BE-EX: Room Heat Pump Expo

NYCHA's CH4A Pilot

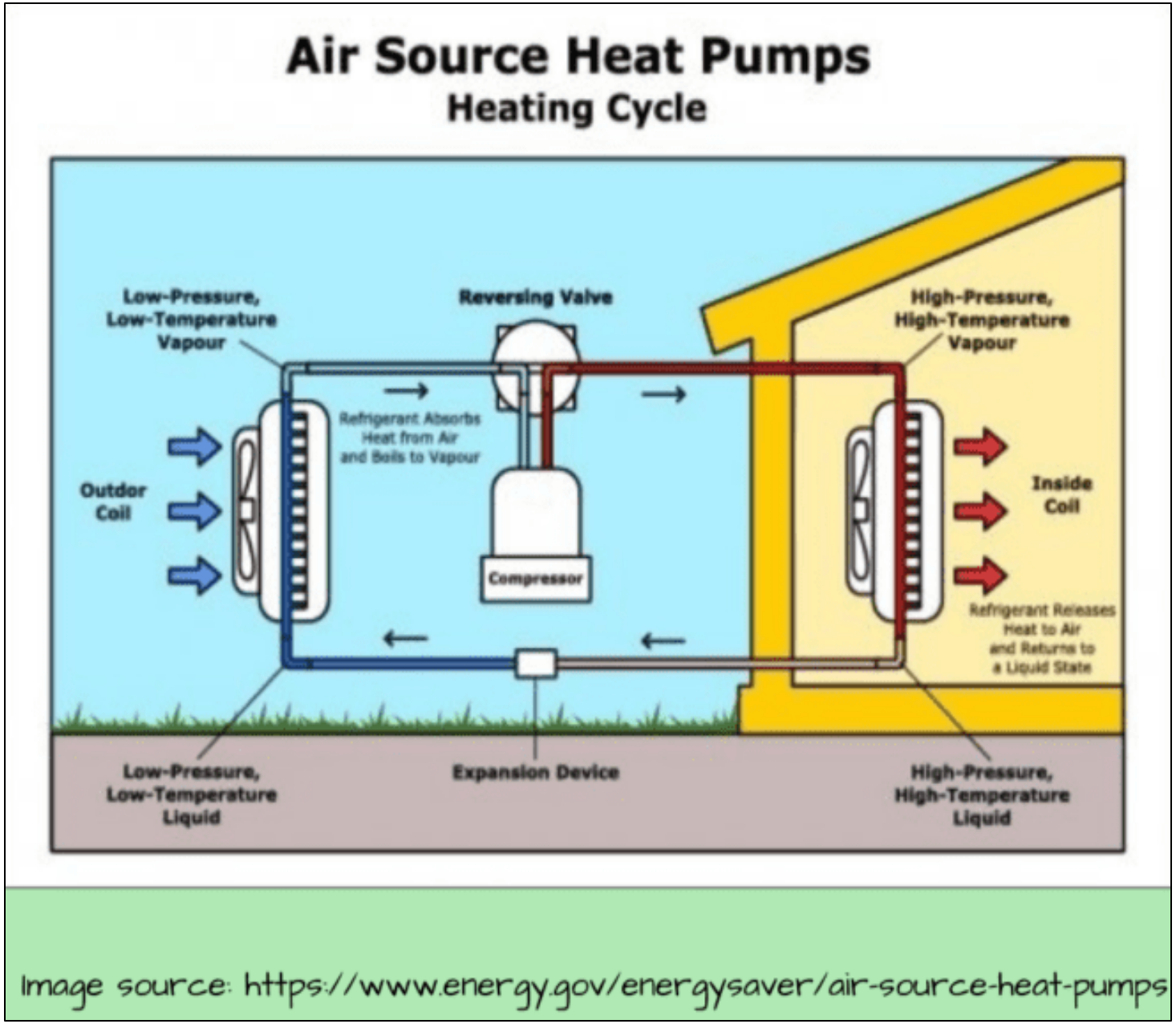
October 15, 2025

NEW YORK CITY HOUSING AUTHORITY

Agenda

- ❑ What is a heat pump?
- ❑ Challenges to retrofitting multifamily housing
- ❑ CH4A heat pump pilot
- ❑ Pilot results
- ❑ Lessons learned

What is a heat pump?



