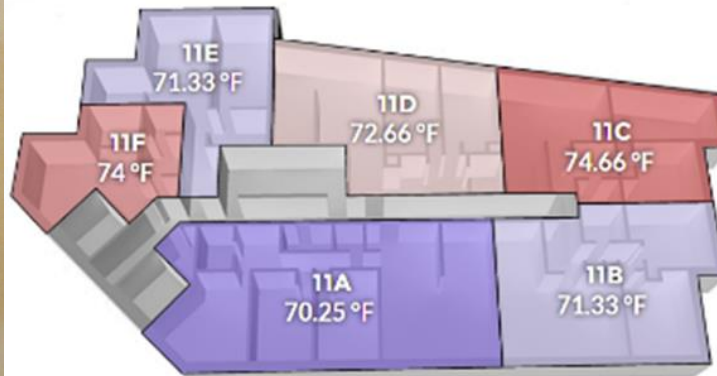


A Systems Approach to Achieving Deep Heating Savings through Measurement, Management, and Motivation



Steven Winter Associates, Sentient Buildings, ESource

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Project Summary

Timeline:

Start date: September 1, 2017

Planned end date: August 31, 2020

Key Milestones

1. Systems installed: March 2019
2. Tenant feedback begins: November 2019

Budget:

Total Project \$ to Date:

- DOE: \$326,215
- Cost Share: \$842,541

Total Project \$:

- DOE: \$699,357
- Cost Share: \$935,912

Key Partners:

Con Edison	NYSERDA
Environmental Defense Fund	Realty Operations Group
NYC Mayor's Office of Sustainability	The Kibel Organization

Project Outcome:

- This project will demonstrate how optimizing systems and engaging tenant behavior can achieve deep savings for central heating systems.
- This may be the most cost effective way to reduce GHG, especially compared to electrification alternatives.

Team



Steven Winter Associates, Inc.

Improving the Built Environment Since 1972

- **Jason Block, Dianne Griffiths, Marc Zuluaga**
- **Broad array of consulting engineering and analysis services drives cycle of identification, development, deployment, and adoption of improvements**



SENTIENT
BUILDINGS

- **David Unger**
- **Technology/product-agnostic—focused on the best solution to a problem, not just how our product can meet clients' needs**



E Source

- **Melanie Wemple**
- **Program planning for 70% of the electricity use in the country—readying this for wider deployment**

Challenge

- **Central heating systems in multi-tenant and multifamily buildings fail twice:**
 - Tenants are uncomfortable and lack controls
 - High energy usage due to lack of direct feedback to the users
- **Beyond utility costs, policy goals are bringing this to the forefront:**
 - Increased transparency into energy usage means some buildings will get a poor mark.
 - Cities are exploring building performance mandates with the promise of financial penalties for excessive usage.



Approach: Optimize System

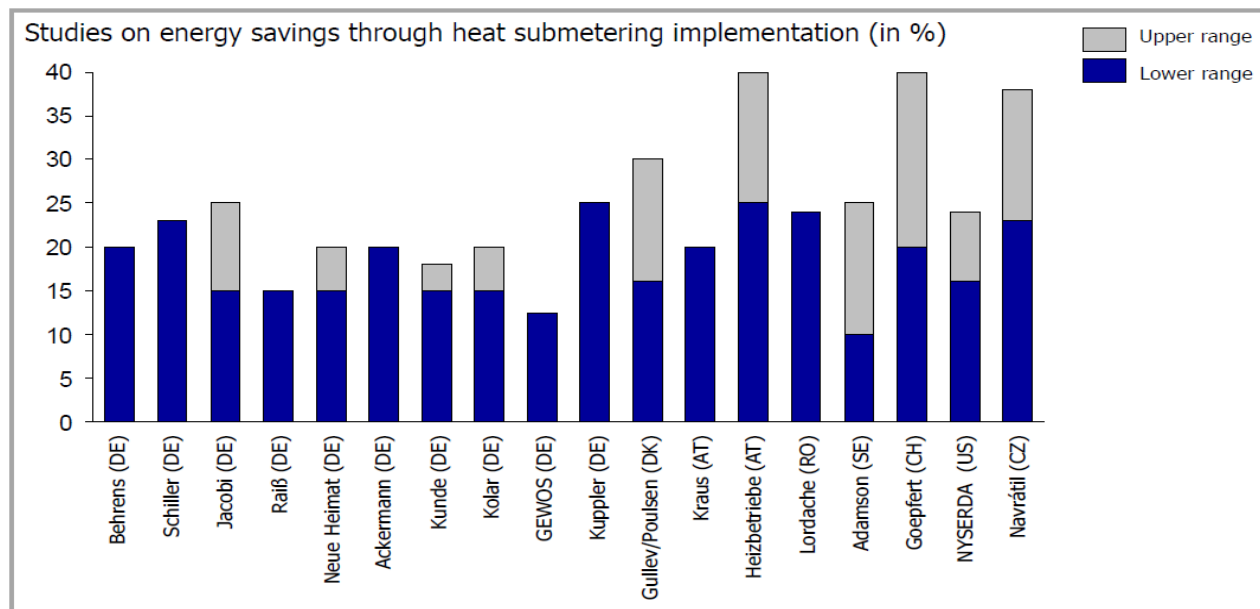
- Upgrade the system so it can deliver the right amount of heat to the right place at the right time
 - Leveraging wireless and IoT cost trends
 - Hosted data feeds real-time energy management



