Low-Income Multi-Family Smart Thermostat Pilot

Jacqueline Berger, APPRISE
Ben Adams, MaGrann Associates

ABSTRACT

A northeastern electric and gas utility implemented a low- and moderate-income multi-family smart thermostat pilot program in 2018. The goals of the pilot were to develop an understanding of the multi-family low- and moderate-income market segment, identify barriers to the installation of smart thermostats in this market segment, and evaluate the customer experience and impacts on energy usage. The program installed Nest-E, Honeywell-T6, and Ecobee-3 thermostats in 942 units within 16 buildings across the service territory. Many challenges were faced during the installation including acceptance from building managers, technical requirements for the smart thermostat installation, Wi-Fi provision in many different structural configurations, and education of residents who did not self-select to receive a smart thermostat.

The pilot program included a comprehensive evaluation. The research entailed market characterization to assess the potential for expanded implementation throughout the utility's service territory; interviews with project managers, implementation staff, and building managers; a quantitative survey with 200 participants; and a usage impact analysis to estimate the impact of the program on electric and gas usage. The survey provided important information about the barriers and accomplishments of the program. The usage impact analysis showed that the thermostats provided a significant reduction in electric energy usage. The experience shows that there is potential for implementing this program on a wider basis and provides specific recommendations for how to achieve the most efficient and effective installation.

Introduction

The Low-Income Multi-Family Smart Thermostat Pilot Program was designed to enable the utility to better understand the lower income (up to 400 percent of the Federal Poverty Level), multi-family market segment, identify barriers to smart thermostat installation in this market segment, evaluate the customer experience, and support future smart thermostat program design that can potentially provide universal access to this technology.

The Smart Thermostat pilot included installations in 942 units within 16 projects and 76 separate buildings from six different property management companies and one Housing Authority. Properties included a mix of building types, including common entrance mid- and low-rise, townhomes and garden apartments, representative of the most common low- and moderate-income multifamily configurations found in the state. Resident populations were mostly mixed in terms of household demographics, including singles and families with and without children, as well as seniors (including one seniors-only building). The installations were completed between mid-August 2018 and the end of October 2018.

Three types of thermostats with various capabilities were selected for the program - the Honeywell T6, the Ecobee-3, and the Nest-E. The thermostats had varying smart features including geofencing, occupancy sensing, and learning.

Smart Thermostat Pilot Program

The Low-Income Multi-Family Smart Thermostat Pilot Program aimed to learn about the specific barriers, challenges and opportunities associated with lower income rental properties in which property management selects, owns and maintains the HVAC systems and thermostats in apartment units, while the residents are responsible for how they are used and the resulting utility bill (the classic "split incentive" associated with multifamily rental properties).

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Overview

The Smart Thermostat pilot included installations in 942 units within 16 projects and 76 separate buildings. The installations were completed between mid-August 2018 and the end of October 2018. Table 1 provides a summary of the installations that were completed.

Table 1. Project Information

Property	Buildings	Units	Thermostat	Connectivity Solution
1	2	94	HW-T6	Yes
2	8	72	HW-T6	Yes
3	N/A	89	Ecobee-3	No
4	5	54	Nest-E	Yes
5	1	41	Nest-E	Yes
6	1	7	Nest-E	No
7	1	48	Nest-E	Yes
8	2	52	Nest-E	No
9	1	60	HW-T6	Yes
10	2	72	Ecobee-3	No
11	1	56	Nest-E	Yes
12	25	100	Nest-E	No
13	6	65	Ecobee-3	No
14	9	60	Nest-E	Yes
15	4	32	Nest-E	No
16	8	40	Nest-E	No
TOTAL	76	942		

The implementation steps for the project are summarized below.

1. Obtain property owner interest
2. Assess site suitability
3. Complete property owner agreement
4. Develop implementation plan
5. Inform staff and residents
6. Perform installation and education
7. Conduct additional education

8. Obtain meter numbers for usage data

Property Selection

There were several requirements for properties to be included in the pilot and additional characteristics that were reviewed in an attempt to develop a heterogeneous sample for the project. The requirements for the properties were as follows.

- Qualified lower-income
- Individually metered residential apartments
- No overlap with the residential low-income energy efficiency program
- Individual forced air heating/cooling
- Compatible thermostat wiring

Additional characteristics that were reviewed included the following.

