Smart Thermostats

Optimizing Multifamily Deployment

Ben Adams

2019 National Home Performance Conference, Chicago IL

MaGrann Associates
Building Science for a Better Environment

ENERGY STAR AWARD 2018
PARTNER OF THE YEAR

Context

- A 942 unit pilot
  - "Lower income" (400% FPL) multifamily rentals
  - Recruitment & installation phases completed
- Determine challenges, lessons learned and impact:
  - Market characterization, recruitment & qualification
  - Technical compatibility
  - Resident & building operator experience
  - Energy savings

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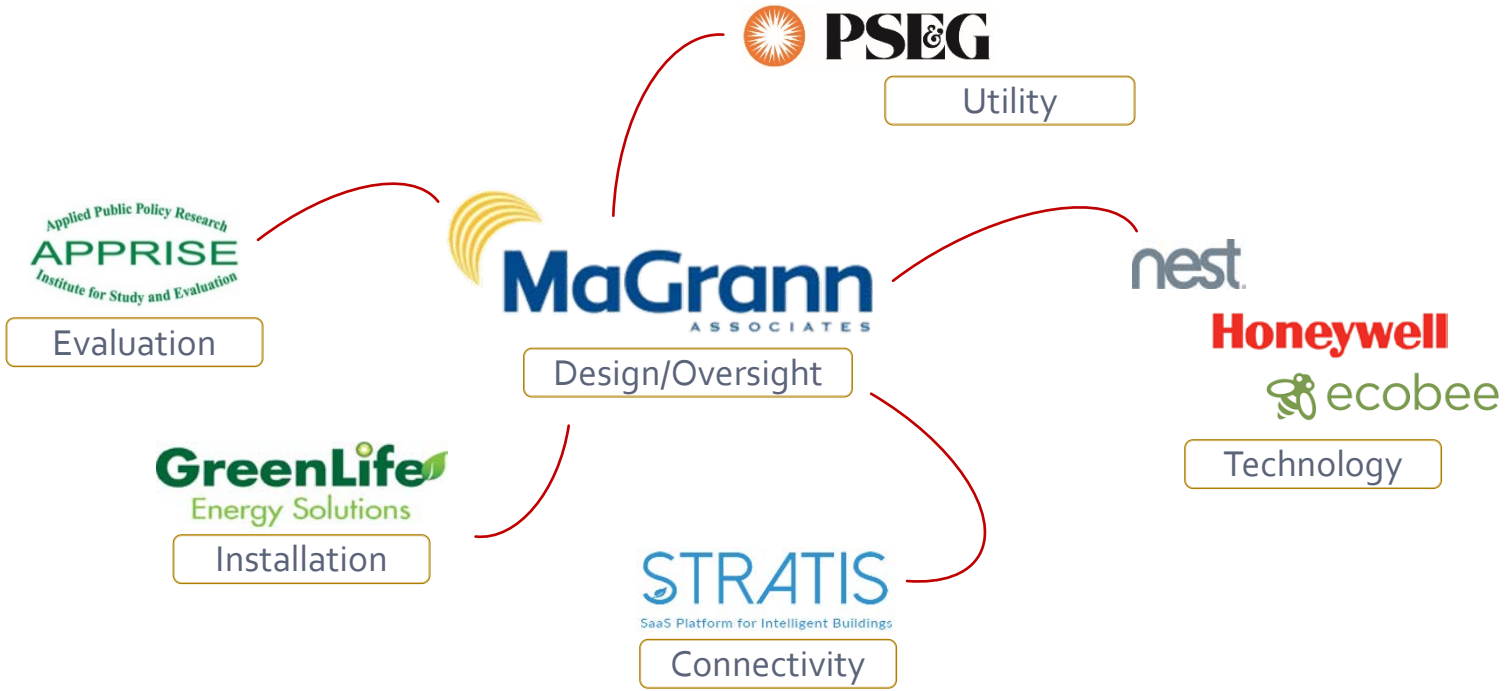
Implementation Team



A Broad Representation of Buildings

- 942 thermostats installed in 16 projects
  - 116 units in 2 buildings of 50+ units
  - 307 units in 8 buildings of 20-49 units
  - 65 in 6 buildings of 10-19 units
  - 454 in 73 buildings of < 10 units*

* Based on average units per building; Includes one project where less than 100% of units installed in each building

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A Growing Choice of Technologies