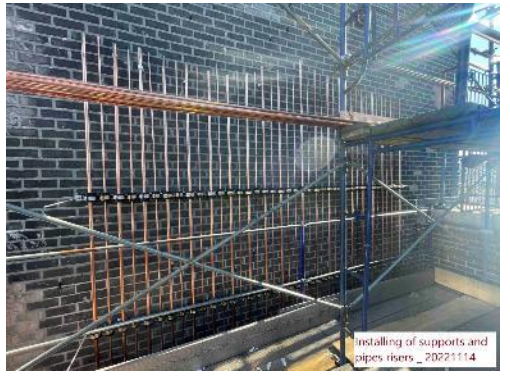
Outdoor Units

Wall-Mount Indoor Unit

Central VRF System requires major electrical upgrades and construction – only possible for certain buildings

Mini-split, Multi-split, and Central VRF Attempts

- Central outdoor units (e.g. rooftop) each serving a large number of indoor units (in apartments) via refrigerant piping
- 2-pipe system only allows heating or cooling at one time; 3-pipe system allows both at same time but is more complex and costly
- Flare fittings and long refrigerant runs pose risk of refrigerant leaks (HIGH GWP!!)



Clean Heat for All Challenge

WHO: NYCHA-NYPA-NYSERDA

WHAT: Partnership to develop new all-in-one packaged cold climate heat pump installed through existing window.

HOW: RFP for bulk purchase

- Minimum Requirements Specifications
- Additional Design Target Specifications (scoring system)
- Initial purchase order of production units

WHERE: NYCHA campus developments

NYCHA estimated internal demand: 156,000 heat pump units to reach climate goals

External demand: Letters of interest from 13 stakeholders: PHAs, government agencies, ESCOs representing over 75,000 housing units. *Price guarantee allows others to purchase at the same price.*

