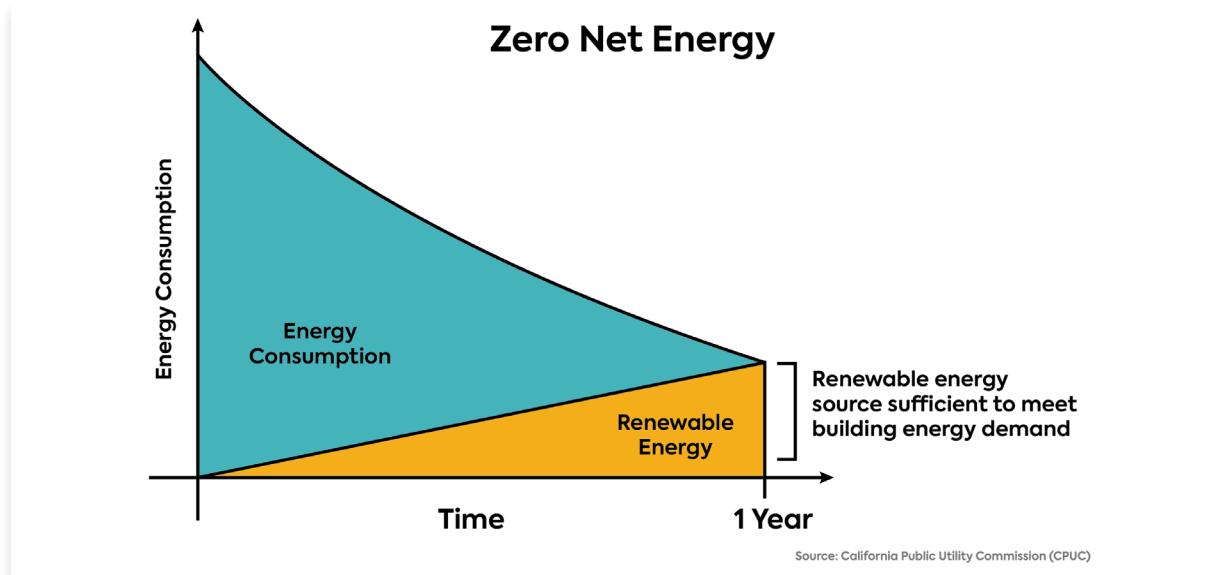
Parks Associates research shows consumers continue to be a magnet to new technology. Now, the average internet household has more than 16 connected devices, and 30% have an adult who works from home at least once a week. In addition, 16% of households own a smart thermostat, and many are looking to reduce their energy consumption. According to the US Energy Information Administration, 15% of household energy is from lighting, and a third of the electricity used is from the heating/cooling systems in the home.

Advanced technologies in homes enable the ability to control energy usage and reduce energy consumption.

Enter the ZNE home:

A ZNE home, also referred to as a Zero Energy Building or a Zero Energy Ready Home, is a home that consumes no more energy than it produces in a year. To achieve this, ZNE homes are extremely efficient, leveraging cutting-edge building materials and methods, smart thermostats, and energy-efficient appliances to keep the home's energy consumption as low as possible without seriously inconveniencing the homeowner.

ZNE homes also produce their own energy from renewable sources. In the most common scenario, photo voltaic (PV) solar panels capture energy from the sun and convert it to electric energy. The solar energy produced offsets the energy the home typically uses.



In addition to benefits to the environment and society, ZNE homes also benefit the owner:

Save money

A ZNE home incurs no additional electricity costs from a service provider. This is made possible by the low energy consumption overall and solar generation during sunny hours of the day. The cost of electricity consumed at night is offset by credits from the electricity provider for electricity generated by the solar panels. When the home solar system makes more energy than the household needs at a given time, there is the opportunity in 17 states to sell surplus power back to the grid.

62% of internet households say electricity costs are too high

In every large demographic group, including high-income families, no fewer than 55% complain of high electricity costs. A ZNE home would eliminate this concern and result in real savings. The average cost of electricity for a US internet household is around \$150 per month, so the annual savings for many homes would exceed \$2,000.

Foster energy security, resilience, and even independence

A core challenge of achieving ZNE is the homeowner's energy consumption is misaligned with the home's energy production. Energy production can be higher or lower than energy consumption, depending on the time of day, day of the week, or season. With the inclusion of battery storage, a ZNE will allow households to maintain normal electricity during longer blackout periods compared to homes with only some of the ZNE features (energy-efficient envelope, home automation, solar, etc.).