Approach: Sub-meter Heat

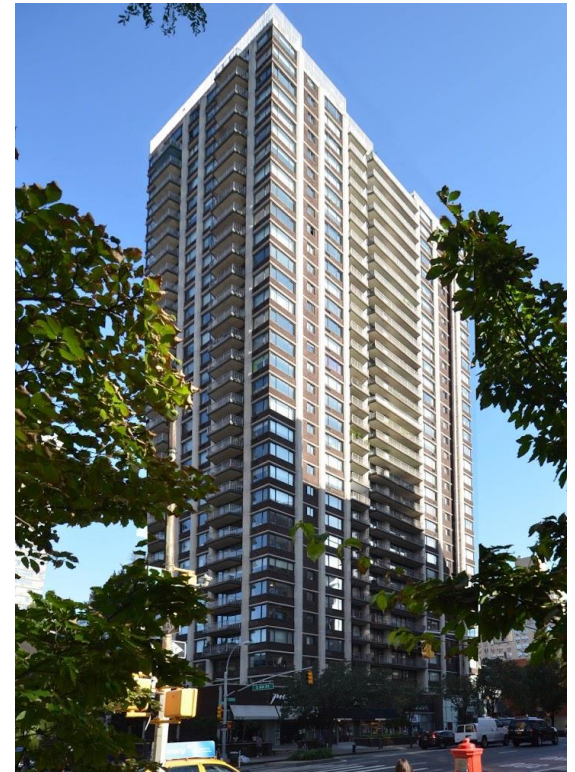
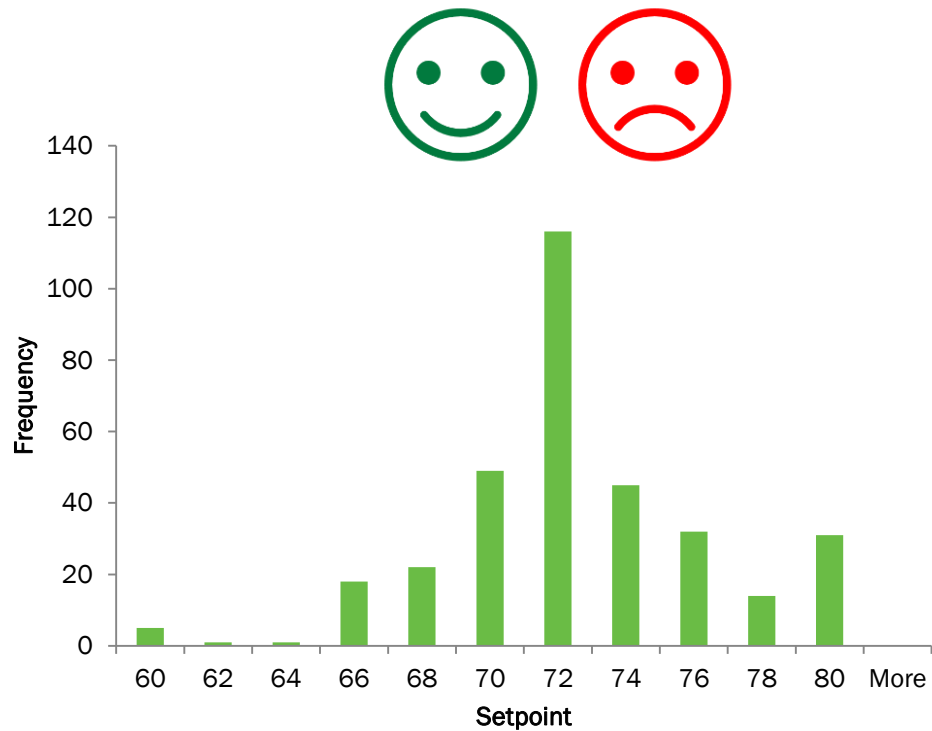
- Equitably sub-meter heat
 - Build upon EU’s long history of heat sub-metering and DOE’s work on electric sub-metering
 - More technically challenging than electric, but other benefits, such as improved comfort and O&M, offer something beyond just a bill