LYRIC ROUND THERMOSTAT

HONEYWELL LYRIC T6 PRO

LUX KONO THERMOSTAT

Available Q2 2018

ECOBEE4

GOCONTROL THERMOSTAT

ECOBEE3 LITE

NEST E THERMOSTAT

Available Q4 2018

NEST THERMOSTAT

Available Q4 2018

ZEN THERMOSTAT

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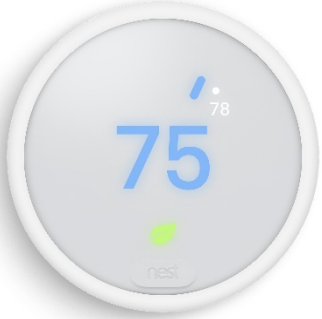
Our Pilot Selection

Honeywell Lyric T6
(Z-Wave)

Ecobee 3
(WiFi)



Nest E
(WiFi)

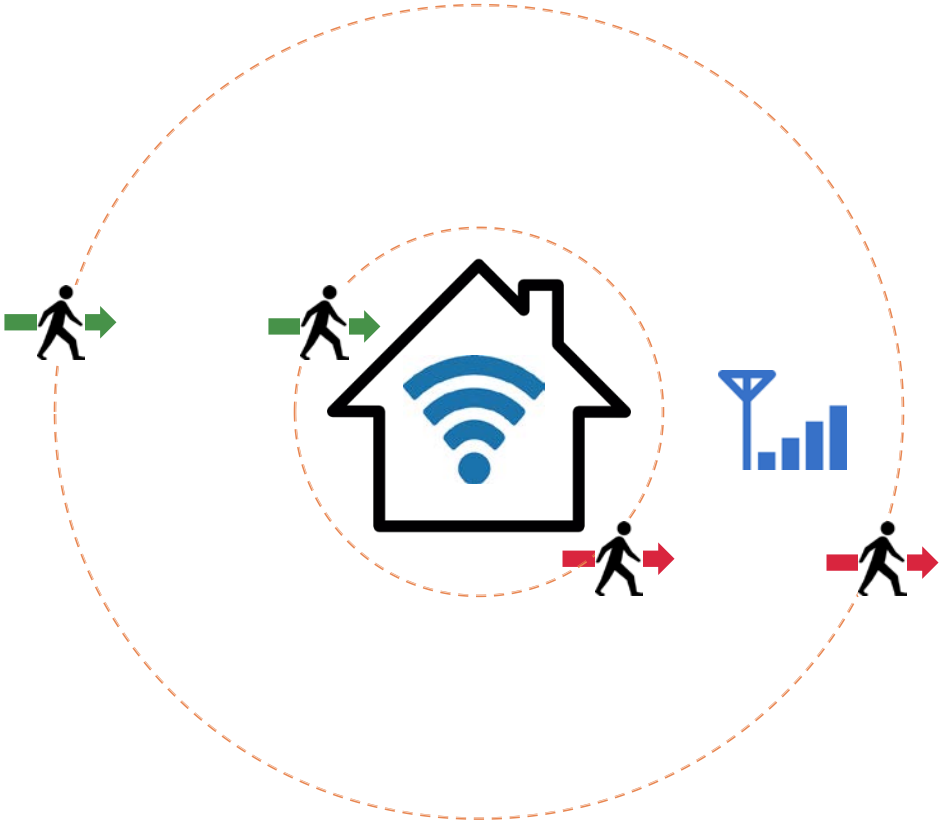
Smart Strategies with Connectivity

- App control
- Geofencing

Both require in-unit connectivity plus cellular mobile device

* Functionality depends on model/configuration

What is Geofencing?



Smart Strategies Without Connectivity

- Occupancy sensing
  With integrated sensor

*

* Functionality depends on model/configuration

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Smart Strategies Without Connectivity

- Occupancy sensing
  With integrated sensor

*

- Learning

* Functionality depends on model/configuration

Multifamily Challenges

WiFi?

Language?

Smartphones?

Turnover?

Occupancy Patterns?

High/Low Temps?

Seniors?

Vacant Units?