- Building Variables
  - Newer and Older
  - Mid/High Rise and Low Rise/Garden Style
- Technical Approach
  - Program WiFi or Tenant WiFi
  - Type of Connectivity Solution – Wi-Fi, Z-Wave, or LoRa
- Education Provided
  - In-Unit
  - Table in Building Lobby
  - Building Presentation ("Workshop")
- Demographics
  - Seniors
  - Families with Children
  - Mixed (singles and families with no children)

Thermostats

Three types of thermostats with various capabilities were selected for the program. These thermostats, the Honeywell-T6, the Ecobee-3, and the Nest-E are shown below.

Honeywell-T6 **Ecobee-3** **Nest-E**

As implemented in the pilot, the various smart features of the thermostats included geofencing, occupancy sensing, and learning, as shown in the table below.

Table 2. Thermostat Smart Features

Smart Feature	Honeywell-T6	Ecobee-3	Nest-E
App Control	✓	✓	✓
Geofencing	✓		✓
Occupancy Sensing		✓	✓
Learning			✓
Offline Programming	✓	✓	✓

Table 3 displays the initial smart feature set-up for each thermostat.

Table 3. Initial Thermostat Set-Up

	Honeywell-T6	Ecobee-3	Nest-E
Program Default	Basic schedule ON	Basic schedule ON Eco-temps (occupancy sensing) ON Auto-hold on manual temp change OFF	Basic schedule ON Auto-schedule (“learning”) ON Eco-temps (occupancy sensing) ON
Optional User Set-Up	Modified schedule App activation/control Geofencing/control	Modified schedule App activation	Modified schedule App activation/control Geofencing

Each of these thermostats had positive and negative design features.

- Honeywell-T6: The more traditional presentation of the HW-T6 was interpreted by some as an advantage for resident acceptance. Set-point and ambient temperatures are clearly displayed and discernable. However, the classic nested menus and small, low contrast on-screen print may present a barrier for residents not interacting with the thermostat

through a smart phone. Additionally, the touch screen was particularly sensitive and could easily lead to unintentional activation of mode or setting changes.

- Ecobee-3: We expected the highly stylized presentation and nested options of the Ecobee-3 and Ecobee-3 App to be a challenge for some residents. However, there were only a small number of service calls related to these attributes. This may have been helped by the fact that in each of the three Ecobee-3 properties a specific member of the maintenance or management staff "championed" resident support specific to the thermostat.
- Nest-E: The Nest-E appeared to present the clearest interface (as well as multiple language options), but still required resident engagement to ensure understanding of the proximity based "come to life" activation, the somewhat confusing distinction between ambient temperature and set-point, and the ease of engaging heat/cool mode which we found problematic in small apartments (we recommended use of only the specific heat or cool modes). We found the "grasp and turn" feature for temperature and menu selection may have been both its easiest and most intuitive feature, but only after demonstrated to the resident or illustrated through the customer materials (including a graphic hanger card).

Residents played no part in the decision to have new thermostats or the selection of the device, so most were unfamiliar with the capabilities or operation of their thermostat prior to installation (unlike a retail consumer who typically purchases and installs a smart thermostat based on their own motivation, research and considered choice of product).

Wi-Fi Connectivity

Data collected during site visits validated the assumption that few units would be connected to resident Wi-Fi at the time of installation. Fewer than 25 percent of properties were connected this way. Lower income customers often do not subscribe to a separate in-home Wi-Fi service or rely on their phone for all of their internet connectivity. Additionally, among those who were home and did have Wi-Fi, some could not find their Wi-Fi password or chose not to connect. Lack of Wi-Fi was addressed in 50 percent of the properties by providing a property-wide connectivity solution which guarantees that all thermostats will be connected and provides all residents who own smart phones with the opportunity to control the thermostat through an App, to enable certain smart features such as geofencing, and allow property staff control of vacant units when coupled with a management platform.

Every property in the pilot was scoped for the potential of installing a connectivity solution from the pilot connectivity partner, STRATIS IoT, and only one property was found to be unsuitable for a STRATIS solution due to unique construction characteristics (others were not selected due primarily to timing or budget constraints after the fifty percent of properties connectivity goal was met). However, although the pilot demonstrated that a connectivity solution is feasible for almost every property configuration, the specific connectivity type selected varied depending on the physical characteristics of the property. This dictated the choice of thermostat, which can limit the specific smart features available.