Saving’s potential of Submetering



Approach: Change Behavior

- Normative feedback / peer comparisons
- Savings tips
- Non-price messaging (environmental and health)



Impact

- **System Balance and Control**
 - + Ongoing Commissioning / RTEM
 - + Behavior Change
 - ~ 50% of space heating energy usage
- EU found sub-metering to be the most cost-effective GHG abatement strategy
- Taps behavior in a way other upgrades do not
- Improves the business case by enabling owners to shift heating costs off their budget
- Potential to scale nationwide: 113B SF of multifamily and office space, accounting for nearly 2500 TBTU of annual heating usage.*

* from EIA 2013 and 2016

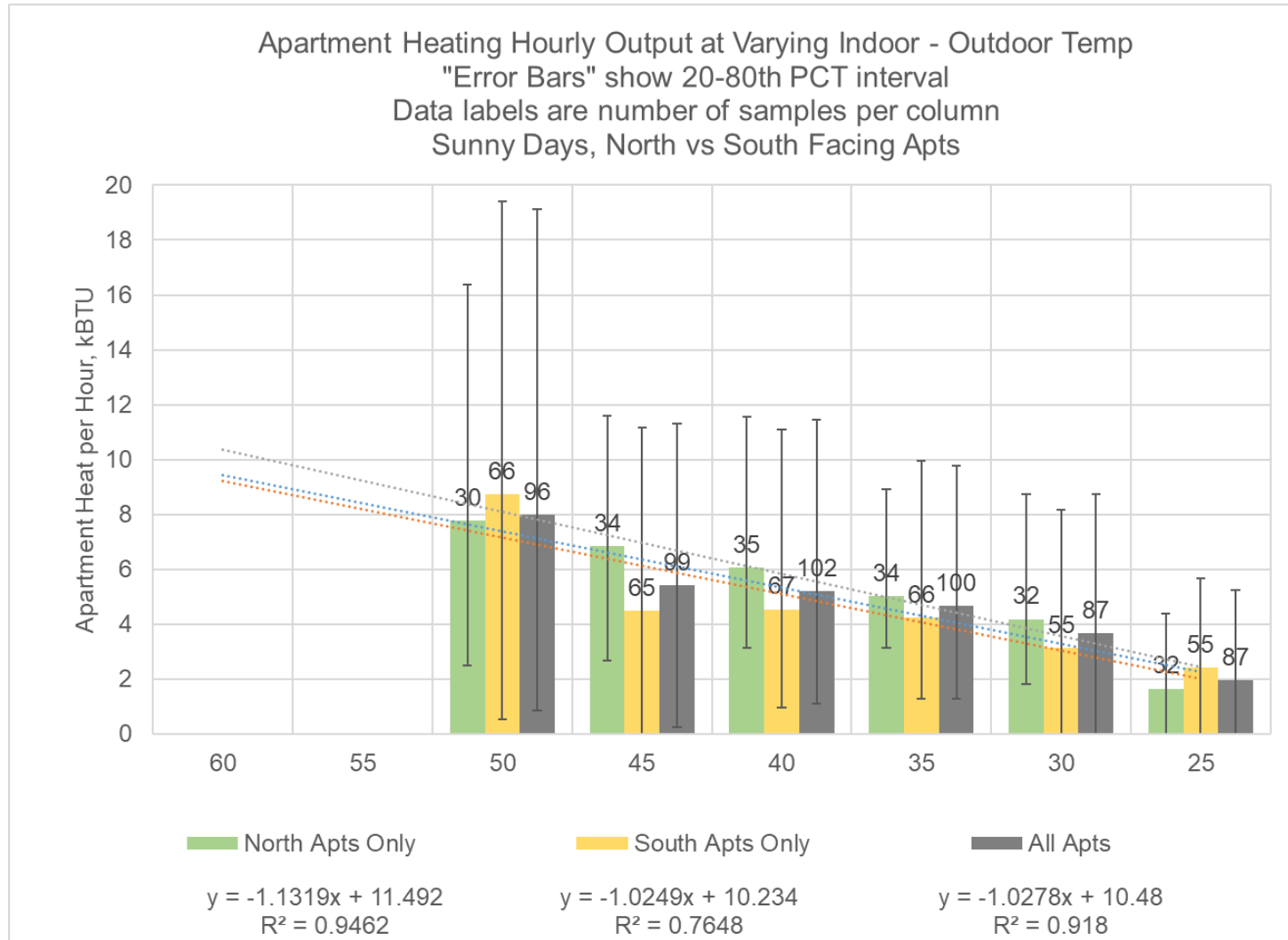
Progress: Installation and Commissioning

