

➤ Thermostat Optimization

A. Description

The Thermostat Optimization product is a multi-tiered product designed to provide residential customers year-round savings through the use of smart thermostat technology. The first tier incentivizes residential customers to purchase and install smart thermostats that have earned the ENERGY STAR® Connected Thermostat certification, resulting in year-round electric and natural gas savings. The second tier of the Thermostat Optimization product aims to leverage available software and customer experience tools that optimize smart thermostat operations to deliver additional savings that may also improve customers' comfort and overall user experience.

ENERGY STAR lists the following key product criteria as requirements for certified smart thermostats¹:

- Work as a basic thermostat in absence of connectivity to the service provider;
- Give residents some form of feedback about the energy consequences of their settings;
- Provide information about heating, ventilating and air conditioning (“HVAC”) energy use, such as monthly run time;
- Provide the ability to set a schedule; and
- Provide the ability to work with utility programs to prevent brownouts and blackouts, while preserving consumers' ability to override those grid requests.

Tier 1 – Purchase & Install ENERGY STAR Smart Thermostat

The concept of realizing energy savings by programming a thermostat is straightforward: scheduling temperature setting changes (setbacks) during times when home occupants are away or asleep ensures no energy is wasted when no one is home or awake. Thermostats meeting the ENERGY STAR Connected Thermostat specification have demonstrated the ability to achieve energy savings through HVAC equipment runtime reductions, specifically an 8% or higher reduction in heating equipment runtime and a 10% or higher reduction for cooling equipment runtime.

These runtime reductions are achieved by smart thermostats through a variety of methods, starting with the ease of scheduling. These devices make it easier to program efficient setback schedules compared to their non-communicating predecessors. Additionally, customers can make temporary or daily changes to setback schedules without having to reprogram the device, and devices can automatically return customers to their normal setback schedule to avoid wasted energy from an inefficient set point. There are other advanced features available from certain devices, such as motion sensors that can direct thermostats to go into a more efficient mode when no motion is detected in

¹ https://www.energystar.gov/products/heating_cooling/smart_thermostats/key_product_criteria

the home, or allowing customers to enter temporary vacation schedules which take advantage of additional savings opportunities without having to completely reprogram the thermostat. The smart thermostat market is relatively young, and these advanced features are expected to grow as manufacturers continue to innovate.

Tier 2 – Optimize ENERGY STAR Smart Thermostat

In addition to ongoing product innovations by thermostat manufacturers, third-party software firms have begun to provide additional optimization functionality that promises to proactively manage consumer thermostats for deeper energy efficiency and demand management functionality without negatively impacting customer comfort.

Thermostat optimization products vary in capabilities and methodologies. Advanced software offerings analyze a volume of data points – e.g. outdoor temperatures, indoor temperature gains and losses, HVAC equipment runtimes, desired temperature set points, and other public and proprietary datasets – and use advanced algorithms to provide individual, premise-optimized energy efficiency and demand management opportunities through more efficient operation of HVAC equipment operation. Optimization algorithms can be tuned to optimize based on customer and/or utility priorities, such as efficiency savings, maximizing Demand Response capacity, or cost savings using time-of-use or demand pricing (among other priorities). Optimization can also be achieved by customers opting into a seasonal program that evaluates their setback schedules and activity in the home through motion sensor data, then deploys more efficient temperature set points and schedule changes to increase energy savings.

The Company began piloting thermostat optimization products in 2017 and preliminary results show energy savings and support additional efficiency and demand management achievements, while further reinforcing high customer satisfaction related to smart thermostat technology. The first pilot deployment during the summer of 2017 tested an advanced software tool that provides optimized thermostat schedules for each participant based on their individual characteristics; including data from their existing thermostat schedule; their home's thermal model calculated from outdoor temperature, indoor temperature set points, indoor temperature gains, and HVAC equipment runtime; and occupancy schedules based on motion sensor data, etc. The results showed a significant reduction in equipment runtime, resulting in energy savings for participants. The 2017 pilot has continued during summer 2018 to build upon the 2017 results.