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A Holistic Approach

Connectivity

+

Building Level Controls

+

Resident Education

Program Advantages Over Tenant WiFi

- Participation
  - Not dependent on resident's own connectivity
    - Tenant WiFi availability may be less than 50% depending on market
- Security & cost effectiveness
  - Drastically decreases costs compared to "Hub per unit" deployments
  - Firewalled network infrastructure with Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)
- Property benefits when paired with device APIs
  - Enables dashboard level monitoring & settings
  - Facilitates vacant unit, common area and tenant turnover control
  - Can support other device amenities and resident internet access

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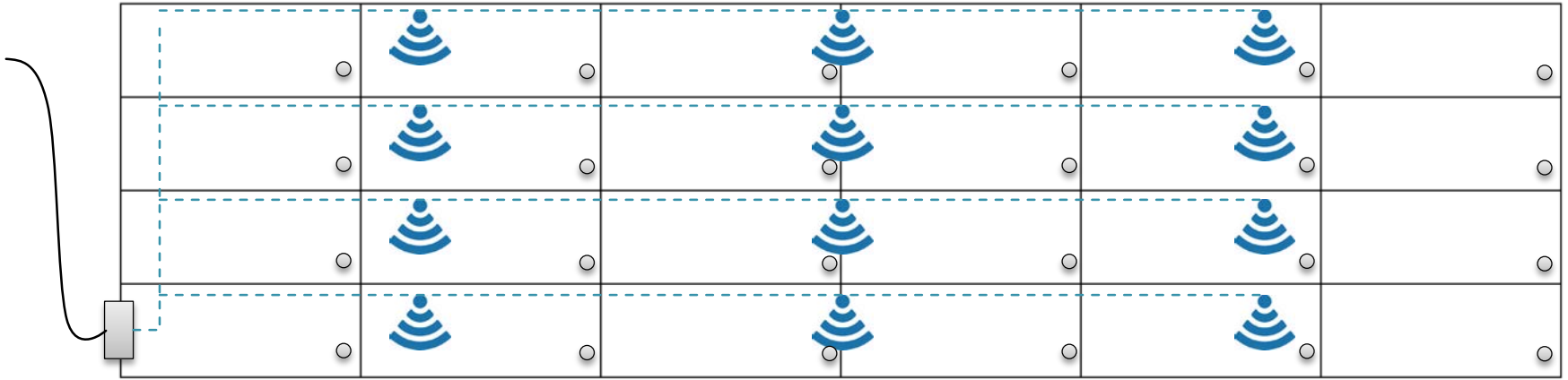
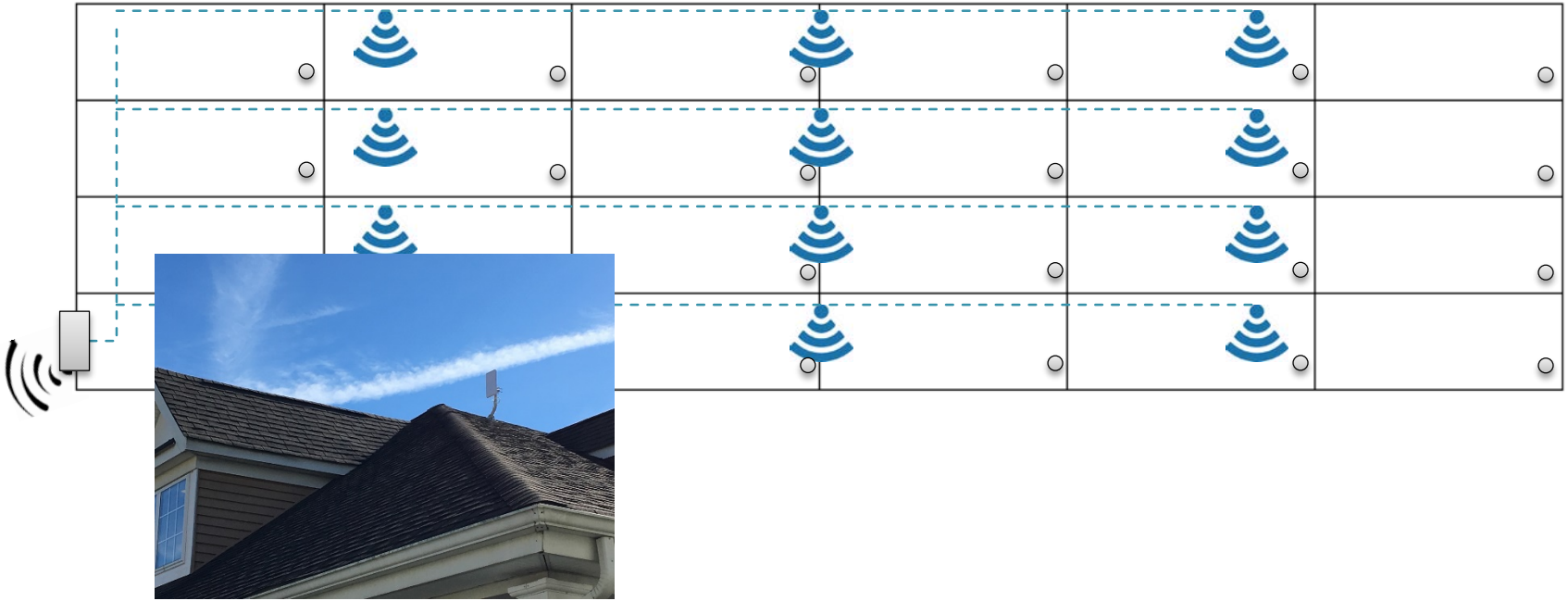
Connectivity Solutions: Direct WiFi