These homes are also well-positioned to be set up for "islanding" or complete independence from the electrical grid, either by including a large gas-burning generator or batteries to power the home when the sun isn't shining. These additions would be costly, but for consumers with the means and motivation, the energy-efficient build of ZNE homes and the frequent inclusion of home automation could help the solar, generator, and battery power sources handle all the household's energy needs.

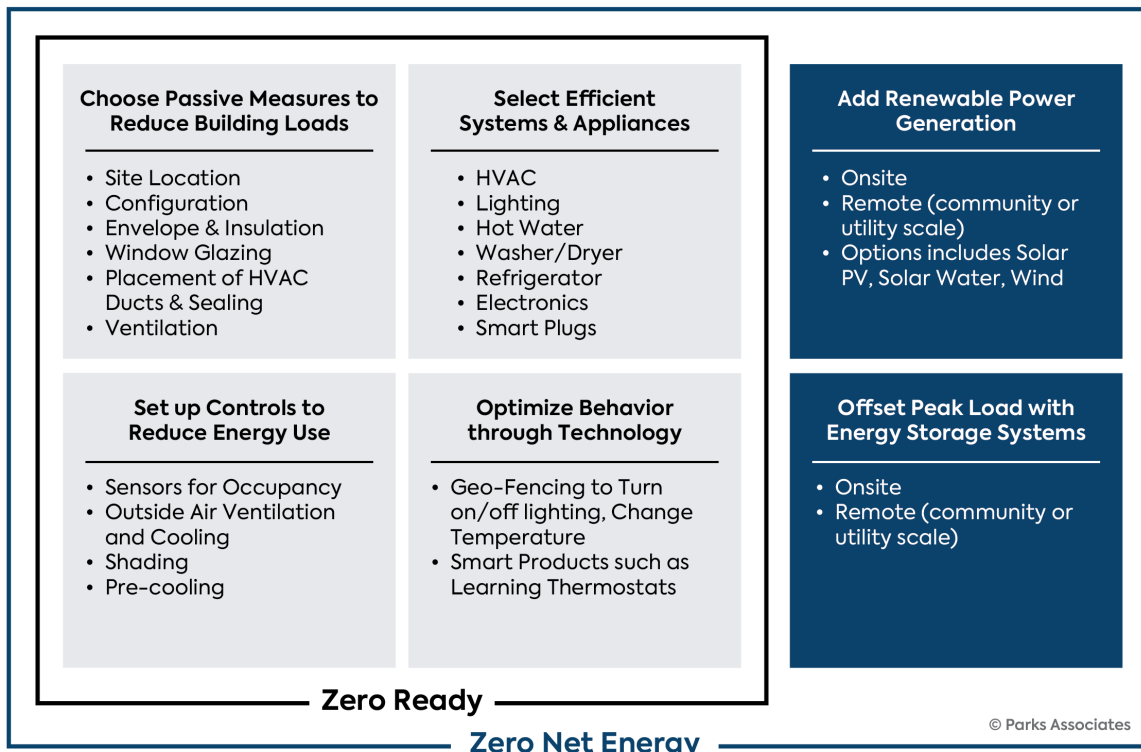
Building Net Zero Energy Homes

The ZNE building process begins with the design and construction of the building envelope by reducing air leakage and energy loss and purposeful ventilation. For example, 4' x 6' walls are filled with insulation and then covered with exterior insulation. Attic insulation is critical to minimizing energy loss and is often minimal in traditional construction. The heating and cooling ducts are tightly sealed and placed in the conditioned space to minimize energy loss. Windows and doors are high performance and placed for maximum daylighting and passive solar heating.

Once the building shell is as efficient as possible, all interior appliances, lighting, and equipment are selected: LED lighting and Energy Star® heating and cooling equipment and appliances. Smart communicating thermostats are installed. Then, set points are programmed to minimize energy use, and occupants are trained. These steps result in a near zero or zero ready home.

By adding enough energy production onsite, the home can become zero net energy efficient.