Implementation Analysis

The implementation analysis included the following research.

- In-depth telephone interviews with the three program implementation partners – MaGrann Associates, GreenLife Energy Solutions, and STRATIS IoT.
- In-depth telephone interviews with building managers at 11 of the 16 properties that participated in the pilot.

Key findings from the implementation analysis are summarized below.

- Motivation for Participating: Building managers participated in the program for the following reasons.
  - Offer tenants an opportunity to save money on their utility bill.
  - Improve tenant comfort.
  - Prevent maintenance issues/upgrade thermostat hardware.
  - Monitor and control temperatures in vacant units and other "platform level" functionality when installed with a STRATIS platform.
- Installation: The Ecobee-3 took the longest amount of time to install, due in part to the required configuration steps and in part to the use of the included "wire extender kit" which made the Ecobee-3 uniquely suited to installation in the absence of an existing "C" wire. The Nest-E was reported to be the quickest and easiest to install and set up.
- Health and Safety: GreenLife Energy Solutions encountered health and safety issues in about five percent of the units, mostly related to the operational condition of older systems, water leaks, blown fuses and disconnected flues. Additional technical barriers included the rewiring required in buildings that did not have a C-wire in place.
- Connectivity Solutions: Many customers relied entirely on their cell phones for internet access. The Nest-E and Ecobee-3 have the ability to enable "smart" energy savings features if there is no connection because of the onboard occupancy sensing feature, while the Honeywell-T6's "smart" features depend on the thermostat having a network connection and the resident having a smart phone.
- Training and Education: GreenLife explained how to operate and troubleshoot the thermostats to the operations staff that accompanied them on installation visits, and GreenLife provided training for tenants on an individual basis to those who were home at the time of installation.
- Technical Support: Less than three percent of customers required follow-up technical support.
- Tenant Experience: Pushback or concerns about participating in the program were predominantly voiced by elderly tenants.

Participant Feedback

APPRISE conducted a telephone survey with 199 participants in the Multi-Family Smart Thermostat Pilot Program to understand participants' satisfaction with the program and their level of understanding with their new thermostat.

Surveys were completed with 43 percent of the sample. The most common non-interview reason was that there was no response from the participant. The cooperation rate, the completion

rate of customers who were contacted and who were eligible for the survey, was 84 percent. The response rate was 57 percent.

One interesting finding was the small percentage of participants who were aware of smart thermostats prior to the pilot. Table 4 shows that only 24 percent of respondents reported that they had heard about smart thermostats prior to participating in the pilot.

Table 4. Awareness of Smart Thermostats Prior to Program

Before hearing about this program, had you heard of smart thermostats, such as Nest-E, Ecobee-3, or Honeywell-T6?				
Awareness	Thermostat Type			Total
	Nest-E	Ecobee-3	HW-T6	
Respondents	99	52	48	199
Had Heard	20%	21%	35%	24%
Had Not Heard	79%	79%	65%	75%
Don't Know	1%	0%	0%	1%
Total	100%	100%	100%	100%

Table 5 shows that 48 percent of respondents reported that they were happy to receive the smart thermostat, 36 percent reported that they were indifferent, and 16 percent reported that they did not want the new thermostat.

Table 5. Initial Attitude toward Smart Thermostat Receipt

How did you feel about receiving the smart thermostat when you first learned about the installation?				
Attitude toward Thermostat Receipt	Thermostat Type			Total
	Nest-E	Ecobee-3	HW-T6	
Respondents	99	52	48	199
Happy to Receive	45%	58%	42%	48%
Did Not Care Either Way	35%	23%	50%	36%
Did Not Want New Thermostat	18%	19%	8%	16%
Don't Know	1%	0%	0%	1%
Total	100%	100%	100%	100%

Table 6 provides information on winter nighttime heat setbacks both by participants who programmed their thermostat and those who used manual setback. While 35 percent did a manual setback, only 13 percent had a programmed setback, and 52 percent did not perform a setback. This shows that there is good potential for savings from this heating change in half of the population.