- System installation is complete
- Lessons learned
 - Order of installing wireless apartment hardware and building network is important to avoid repeated access
 - With so much data, computing capacity may be a choke point



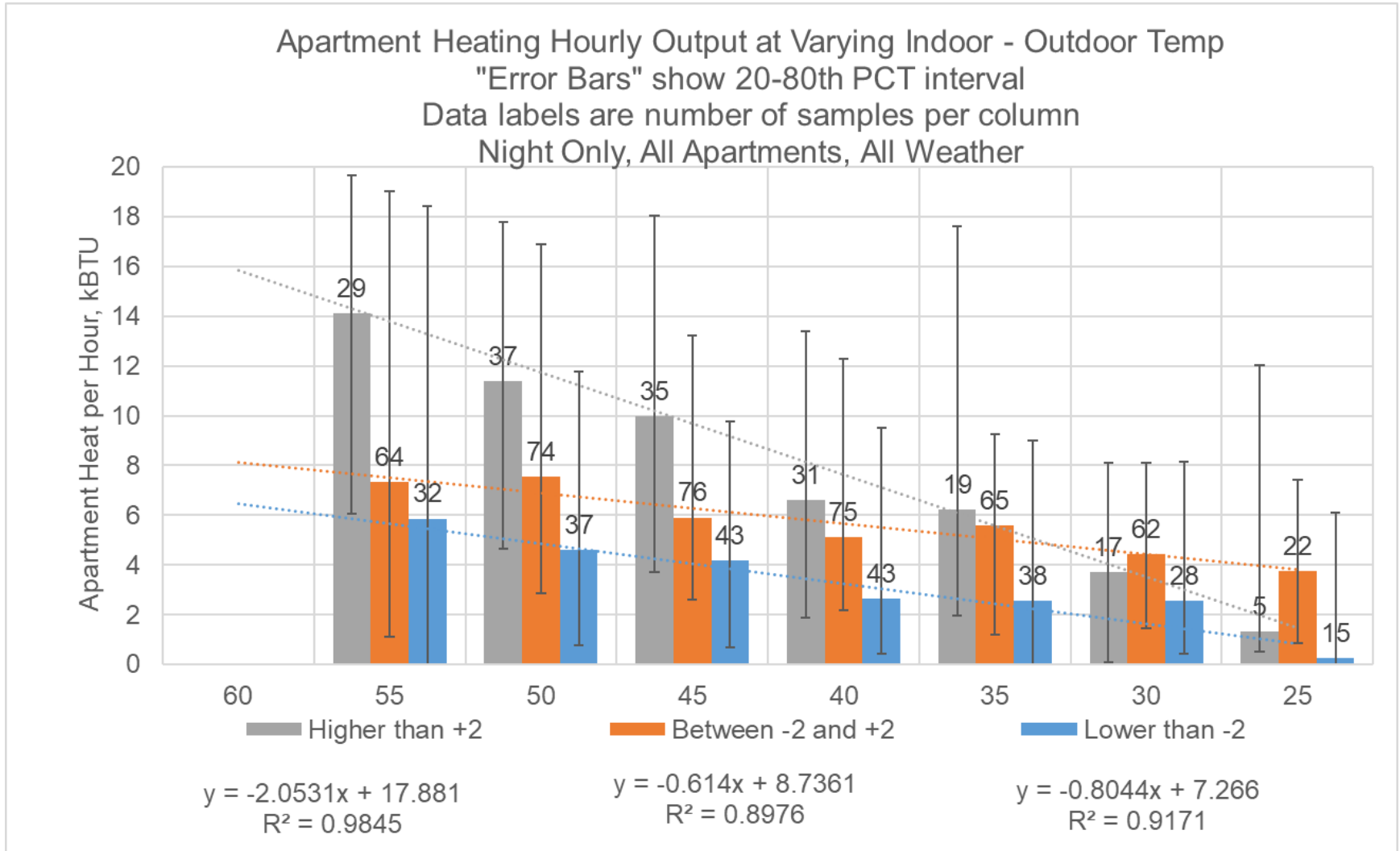
Progress: Preliminary Data Analysis

- Solar gain may not be a big factor...