Image Source: Grain Collective

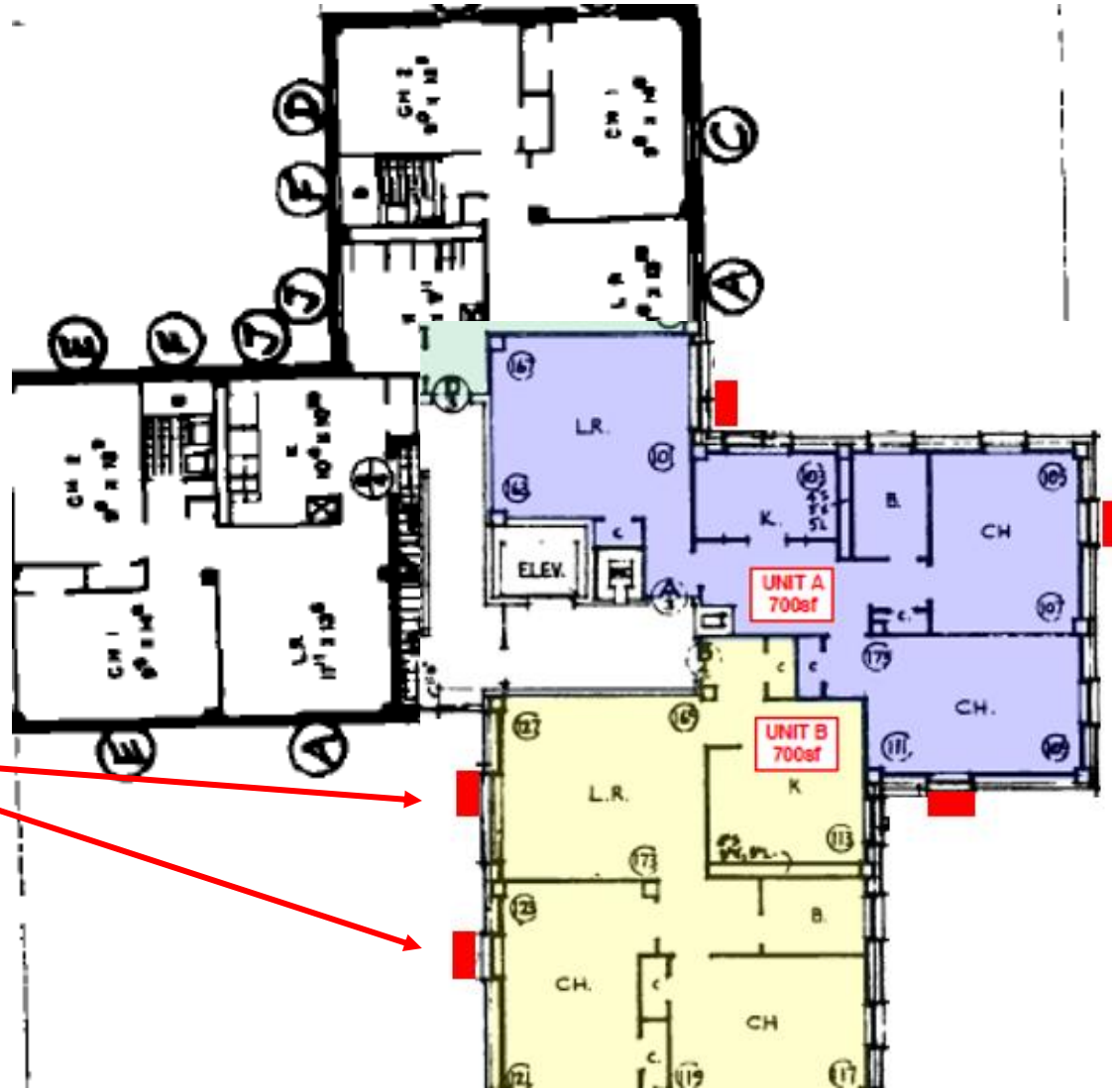
RFP Desired Product Specifications

- ❑ Form factor with approximate size and weight of a typical window AC or through-the-wall AC with all refrigerant piping hermetically connected within the unit and no exterior core drilling required for installation;
- ❑ Run on 120 VAC and plug into a standard 3-prong outlet, 15-amp circuit;
- ❑ Minimum efficiency of 1.85 COP at 17°F outdoor temperature and 70°F indoor temp in heating mode, at rated capacity;
- ❑ Shall operate in heat pump mode down to 0°F and have no backup resistance heat;
- ❑ Variable speed compressor with capacity of 9,000 Btu/hr heating at 17°F outdoor temp;
- ❑ Condensate line and pump (if needed) are internal and discharge outdoors or nearby indoors with no need for plumber labor;
- ❑ Can be installed so it is airtight around its perimeter without any degradation to the overall R-value or infiltration of the building envelope;
- ❑ Provide BACNet compatibility for BMS integration with no external proprietary cloud software required; and
- ❑ Can be installed by unskilled labor within approximately two hours.

Two window heat pump products piloted at Woodside

Background

- Two adjacent lines of apartments selected at two 6-story buildings
- 6 apartments per line, 12 apartments in each building, 24 total apartments in the pilot
- Buildings currently heated by 2-pipe steam
- Steam service was disconnected for the pilot apartments but left in place for the control apartments
- One heat pump installed in each bedroom and living room
- No direct heat provided in kitchens and bathrooms
- Electric meters installed on each heat pump and on each electric riser
- Space temperature measured in each room