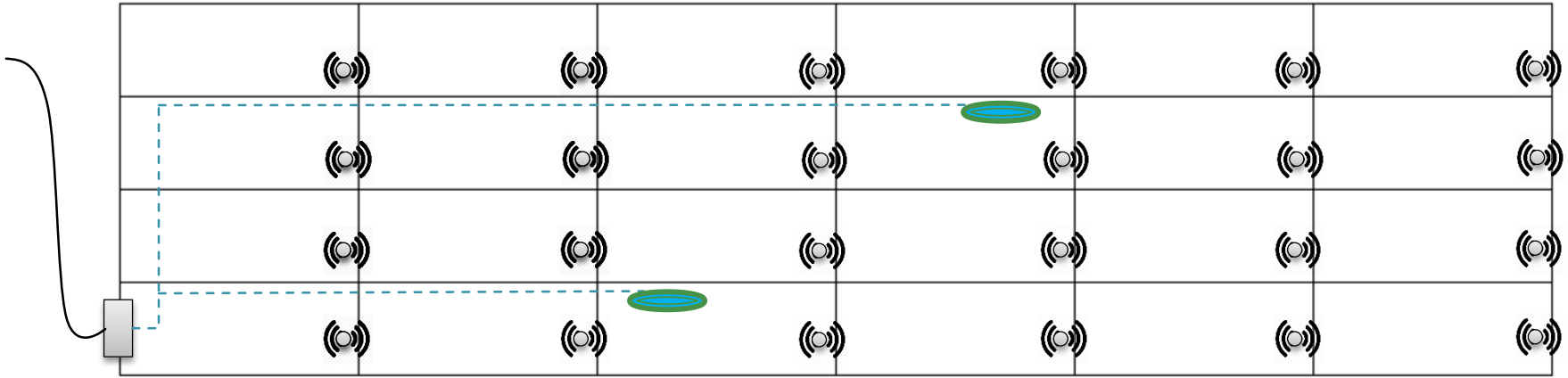


Connectivity Solutions: Beamed WiFi

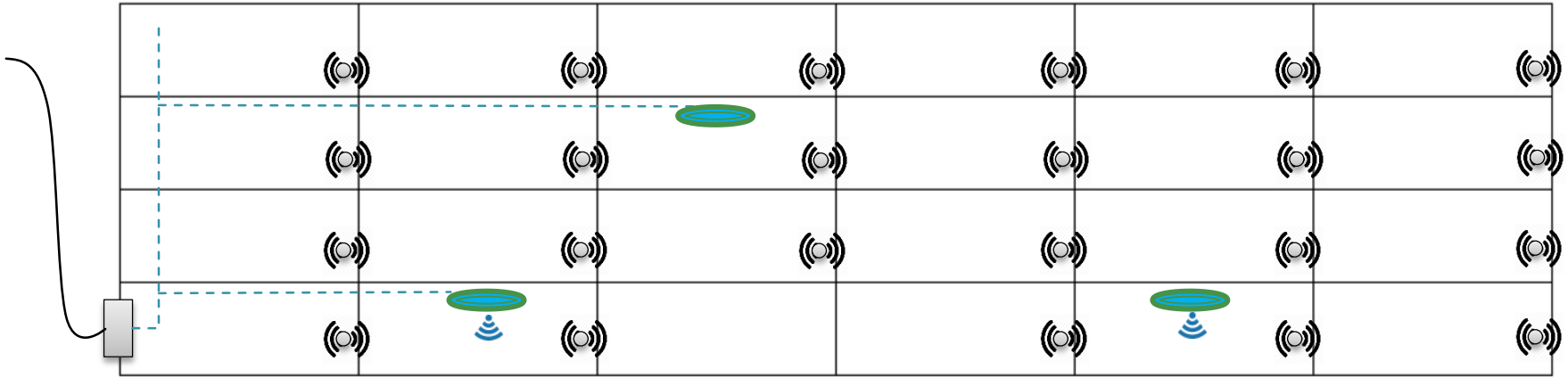


LEASING
OFFICE

Connectivity Solutions: Mesh/Z-Wave

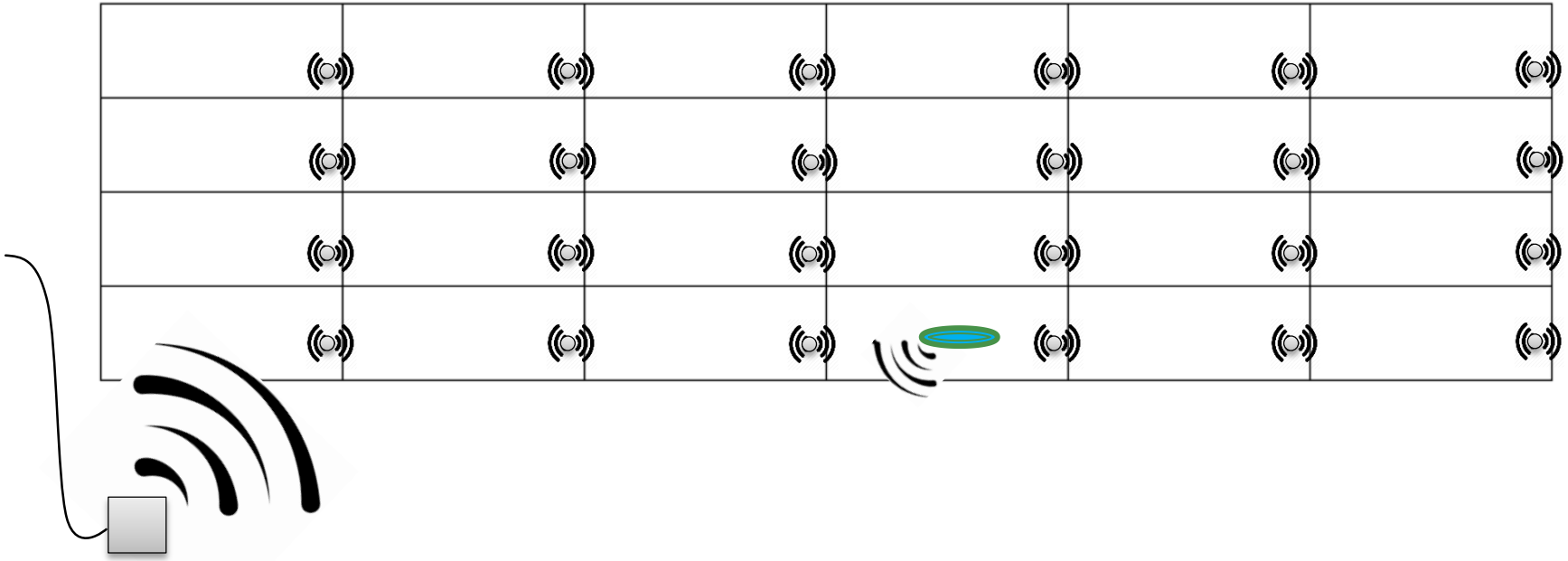


Connectivity Solutions: Mesh + WiFi



THE WILLOWS AT SYMPHONY HALL
395
Google
Image capture: Nov 2017 © 2018 Google United States

Connectivity Solutions: LoRa WAN



Connectivity Solutions: Tenant WiFi

Solutions broadly represented in Pilot

- 5 Projects (259 units) Nest E with Stratis Wi-Fi
- 5 Projects (231 units) Nest E with tenant Wi-Fi if present
- 3 Projects (226 units) Ecobee 3 with tenant WiFi if present
- 2 Projects (154 units) Honeywell Lyric T6 Z-Wave with Stratis Mesh
- 1 Project (72 units) HW Lyric T6 Z-Wave with Stratis Mesh+LoRaWAN

