

Looking ahead: How connected thermostats can deliver high impact at a low cost

Low-income program managers are actively choosing connected thermostats for their ability to deliver high-impact energy savings at a reasonable cost, improve comfort, and adjust to individual households' preferences. Nest has partnered with more than 30 energy efficiency programs that have a low-income component, and more partnerships are expected in the future.

Regulators are also taking note. In California, the Public Utilities Commission is testing smart thermostats as a way to help low-income households adapt to default time-of-use rates. New York is also investing in smart thermostats for low-income participants, with the New York State Energy Research Agency partnering with National Grid on a pilot for smart thermostats near Buffalo.⁸

Oregon has gone even further. The Oregon Public Utilities Commission, Oregon Department of Energy, and Oregon Housing Community Service have noted the significant energy savings potential from smart thermostats. In their "Ten-Year Plan: Reducing the Energy Burden in Oregon Affordable Housing,"⁹ they wrote, "Analyzing natural gas savings, there was one measure that

clearly stood out as having the highest cost-effective achievable potential savings – smart thermostats in homes with gas furnaces. This measure was cost-effective for all types of existing housing, including multi-family, manufactured housing and single-family."¹⁰ Savings are projected to be 3 million therms and 98 million kWh, equivalent to \$14.7 million in potential bill savings and 52,600 metric tons of CO₂e annually.¹¹

Nest is committed to supporting energy-saving programs like these across the country and bringing affordable energy efficiency to those who need it most. Nest thermostats are a multi-purpose tool for these programs because they build on improvements like insulation, weather stripping, and efficient appliances by adding advanced controls and automating energy-saving behaviors. The Nest Thermostat E is also available at a lower price than many other connected thermostats, so it offers even more attractive payback. And because the technology is designed for engagement through a visual interface, saving energy is easier for most customers.

“Improving quality of life while being efficient, that’s a great thing for everyone. Nest is an excellent way for us to bring energy-saving technology to all of our customers. They really knew what we were trying to do with the low-income offering.”

Ray Martinez, program manager for Residential Energy Efficiency Programs & Services, TEP

⁸<https://www.nysersda.ny.gov/ny/Smart-Thermostat-Pilot>
⁹<https://www.oregon.gov/energy/Get-Involved/Documents/2018-BEEWG-Ten-Year-Plan-Energy-Burden.pdf>
¹⁰Ibid., p. 14
¹¹Ibid., p. 36-37



Connected Thermostats and Low-Income Energy Programs: High Impact, Low Cost

Smart thermostats have now proven they can complement core weatherization and appliance upgrade measures to deliver meaningful savings.

Everyone wants to save money on energy bills, but for the one in four American households that struggles with a high energy burden, cutting costs is critical. These families spend at least 20% of their monthly income on energy, compared with 3.5% for the average American.¹ They include more than 22 million children, elderly customers, and people with disabilities.

The average American family spends 3.5% of their income on energy

Many lower-income families spend 20% of their income on energy

Access to affordable energy is an acute need for these families – but eliminating the energy burden is a perennial challenge. Although many utilities have sizeable programs for low-income customers, they often have many more households in need of assistance than they can serve with available funding.

While traditional weatherization programs have proven successful in reducing the energy burden, a growing number of low-income programs are looking at a new class of measures driven by advanced technologies beyond LEDs. Technologies that can meaningfully reduce heating and cooling, which account for about 50% of a U.S. home's energy usage, are the most promising way to deliver high impact at a reasonable cost.

When smart thermostats came on the market about a decade ago, they quickly became a welcome alternative for both consumers and installers, who had relied for decades on traditional programmable thermostats that tended to be underused once they were installed. As a result, ENERGY STAR de-listed them as an energy-saving device – until Wi-Fi thermostats like the Nest Learning Thermostat came onto the market and met ENERGY STAR criteria.² Today, smart thermostats outsell programmable thermostats, but adoption is not equal across household segments.³

Smart thermostats are still among the least common measures adopted by utility low-income programs.

ENERGY STAR® approved smart thermostats have been proven to drive substantial HVAC savings – but a 2017 study found that smart thermostats are still surprisingly among the least common measures adopted by low-income programs.⁴ Nest has been focused on closing the gap between customer need and program resources through an initiative called the Nest Power Project, which began in April of 2018.

¹<https://aceee.org/sites/default/files/publications/researchreports/u1806.pdf>
²https://www.energystar.gov/ia/partners/prod_development/revisions/downloads/thermostats/Spec_Suspension_Memo_KeyDates.pdf?8fd5-1967
³<https://www.greentechmedia.com/articles/read/smart-thermostats-start-to-dominate-the-market-in-2015#gs.VNRxucC8>
⁴<https://aceee.org/sites/default/files/low-income-baseline-1117.pdf>

Nest Power Project

Nest launched the Power Project to raise awareness of the energy burden for low-income customers. It's a commitment to install 1 million thermostats in homes that need them most, in collaboration with energy companies, housing agencies, and non-profit organizations that are working to bring energy efficiency to everyone.