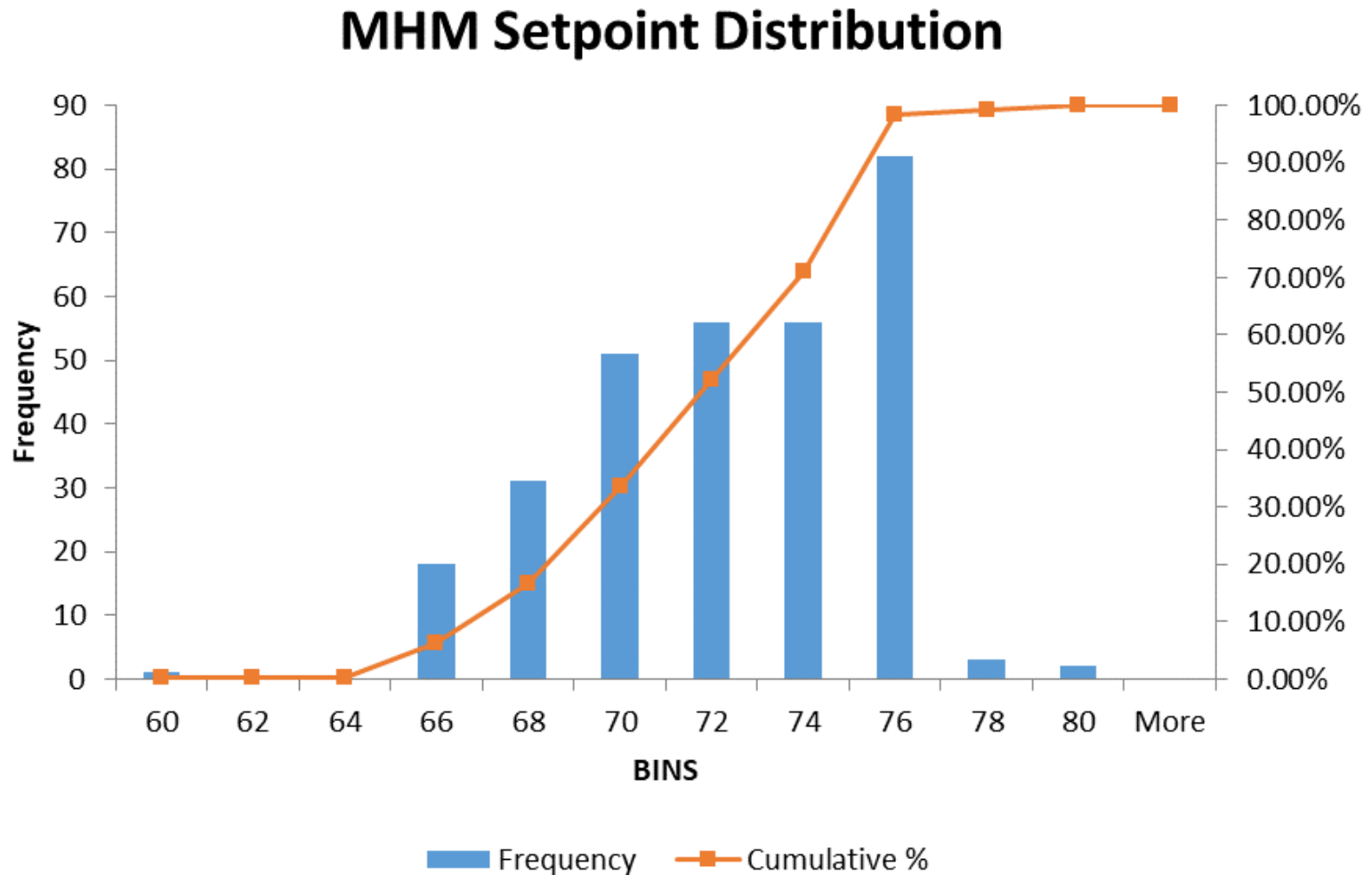
Progress: Preliminary Data Analysis

- ...but neighbors may have a big impact



Progress: Preliminary Data Analysis

- ...and people are used to maximum heat



Stakeholder Engagement

- **Kickoff in May 2018**

Con Edison	DOE
EDF	European Commission
NRDC	NYC Mayor's Office of Sustainability
NYSERDA	Owners

- **Key Takeaways**

- Transparency will be important
- Avoid split incentive
- Utility concerns

Remaining Project Work

- Finalize operator interface
- Finalize heat allocation algorithm
- Develop tenant interface and feedback

Energy Savings Tips

How can you help?

Utilize (or know) your thermostat.

- Minimizing the difference between the indoor and outdoor temperatures results in less energy needed.
- Higher heating and lower cooling setpoints do not heat or cool your space quicker.

Stay proactive in maintaining our home.

- Report drafts (e.g. around windows, or the heater)
- Ensure that windows can close fully to create continuous seals

Be mindful of your windows.

- In winter months, open your curtains during the day to naturally heat your space, close them at night to help keep the heat inside.
- You should not need to open your window to cool your space in the winter.

Respect the heater

- Ensure that the top heater fins are warm before increasing thermostat setting.
- Do not obstruct the heater.

Thank You

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REFERENCE SLIDES