The Process of Achieving a Zero Net Energy Home



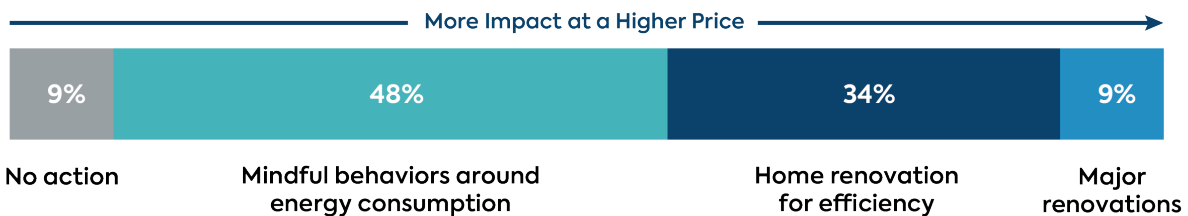


Drivers for Net Zero

Consumer Demand for Energy Efficiency

Parks Associates research indicates that nearly all (91%) internet households are actively engaged in reducing energy consumption within their homes.

Actions Taken to Reduce Energy Consumption



- 48% report altering their behaviors to consume less energy
- 34% made modifications to their homes to achieve greater energy efficiency
- 9% added major energy equipment like solar panels

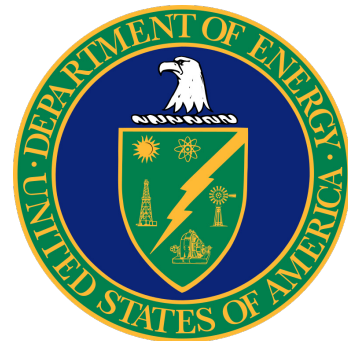
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The Government's Role: Policy, Codes, and Incentives

On August 16, 2022, President Biden enacted the Inflation Reduction Act, providing a landmark investment, including \$500 billion in new spending and tax breaks to boost clean energy and reduce inflation. While the IRA aims at curbing inflation and strengthening the economy, the bill is also the most significant legislation for the renewable energy space in nearly two decades.

The Inflation Reduction Act amended the Internal Revenue Code Section 45L, offering taxpayers a tax credit for new or substantially reconstructed homes meeting ENERGY STAR or DOE Zero Energy Ready Home (ZERH) program requirements. The credit has two tiers, with higher credits for eligible homes certified to ZERH requirements. Single-family and manufactured homes eligible for ENERGY STAR programs can receive a \$5,000 credit, while multifamily units can get \$1,000 or \$5,000 per unit with prevailing wage compliance. These rules apply to energy-efficient homes acquired between December 31, 2022, and January 1, 2033. Notable for retrofit projects, the law also raised the federal tax credit for solar panels to 30% through 2032. It included new tax credits for home energy management devices and battery storage.

In addition to federal action, many state and local governments have strategies in development or in place to increase use of renewables, and some have specific goals today regarding net zero home building and renovation. States and jurisdictions do not typically develop their own codes, but rather adopt model codes, so it is notable to see a movement toward energy efficiency in codes in development by many influential code-making bodies.



Notable Code: ASHRAE Standard 90.1

ASHRAE Standard 90.1 is the energy code used for commercial and multifamily buildings that are over three stories high. It is developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). Residential buildings below three stories, on the other hand, follow the International Energy Conservation Code (IECC) developed by the International Codes Council. ASHRAE plans to achieve a net zero carbon 90.1 model code by 2031, while the International Codes Council has an Energy and Carbon Advisory Council to guide the development of the IECC.

Notable Policy: California's Title 24

California's Title 24 encompasses the most advanced energy standards, which have been mandatory for residents since 1978 and promote responsible and sustainable energy usage in the state. To enhance energy efficiency state-wide, California has set ambitious goals for commercial buildings. By 2030, the state aims for all newly constructed commercial buildings to achieve Zero Net Energy (ZNE), with 50% of existing commercial buildings retrofitted to meet ZNE standards.

These goals necessitate changes in building practices, affecting elements such as the building envelope, HVAC thermostats, indoor lighting levels, lighting controls, and exterior lighting in remodeling and new-construction retail projects. While California is often seen as being at the forefront of energy policy, the success of Title 24 could influence other states to adopt new energy policies.

ZNE Home Construction Outlook

In a trend quickly becoming the norm, builders are making a highly energy-efficient home an option for customers, and whole planned communities are cropping up around the US. According to the Department of Energy, there are now more than 12,000 certified ZERHs (Zero Energy Ready Homes) across the country. Additionally, boutique home builders have built homes that are zero-capable but are not certified. Others are built to be highly energy efficient, and while some of these homes may not be ZNE capable at the time of purchase, additional actions by the home buyer, such as adding solar panels, would move the homes toward "zero."