Power Project partners benefit from special pricing on the Nest Thermostat E, which costs less than the Nest Learning Thermostat, increasing its savings-to-investment ratio and shortening the payback period. And the Nest Thermostat E delivers the same learning capabilities as other Nest thermostats, making energy savings easier.

Here are some ways Nest thermostats have shown they can add value to income-qualified programs:

- They're ENERGY STAR certified, so users can be confident about their energy-saving potential.
- They're easy to use, with simple-to-read interfaces and multi-language capability, so users can balance comfort and energy savings without adjusting schedules and settings.

- They're designed to work even without Wi-Fi, which is not required for the core energy-saving functionality.
- They allow for either control or automation of temperature settings.
- Aggregated, anonymized data from the thermostats can support measurement and verification for program management and refinement.
- Once weatherization measures have been installed, Nest thermostats encourage efficient behavior by rewarding efficient choices.

Nest thermostats have easy-to-read interfaces and multi-language capability, and they don't require Wi-Fi for core energy-saving functionality

Case study

Colorado Energy Office Weatherization Assistance Program

As part of its low-income weatherization program, the Colorado Energy Office Weatherization Assistance Program (WAP) launched a pilot project in 2016 to test the incremental energy savings potential from the installation of Nest thermostats.

They found that homes that installed a Nest thermostat used an average of nearly 10% less heat than participants who only received weatherization measures.⁵ Participants received a

one-page sheet about product features, but relatively little direct guidance on maximizing the energy savings benefits. With more education and resources, participants in other programs could see even higher energy savings in the future.

Although Wi-Fi was not required, as most energy-saving features of the Nest thermostat still operate without it, 81% of participants who had the thermostat did have Wi-Fi. The evaluation found that homes with and without Wi-Fi saved at similar levels.

“**The Colorado Weatherization Assistance Program is one of the top programs in the nation. We've built a lot of working and political capital because of our strong processes and quality assurance services. Other programs might focus on Weatherization 101; we deliver Weatherization 101, 201, 301. We're dialed in, which enables us to be proactive, creative, and innovative.**”

Ryan Manzik, senior program manager at the Colorado Energy Office

⁵Evaluation of Energy Savings from Colorado Weatherization Assistance Program, Nest Thermostat Pilot, August 2018. Individual savings depend on utilization of energy saving features and are not guaranteed.

Other findings included:

- Homes that received a Nest thermostat achieved average gas savings equal to 24% of pre-program heating use, compared to 14% heating savings for comparable standard WAP clients (18% vs. 11% of total gas use.)
- Cost-effectiveness analysis using the Weatherization Assistant National Energy Audit Tool showed that Nest thermostats were very cost-effective, with savings-to-investment ratios (SIRs) ranging from 4.3 to 8.6. (By comparison, overall federal weatherization programs deliver an SIR of approximately 1.5).⁶

Weatherization programs that used a Nest thermostat increased savings by 64%

Additional partnerships

Tucson Electric Power (TEP)

Nest also partners with low-income programs that exclusively serve multi-family units. TEP saw the potential for connected thermostats to help customers save energy and improve their quality of life, so the utility invested in a pilot with property managers of affordable housing complexes. The program installed 4,200 Nest Learning Thermostats in low-income apartments, along with other direct-installed energy efficiency measures like low-flow showerheads and LED light bulbs.

Southern California Gas Company (SoCalGas)

In California, leading utilities are also looking beyond weatherization and water-saving showerheads. Last year, SoCalGas partnered with electric utilities to install more than 75,000 Nest thermostats in low- to moderate-income (LMI) homes through their single-family, multi-family, and mobile home direct install programs. Now, in 2019, SoCalGas looks to provide even more connected smart thermostats to customers through these direct install programs, as well as its Energy Savings Assistance Program. This LMI commitment allows customers to further benefit from an energy efficiency thermostat optimization service, with enrollment growth over 30% in the past year.

- WAP clients were able to use the thermostat successfully. Data from the thermostats indicated that WAP participants had heating set point schedules and setbacks that were just as efficient as those of other nearby Nest customers.
- The total weatherization treatment cost was only slightly (5%) higher in the Nest homes, which were likely to be leakier than the homes that did not have a Nest thermostat.

Consumers Energy

As part of the Power Project, Michigan's Consumers Energy announced in 2018 that it will install 10,000 Nest Thermostat E's to income-qualified customers in the next three years. The commitment is part of Consumers' Helping Neighbors program, which provides free energy assessments and energy- and water-saving upgrades for low-income customers, including renters in multi-family buildings.

“We're excited to be Nest's partner in Michigan to make a difference in so many people's lives,” said Patti Poppe, Consumers Energy's president and chief executive officer. “We want to be part of the solution to help our friends, family, and neighbors to reduce energy waste and lower their monthly energy bills.”⁷

⁶https://www.energy.gov/sites/prod/files/2015/08/f25/WAP_NationalEvaluation_WxWorks_v14_blue_8%205%2015.pdf

⁷<https://www.marketwatch.com/press-release/consumers-energy-nest-announce-goal-to-provide-10000-free-thermostats-to-michigan-households-2018-04-23>