Project Budget

Project Budget: \$1.4MM originally; 50% cost share

Variiances: Total budget increased by 17% due to size and scope of participating sites; all increase was in cost share

Cost to Date: 71% of total; 47% of DOE

Additional Funding: NYSERDA, Realty Operations Group (owner), The Kibel Organization (owner)

Budget History

Sept 2017 – FY 2018 (past)		FY 2019 (current)		FY 2020 – Aug 2020 (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$303,801	\$24,738	\$221,698	\$869,790	\$173,858	\$41,384

Project Plan and Schedule

- Project start: September 2017
- Projected end: August 2020

BP	Task / Milestone Description	Completion Date		Status	Notes
		Original Planned	Actual / Revised		
1	Technology and M&V installation	Oct-19	Mar-19	Completed	Delays in owner decision-making; logistics of installation in occupied apartments
1	G/NG: verified installation, stakeholder meetings	Nov-18	Apr-19	In Progress	
2	Develop building operator interface	Feb-19	Jul-19	In Progress	Some preliminary work begun
2	Develop heat allocation algorithm	Jun-19	Jul-19	In Progress	Some preliminary work begun
2	Develop tenant interface	Oct-19	Oct-19	In Progress	Some preliminary work begun
2	Pilot billing for heat	Nov-19	Nov-19		Some lease language in place
2	G/NG: tenants participating in billing	Dec-19	Dec-19		
3	With ORNL, analyze results	Jun-20	Jun-20		
3	Final reporting and presentations	Aug-19	Aug-20		