Table 6. Manual and Programmed Winter Night Heat Setbacks

Was your OLD thermostat programmed to change the heat to a lower temperature / Did you adjust the heat on your OLD thermostat to a cooler temperature before going to bed at night in the winter?				
Winter Nighttime Heat Setback	Thermostat Type			Total
	Nest-E	Ecobee-3	HW-T6	
Respondents	99	52	48	199
Lowered Heat - Manually	31%	42%	33%	35%
Lowered Heat - Programming	15%	10%	13%	13%
Did Not Lower	54%	48%	54%	52%
Total	100%	100%	100%	100%

Table 7 displays whether the respondent set up the App by the presence of an elderly household member. The table shows that while 45 percent of those without an elderly household member set up the App, 18 percent with an elderly household member reported that they set up the App.

Table 7. Smart Thermostat App Set-up By Presence of Elderly Household Member

Have you set up the App to control your smart thermostat from your smart phone or tablet?		
Smart Thermostat App	Elderly Household Member	No Elderly Household Member
Respondents	57	141
Set Up the App	18%	45%
Did Not Set up the App	44%	50%
Don't Know	2%	0%
Do Not Have a Smart Phone or Tablet	37%	4%
Total	100%	100%

NOTE: One respondent who refused to report whether the household had an elderly member was excluded from this table.

Table 8 displays satisfaction with the smart thermostat by presence of an elderly household member. The table shows that 64 percent of those without an elderly household member were very satisfied compared to 44 percent of those with an elderly household member.

Table 8. Satisfaction with Smart Thermostat by Presence of Elderly Household Member

How satisfied are you overall with the smart thermostat?		
Satisfaction	Elderly Household Member	No Elderly Household Member
Respondents	57	141
Very Satisfied	44%	64%
Somewhat Satisfied	28%	23%
Somewhat Dissatisfied	11%	9%
Very Dissatisfied	12%	4%
Don't Know	5%	1%
Total	100%	100%

NOTE: One respondent who refused to report whether the household had an elderly member was excluded from this table.

Key findings and from the survey are summarized below.

- Energy-Saving Opportunities: Prior to installation of the smart thermostat, the majority of participants did not use programmed or manual setbacks at night or when away from the home.
- Demographic Impact: Elderly customers were less receptive to the thermostat and less satisfied.
- Technological Preparation: Participants were likely to use computers, smart phones, and tablets. However, only a minority set up the thermostat app.
- Thermostat Education: Participants took advantage of many opportunities to learn about smart thermostats, but said that still more education was needed.
- Thermostat Understanding: Most reported a very good or good understanding of the smart thermostat.
- Satisfaction: Most were very or somewhat satisfied with the installation crew, temperature settings, thermostat, and program.

Usage Impact Analysis

APPRISE conducted an energy usage analysis for participants in the Multi-Family Smart Thermostat Pilot Program to understand how the smart thermostats impacted participants' energy usage.

Table 9 displays the characteristics of each building that was included in the program. The table displays information on the type of thermostat, building, STRATIS Connectivity provided, year built, HVAC type, and resident type. The table shows that there are numerous observable characteristics that can impact energy savings (in addition to unobservable characteristics), and one cannot conclude that any particular factor on its own was the cause of higher or lower savings.

Table 9. Building Characteristics

Thermostat Type	Building Type	STRATIS	Year Built	HVAC Type	Resident Type
Ecobee-3	Common Entrance Mid-Rise	No	2014	Conventional Furnace/Condenser	Families
HW-T6	Common Entrance Mid-Rise	Yes	2009	Conventional Furnace/Condenser	Families
Nest-E	Common Entrance Mid-Rise	Yes	2017	2-Stage Conventional Furnace/Condenser	Mixed
Ecobee-3	Other	No	1973	Conventional Furnace/Condenser	Families
Ecobee-3	Garden Style	No	1971	Electric Resistance Furnace, Split System A/C	Families
Nest-E	Common Entrance Mid-Rise	Yes	2002	Hydronic Forced Air, Split System A/C	Senior
Nest-E	Common Entrance Low-Rise	No	1986	Conventional Furnace/Condenser	Families
Nest-E	Town/Row Homes	No	2012	Conventional Furnace/Condenser	Families
HW-T6	Town/Row Homes	Yes	2006	Conventional Furnace/Condenser	Families
HW-T6	Common Entrance Mid-Rise	Yes	2017	Conventional Furnace/Condenser	Families
Nest-E	Common Entrance Mid-Rise	Yes	2012	Conventional Furnace/Condenser	Families
Nest-E	Garden Style	Yes	2016	Conventional Furnace/Condenser	Families
Nest-E	Town/Row Homes	No	2006	Conventional Furnace/Condenser	Families
Nest-E	Town/Row homes	No	2008	Conventional Furnace/Condenser	Families
Nest-E	Common Entrance Mid-Rise	No	2010	Hydronic Forced Air, Split System A/C	Mixed
Nest-E	Common Entrance Mid-Rise	Yes	2008	Conventional Furnace/Condenser	Families

Table 10 displays the average annual weather-normalized gas and electric usage and savings. The results show that overall, participants reduced total electric usage by 3.2 percent and total gas usage by 1.6 percent.