Hoffman Homes is growing a net zero community not far from Parks Associates in Dallas, while the home of Smart Energy Summit, Austin, Texas, is the home of Whisper Valley and Build NATiVE.

Colorado's largest net-zero ready affordable housing development is currently under construction by The Boulder County Housing Authority, aiming to create a sustainable and energy-efficient living space. The project focuses on providing affordable housing options while incorporating innovative design and construction techniques that minimize environmental impact. The development's net-zero ready status indicates its capability to generate as much renewable energy as it consumes, contributing to reduced carbon emissions and long-term cost savings for residents, and Colorado's commitment to sustainable urban development and addressing housing affordability challenges.

Ball State students in the College of Architecture and Planning have constructed an eco-friendly, net-zero home on the east side of Indianapolis, showcasing sustainable features such as solar panels, rainwater collection, and energy-efficient appliances to promote environmentally conscious living and provide a model for future housing designs. This project is part of the US Department of Energy Solar Decathlon® 2023 Build Challenge, "a national competition that challenges student teams to design net-zero homes that generate at least as much energy onsite as it consumes on an annual basis."

The city of Milwaukee is actively seeking developers to construct two net-zero test energy homes, emphasizing sustainable and energy-efficient designs, as part of their efforts to promote environmentally friendly housing and address energy consumption challenges. The project is led by the Environmental Collaboration Office (ECO) and the nonprofit Community Development Alliance (CDA).

In North Carolina, a new development in homes called the Array Sustainable Living community features energy-efficient homes that showcase sustainable living through features like solar power, energy-efficient systems, and a rainwater collection system, serving as an example of eco-friendly housing and emphasizing the potential for sustainable living practices.

build™

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The Build Show, a streaming content leader for home construction, is working with residential construction expert and former builder **Mark Wille** to build a ZNE home in Boston and airing the details of the production process in a 14-part series, The Build Show Build Boston. Mark shared that predictability is a big driver for building a Net Zero home, as it allows the homeowner “to know the cost to operate a space, which allows for investment in other parts of life.” In addition to a tight building envelope, careful design to optimize air flow and natural lighting, and solar power generation, Mark emphasized the importance of coordinating with home automation suppliers, for products like window shading.



“Window shading is a huge benefit to energy, comfort, and privacy, not to mention looks. The electricians and framers had finished their work and the insulation professionals and drywall crew were right behind them with deadlines to meet. The equipment was integrated in this small moment of time. Once the drywall and paint are completed the final installation and connection of the automation products will happen, and you will not even notice them except for the enjoyment they offer.”

GDK, the smart home integrator on the home build, also shared that planning routes for wires and accommodating devices require careful consideration in a Net Zero build, as they must not compromise the building’s envelope integrity. This is particularly important for products like integrated ceiling speakers and other elements that might introduce air leakage.

Both the builder and integrator see a need for more training around Net Zero techniques for builders. According to GDK, “The benefits of Net Zero building practices need to be taught to builders. For any movement to happen with this, it has to be shown to be more profitable for the builder and cost effective to the homeowner. In other words, if you can tell the homeowner that spending 20% more on a Net zero house will pay for itself in five years and then start to show a profit, it would be far more palatable. This equation needs to be simple and straight forward without any rhetoric.”



Nice is one of several industry partners in the Build Show project demonstrating the importance of technology and automation in building a net-zero home. Mark Wille, when asked about his experience working with Nice, used one word: “Seamless.”

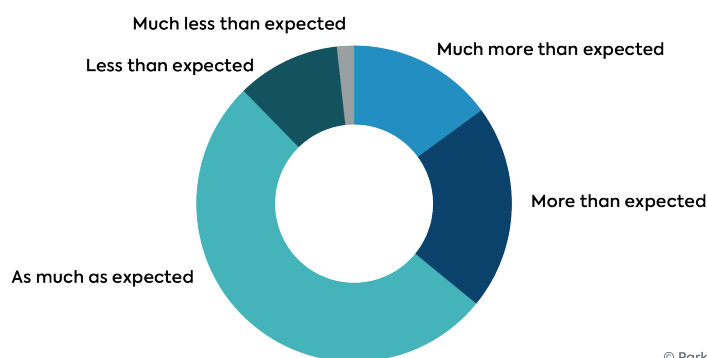
“The electricians and framers had finished their work, and the insulation professionals and drywall crew were right behind them with deadlines to meet. The equipment from Nice was integrated in this small moment of time. Once the drywall and paint are completed, the final installation and connection of the Nice products will happen, and you will not even notice them except for the enjoyment they offer.”