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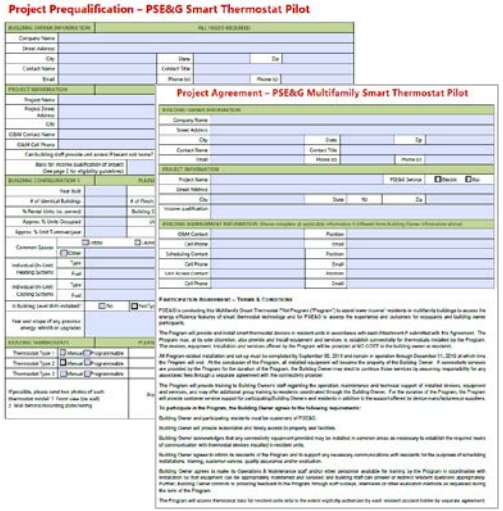
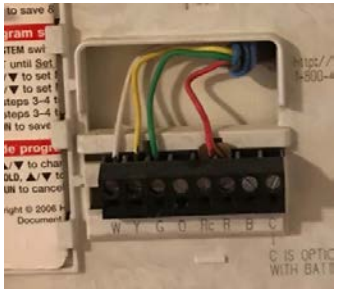
Recruitment

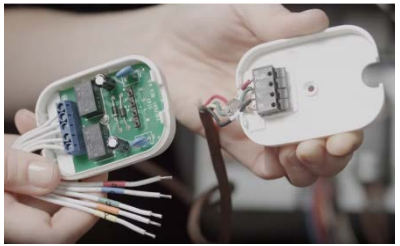
- Challenges
  - Interest/response at owner level
  - Decision making process and timelines
- What's worked
  - Simple application/agreement plus "concierge"
  - Engagement at property staff level
  - Robust technical discovery
  - "Embedded champions"
  - Problem solving
  - Persistence



Compatibility

- Challenges
  - All central systems in older buildings (>20 years)
  - Some individual systems (certain heat pumps, minisplits, PTACs)*
  - C-Wire
  - System condition
- What's worked
  - Newer buildings with individual systems
  - Broad compatibility
    (conventional, Magic-Pak, hydronic forced air)
  - Creative wiring solutions
  - Few mounting issues





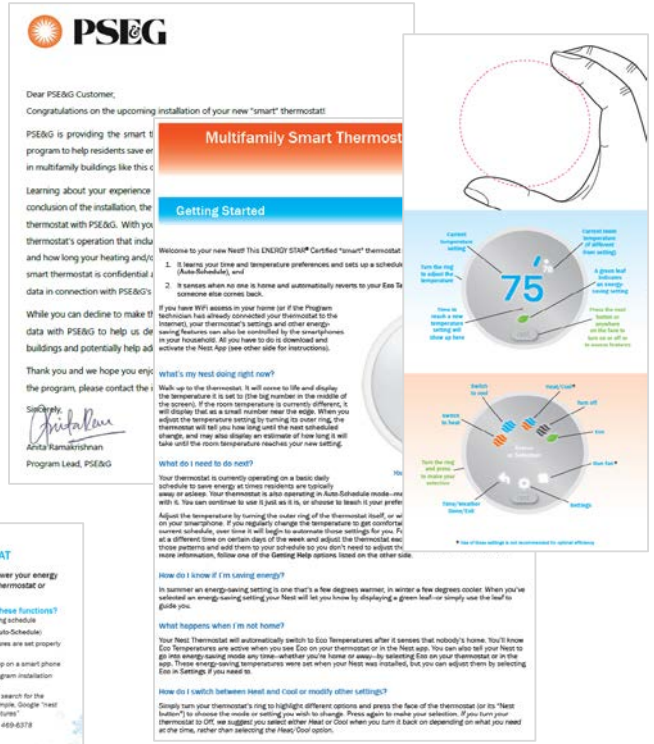
*Other connected thermostat solutions are available but were not included in this pilot

Connectivity

- What's worked
  - Range/flexibility of coverage options
  - Creative solutions for power & ISP access
  - Pre-commissioning of WAPs/thermostats
  - Maintenance staff collaboration

Tenant Experience

- What's worked
  - Advance notice
  - Installer interaction
  - Leave-behind education materials
  - On-site "help desk" during installs
  - Multiple support options
  - Post installation workshops
  - Seasonal tip cards


PSE&G

Dear PSE&G Customer,

Congratulations on the upcoming installation of your new "smart" thermostat!