Table 10. Overall Gas and Electric Usage and Savings

Fuel Type	Normalization Method	#	Pre	Post	Savings	% Savings
Electric (kWh)	Degree Day	552	6,053	5,857	196**	3.2%
Gas (therms)	Degree Day	472	336	331	5*	1.6%

**Denotes significance at the 99 percent level. * Denotes significance at the 95 percent level. #Denotes significance at the 90 percent level.

Table 11 displays the electric savings by period (baseload, heating, and cooling). The table shows 8.8 percent electric cooling savings and 9.7 percent electric heating savings.

Table 11. Savings by Usage Period

Fuel Type	Usage Period	#	Pre	Post	Savings	% Savings	% of Total Savings
Electric (kWh)	Baseload	552	3,897	3,898	-2	< -0.1%	< -0.1%
	Cooling	552	1,228	1,120	107**	8.8%	54.9%
	Heating	552	928	839	90**	9.7%	45.9%

**Denotes significance at the 99 percent level. * Denotes significance at the 95 percent level. #Denotes significance at the 90 percent level.

Table 12 displays the savings by thermostat type and whether a connectivity solution was provided. Only the Nest-E thermostats were installed both with and without the connectivity solution. Participants who received the Nest-E smart thermostat and STRATIS Connectivity had average electric savings of 3.5 percent and no statistically significant change in gas usage. Participants who received the Nest-E thermostat without STRATIS Connectivity had average electric savings of 5.2 percent and average gas savings of 3.1 percent. It is important to note, however, that the No Connectivity Solution participants had significantly higher pre-treatment usage, which is typically found to be related to higher energy savings. The differences between the Connectivity and No Connectivity Solution savings do not appear to be caused by the connectivity solution itself.

Table 12. Savings by Thermostat Type and Connectivity Solution

Fuel Type	Thermostat	Connectivity Solution					No Connectivity Solution				
		#	Pre	Post	Savings	% Savings	#	Pre	Post	Savings	% Savings
Electric (kWh)	Nest-E	154	4,426	4,272	154**	3.5%	173	7,667	7,270	398**	5.2%
	Ecobee-3	-	-	-	-	-	99	7,066	6,892	173	2.5%
	HW-T6	126	5,029	5,042	-13	-0.3%	-	-	-	-	-
Gas (therms)	Nest-E	111	242	246	-4	-1.7%	168	445	432	14*	3.1%
	Ecobee-3	-	-	-	-	-	73	282	266	16*	5.7%
	HW-T6	120	304	308	-4	-1.3%	-	-	-	-	-

**Denotes significance at the 99 percent level. * Denotes significance at the 95 percent level. #Denotes significance at the 90 percent level.

Key findings from the usage analysis are summarized below.

- Overall Savings: Participants reduced overall electric usage by 3.2 percent and gas usage by 1.6 percent.
- Usage Period: Participants experienced 8.8 percent electric cooling savings and 9.7 percent electric heating savings.
- Property Level Connectivity: Participants with no STRATIS connectivity provided were estimated to have higher savings. However, these differences appear to be related to the pre-treatment usage and the type of thermostat installed.
- Building Type: Low rise buildings with a common entrance had the greatest electric and gas savings, roughly 14 percent for each. However, there were only a small number of observations in these types of buildings that were included in the analysis. Town/row homes also had statistically significant savings that averaged 5.6 percent for electric and 2.8 percent for gas. Mid-rise buildings showed the least impact, although this may also be reflective of other factors, such as thermostat type.
- Building Age: Buildings built before 2000 had the highest pre-treatment usage and the greatest savings. However, the sample is small, and the savings were not statistically significant. Those living in a building built in 2001 to 2009 had statistically significant average electric savings of five percent and average gas savings of three percent.
- HVAC Type: Participants with a conventional furnace / condenser had the highest savings compared to other HVAC configurations, at an estimated 4.1 percent electric and 2.3 percent gas savings.