The second optimization deployment occurred during the winter of 2018. The Company tested a different optimization algorithm that's typically deployed seasonally and evaluates participants' setback schedules, then gradually deploys more efficient temperature set points and schedules during an initial adjustment period of approximately three weeks. Once that initial period is over, the new efficient schedule remains on each participant's thermostat for the remainder of that season. Results from this deployment to nearly 12,500 participants showed an average temperature set point change of 0.81 degrees Fahrenheit, and an average heating equipment runtime reduction of 4.4%. The

Company is continuing the testing for this optimization tool during the summer of 2018 to study savings potential during the cooling season.

Both pilot deployments showed encouraging results and the potential to increase energy efficiency and demand management savings from smart thermostats on top of savings inherent to the ENERGY STAR certification. The Company will continue to test optimization technologies and approaches as this market is expected to evolve and grow similar to the consumer smart thermostat market. Further, thermostat optimization represents an appealing choice to customers as variable rate designs enter the market and more advanced demand management programs become available to residential customers.

B. Targets, Participants & Budgets

Targets and Participants

Tier 1 participation targets are based on past performance of the Smart Thermostat Pilot and AC Rewards products. The Tier 1 offering will be available to all residential customers in single-family homes with central air-conditioners. The Company will continue evaluating potential for customers in other dwelling types or cooling systems, such as multifamily buildings or customers with heat pumps, for potential eligibility in the future.

Tier 2 participation is based on leveraging the installed base of smart thermostats within the Company's service territory.

Savings will be determined based on actual participation within each Tier offering.

Budgets

Program costs are driven primarily by two categories: participant rebates and product administration. The majority of participant rebates are attributable to the Tier 1 offer which provides up to a \$50 rebate to each approved participant. Program administration costs include internal labor to manage the day-to-day operations of the program and third-party fees such as software licenses, annual device fees, data access and marketing support. There are minimal costs included in the Marketing and Evaluation categories.

C. Application Process

The Company also plans to make the Thermostat Optimization product available through other channels [in addition to the Xcel Energy Store Online Marketplace, these may include direct-install, or bring your own thermostat options](#) and [through other](#) programs, for example ~~the Xcel Energy Store Online Marketplace and~~ Home Energy Squad® and other products. The Thermostat Optimization product will leverage existing application processes when other channels are used to streamline customers' application experience.

D. Marketing Objectives & Strategies

The Company plans to directly promote the Thermostat Optimization product to customers using a variety of marketing strategies, including but not limited to:

- e-mail;
- A web-page for interested customers to explain how to apply and the benefits of participating;
- Bill onserts;
- Co-marketing with other DSM products;
- In-store materials at participating retail stores; and
- Engaging contractors who install smart thermostats.

The Company also plans to work with thermostat manufacturers to co-market eligible products and the customer incentive. This includes manufacturers providing online promotion of the program's rebates, marketing materials to existing smart thermostat owners for the Tier 2 offerings, and in-store materials at participating retail locations.

E. Product-Specific Policies

To be eligible for the Thermostat Optimization offering, participants must be a residential customer of Public Service in single-family homes. For customers with electric service, participants must have central air conditioning; for gas-only customers, participants must have central gas heating.

Devices must be certified as ENERGY STAR Connected Thermostat products, **be compatible with the Residential Demand Response product requirements** and meet all product criteria to be eligible for the Thermostat Optimization product offering.

The Tier 2 offering will also require ENERGY STAR certified thermostats. Customers can participate in the Tier 2 offering without having been a Tier 1 participant. The Company will work with manufacturers and vendors to confirm device eligibility for Tier 2 offerings. The Company may work with multiple third parties to deliver Tier 2 offerings should there be differentiated products and services to offer customers that meet product requirements.

F. Stakeholder Involvement

Public Service has worked closely with a number of external stakeholders since the inception of the Smart Thermostat Pilot in 2014. The Company maintains active relationships with leading smart thermostat manufacturers, software vendors, consultants, and evaluators, and will continue to interact frequently with all parties as the product, technology, and product market grows.

G. Rebates & Incentives

The Thermostat Optimization product will offer up to a \$50 rebate to Tier 1 participants upon purchase and installation of an eligible smart thermostat. Tier 2 participant incentives will vary based on the specific approach and products chosen, with the possibility of no rebate offered to participants.