Role of Smart and Automated Solutions in ZNE Homes

According to the US Energy Information Administration, heating and cooling represent the biggest electrical load—about a third of the energy used in the home. To better manage this expenditure, 16% of consumers have incorporated automation into their energy-saving efforts by adopting smart thermostats. The outcomes have been overwhelmingly positive, with a remarkable 88% of users attesting to saving as much, if not more, money than initially expected.

Perception of Energy Saving among Smart Thermostat Owners



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Smart thermostat owners say their thermostats saved them 22% on average on their energy bill.

These savings represent a great success for a solution that can cost under \$300. Other home energy automation products are available to support maximum efficiency for each major electrical load and energy-efficiency considerations (below) by enabling remote or automated on/off and scheduling activities when energy rates are lowest.

- Heating, Ventilation, and Air Conditioning – Smart thermostats and smart A/Cs
- Monitoring fenestration and building envelope – Temperature and humidity sensors
- Appliances – Energy-efficient appliances, smart appliances
- Lighting – Smart lighting systems, smart light bulbs, smart switches
- Miscellaneous plugged devices – Smart plugs, smart power strips, smart TVs

Energy consumers want information they can use to make behavioral decisions regarding their energy usage. Viewing whole-home energy usage in real time continues to provide high value to consumers, as 25% of households rank this ability as the most valuable for managing energy usage and costs.

At present, home energy management systems including smart electrical panels and the devices above can provide access to this type of real-time data. Energy monitoring technology can aid residents in achieving the goal of ZNE in their homes by allowing them to manage their energy-consuming activities.

70% of consumers are interested in energy consumption details regarding their devices/appliances and want real-time energy data.



Electricity Providers' Rate Programs

Energy efficiency and technology can help reduce overall consumption, but the electricity provider needs to be involved to optimize consumption and generation. Most providers have rate programs designed to reward homes with excellent efficiency, EV chargers, and energy automation with good rates in exchange for collaboration.

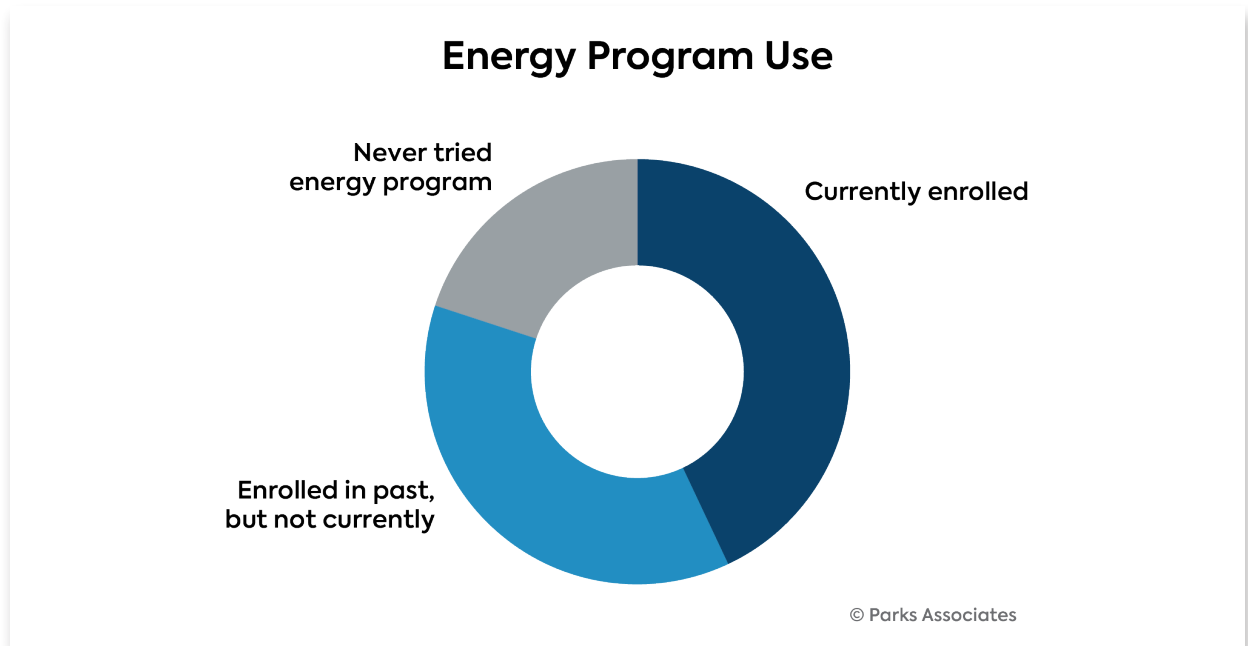
- Duke Energy's Power Manager pays smart thermostat owners to allow Duke to adjust their temperatures by four degrees during the hottest and coldest days.
- Con Edison pays electric vehicle (EV) owners for off-peak charging and facilitates a \$5,000 discount for energy-efficiency renovations like adding insulation and sealing air leaks.