Multifamily Smart Thermost

Getting Started

Anita Ramakrishnan

Program Lead, PSE&G

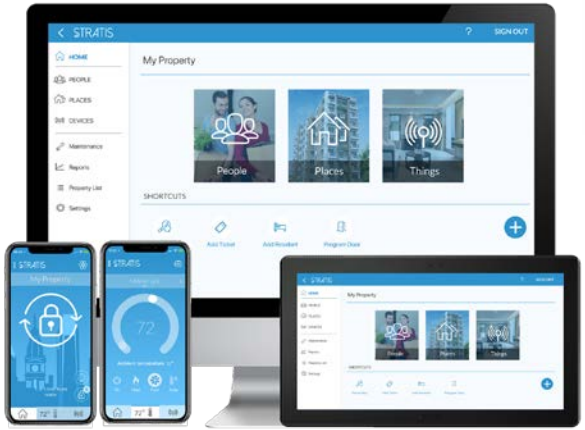
PSE&G WINTER TIPS FOR YOUR nest THERMOSTAT

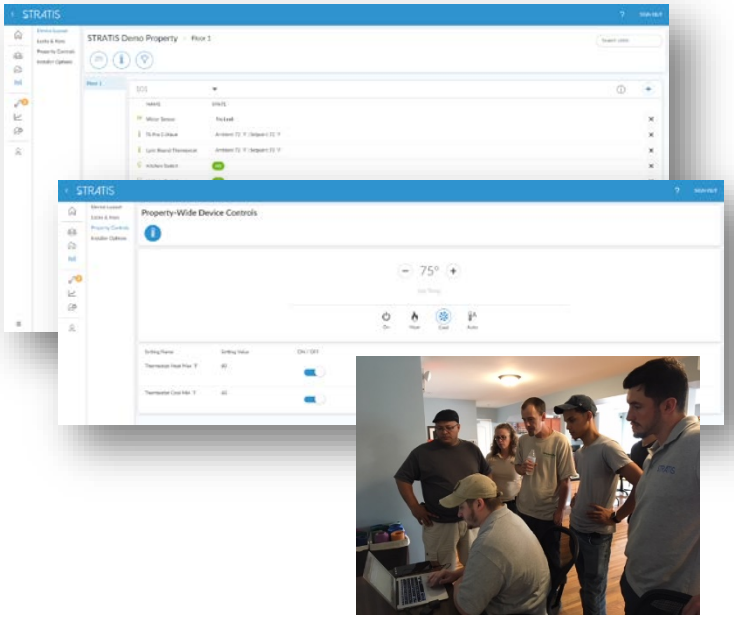
Winter is here and your Nest thermostat makes it easy to save! Here are some tips to lower your energy costs while staying comfortable. Settings can be checked and adjusted directly on the thermostat or from anywhere using the phone app.

1. Make sure your temperature display is orange.
2. Use a lower temperature setting, especially at night.
3. Use Eco settings when no one is home.
4. Do you need help with any of these functions?

Property O&M Experience

- What's worked
  - Collaboration at scoping
  - Staff training & advance installs
  - Anticipation of benefits
    - Fewer tenant operation issues
    - Building level support/controls





Market Potential

- Pilot completions
  - Accepted 16 properties (942 units) out of 43 considered (8,281 units)
  - Approx. 37% of properties reviewed (11% of units)
- Pilot rejections
  - Rejected 27 properties (7,339 units)

Rejections	Projects	Units
HVAC compatibility	19	4,787
HVAC age/condition	2	1,404
Withdrawn	6	1,148

  - Ultimately, no compatibility rejections due to wiring or mounting issues

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Market Potential

Building Size	Eligible Households	% of Total	Potential Units	% Potential
<10 Units	48,733	29%	27,656	57%
10-19 Units	42,751	26%	5,789	14%
20-49 Units	35,634	21%	3,252	9%
50+ Units	39,398	24%	1,257	3%
TOTAL	**166,516**	**100%**	**37,954**	**23%**

Source: 2012-2016 ACS

Building Size	Eligible Buildings	% of Total	Potential Bldgs	% Potential
<10 Units	6,962	61%	3,971	57%
10-19 Units	2,948	26%	385	13%
20-49 Units	1,033	9%	59	6%
50+ Units	394	3%	23	6%
TOTAL	**11,337**	**100%**	**4,437**	**39%**

Source: 2012-2016 ACS; NJDCA

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Thank You

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