Findings and Recommendations

This section provides a summary of findings and recommendations from the pilot implementation and evaluation.

Design and Implementation

The experience in this pilot provided a wealth of information about implementation challenges and solutions that would be useful in future implementation of such a program.

- Recruitment Recommendations
  - Use a simplified program application.
  - Utilize existing relationships with property owners and building managers.
  - Work with Housing Authorities to further identify compatible buildings among their portfolios.
  - Encourage enthusiastic on-site champions for the program.
  - Make multiple site visits to develop support and collaboration.
  - Understand that persistence is essential.
- Compatibility: Key challenges included some system types and wiring issues. Understand that the thermostat will not work in all situations until additional technologies can be incorporated.
- Connectivity: A property-wide connectivity system of the type provided by STRATIS during the pilot can be a selling point for some building owners, potentially helping to address the typical split incentive dilemma. Be prepared with flexible solutions for

providing the Wi-Fi access as different building scenarios present unique challenges. Because property level connectivity involves a long-term commitment, consider a building owner co-payment at time of installation.

- Tenant/Installer Experience: Difficulties were experienced because of the amount of tenant education that was required and the fact that many tenants were not home at the time of installation. Budget for extensive education and provide the education through multiple types of interactions.
- Thermostat Set-Up: Residents expressed some confusion over the operation and behavior of the Nest-E and the interface of the Ecobee-3. In lower-income multi-family rental deployment, define and perform specific initial set-ups depending on whether residents are home at the time of install and receptivity to features based on the age, demographics, and educational engagement.
- Property Staff Experience: Some of the property staff were apprehensive about the technology or installation. Educate building staff to understand their potential benefits from the installation and enable early engagement of property management and/or maintenance staff.
- Program Design: Challenges with respect to program design related to the thermostat technologies and connectivity issues. Build in time to address the technology issues and work with implementers that have expertise.

Participant Experience

The participant survey, on-site work, and additional interaction with residents provided additional information and led to the following recommendations for the program.

- Smart Thermostat Information Sources: The most common participant recommendation was that the program should provide more information on how to effectively use the smart thermostat. Future programs should follow the pilot's approach and provide various types of opportunities to obtain information about how to use the thermostat.
- Thermostat Instructions: Significantly simplify instructional guides, using more graphics and fewer words wherever possible.
    - Focus guides on the initial set-up functionality.
    - Provide supplemental information on deeper smart functions and set-up options later or upon request.
    - Provide a thermostat informational hanger for all thermostat models deployed.
    - Provide some or all materials in advance of device installation.
- Engagement at the Time of Installation: Separate the installation and education functions, with a dedicated engagement crew accompanying or following behind installers with the sole purpose of ensuring thermostats and residents are optimally set up and comfortable with their device.
- Elderly Households: Consider additional educational opportunities and installation of the easiest-to-use smart thermostat for elderly residents.
- Home for Installation: Respondents who were at home at the time of the smart thermostat installation were more likely to be very satisfied with the installation. Try to perform installations when customers are home if possible.

Energy Savings

- Energy Usage Data: Attempts to collect account numbers from residents at time of installation, or subsequently by a variety of outreach efforts, resulted in less than 50 percent success. Develop an improved IT system to match participants to account numbers for energy usage data and record meter numbers on site as a cross reference in case they are needed.
- Analysis Results: The program found significant energy savings, especially electric savings, for program participants. The utility should conduct additional research on future installations to assess the most effective thermostats for various populations.

Full Scale Implementation

Based on currently available technology, we estimated that there are approximately 38,000 households in low- and moderate-income multi-family buildings in the utility's service territory who could be eligible and who would participate in a smart thermostat program. Potentially more households will be able to be served as available technologies continue to expand (for example, connected thermostat solutions for certain central systems, baseboard electric heat, and mini-splits).

The majority of properties submitted by Housing Authorities were found to be incompatible due to the predominance of central systems. However, based on the pilot's experience with a Housing Authority property, we recommend further engagement with Housing Authorities to identify compatible properties among their portfolios.

Given the energy savings and positive tenant reviews, we recommend that the utility test this program on a broader scale and continue to conduct research to develop the most efficient and effective solutions, as well as additional technology options to serve more customers. We also recommend that the utility work to raise awareness of this program, its results, and its benefits to building owner and tenants to increase demand for the program.