In this way, even homes that are not ZNE can still find savings by leveraging technology or modifying their behaviors.

Despite the potential for households to benefit from these programs and save on their energy costs, a considerable number of customers remain unfamiliar with the rate programs offered by their service provider.

43% of households indicate that they are utilizing a special rate energy program.

Among the 43% of households who are using a special rate energy program, 11% are new users, suggesting a gradual uptake of these programs. However, overall familiarity with these programs has shown limited progress. Over the past five years, the percentage of households claiming to be highly familiar with rebate, time-of-use (TOU), demand response (DR), tiered pricing, and EV plans has not exceeded 26% for any specific program. When a household is considering buying a ZNE home, an understanding of how the rate programs can optimize energy cost is important.



Parks Associates data indicates the potential for uptake in energy programs is high. A significant majority of households, 77%, express a willingness to participate in these programs if they can save \$50 or more. A ZNE would save \$50 very easily, after the large investments are made in this type of home.





Moving to Net Zero

Many obstacles exist in the marketplace, such as lack of awareness and knowledge, and tight budgets during a difficult economic time. However, demand for energy savings and the push from governments and utilities via policies, codes, and legislation will drive innovation in the Net Zero space and increase interest from consumers in ZNE homes.

Implications on the Net Zero Players

Electricity Providers

With the goals to reduce energy consumption and greenhouse gases, expect renewable energy and storage to exist behind the meter, at the micro-grid community level and at larger scale utility operations. The distributed energy segment will continue to see rapid gains in efficiencies and lower costs as adoption increases. Enhanced load shedding and load shifting will be implemented to optimize renewable wind, solar, and storage.

Builders

As demonstrated by the collaboration between the National Renewable Energy Laboratory and Habitat for Humanity in Colorado, new construction of ZNE homes can be cost effective. The demand is there – 62% of households say their electricity bills are too high so the new group of home buyers will certainly see the appeal of energy-efficient homes. While some builders have differentiated themselves by offering higher efficiency homes and focusing on the additional benefits, the status quo remains for the majority. Builders who are willing to invest in the skills and materials needed to build net zero homes have an opportunity to tap into a growing market.

Smart Home Players

Smart home manufacturers and retailers have an opportunity to work with builders to develop smart home packages that support the ZNE goal. Custom builders have full flexibility with regards to brands and mixes of devices. Production builders will want a more standardized solution, representing an opportunity to sell in bulk but an implicit requirement for cost savings and additional support. Also, manufacturers and installers of connected energy devices have an opportunity to work with energy providers and policymakers to push for their products to be included in requirements for energy-efficiency programs that work in a ZNE context.

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 Nice



Nice is a global leader in Home and Building Management solutions, and a leading manufacturer offering a complete ecosystem of integrated products for smart home management, security and automation, perimeter access, protection and control, sunshade solutions, energy management, and whole-home entertainment. The company leverages the expertise and innovation of its global network to expand its portfolio of connected technology and deliver high-quality customizable solutions that seamlessly integrate into everyday lives. Today, Nice spans five continents and owns more than 14 R&D centers and 13 production plants serving its partners and customers across 100 countries. For further information, visit www.niceforyou.com.

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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.

ATTRIBUTION

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RESEARCH & ANALYSIS

for Emerging Consumer Technologies

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Smart Home Devices and Platforms



Digital Media and Platforms



Home Networks



Digital Health



Support Services



Entertainment & Video Services



Consumer Electronics



Energy Management



Home Control Systems



Home Security