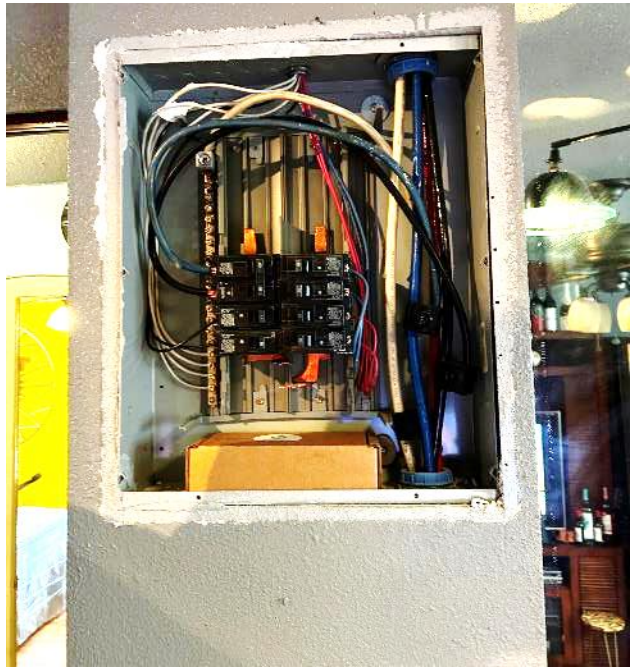


Window Heat Pumps

Midea

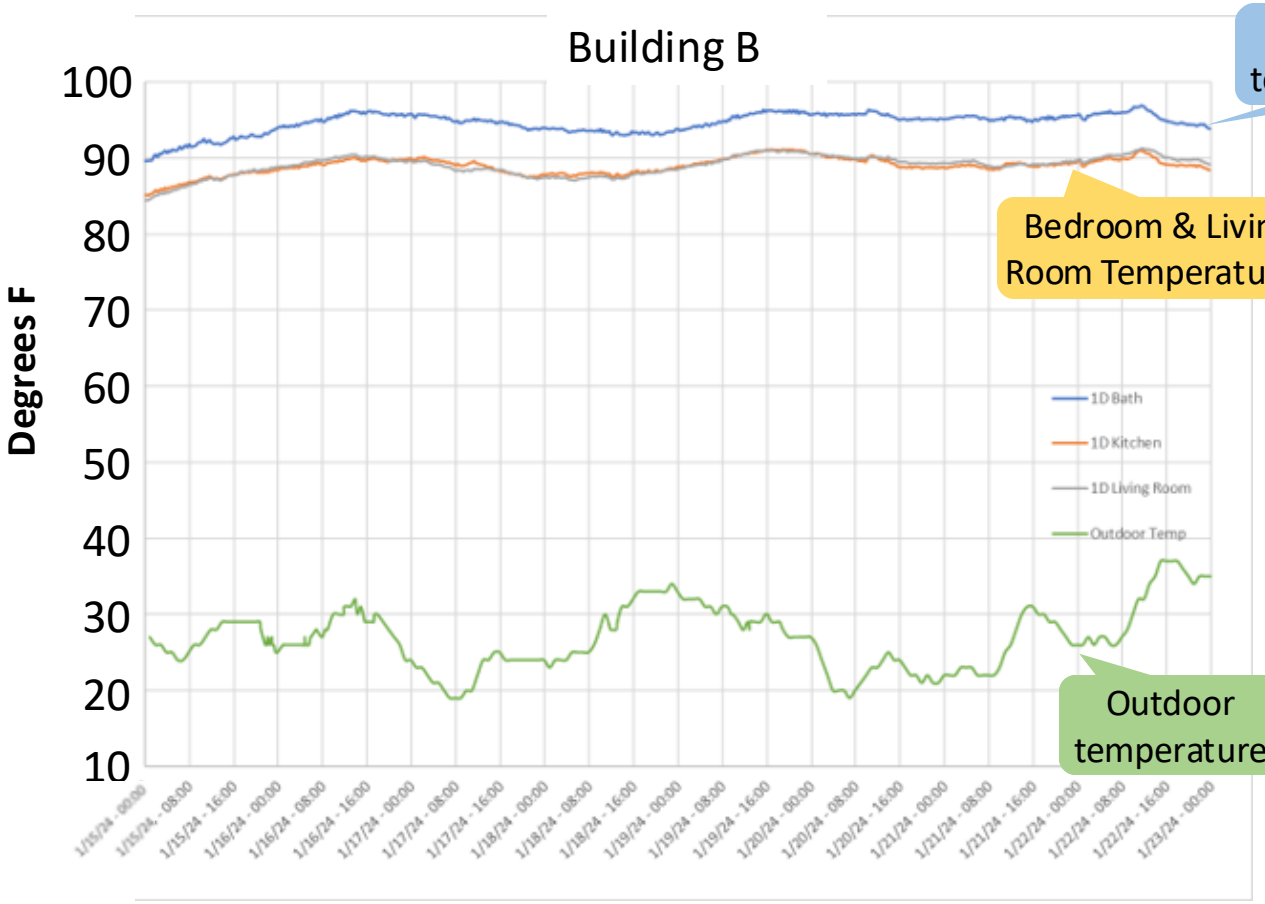
Gradient

Pilot installation completed by NYCHA maintenance staff with 24 apartments completed in 8 days (excluding outlets)

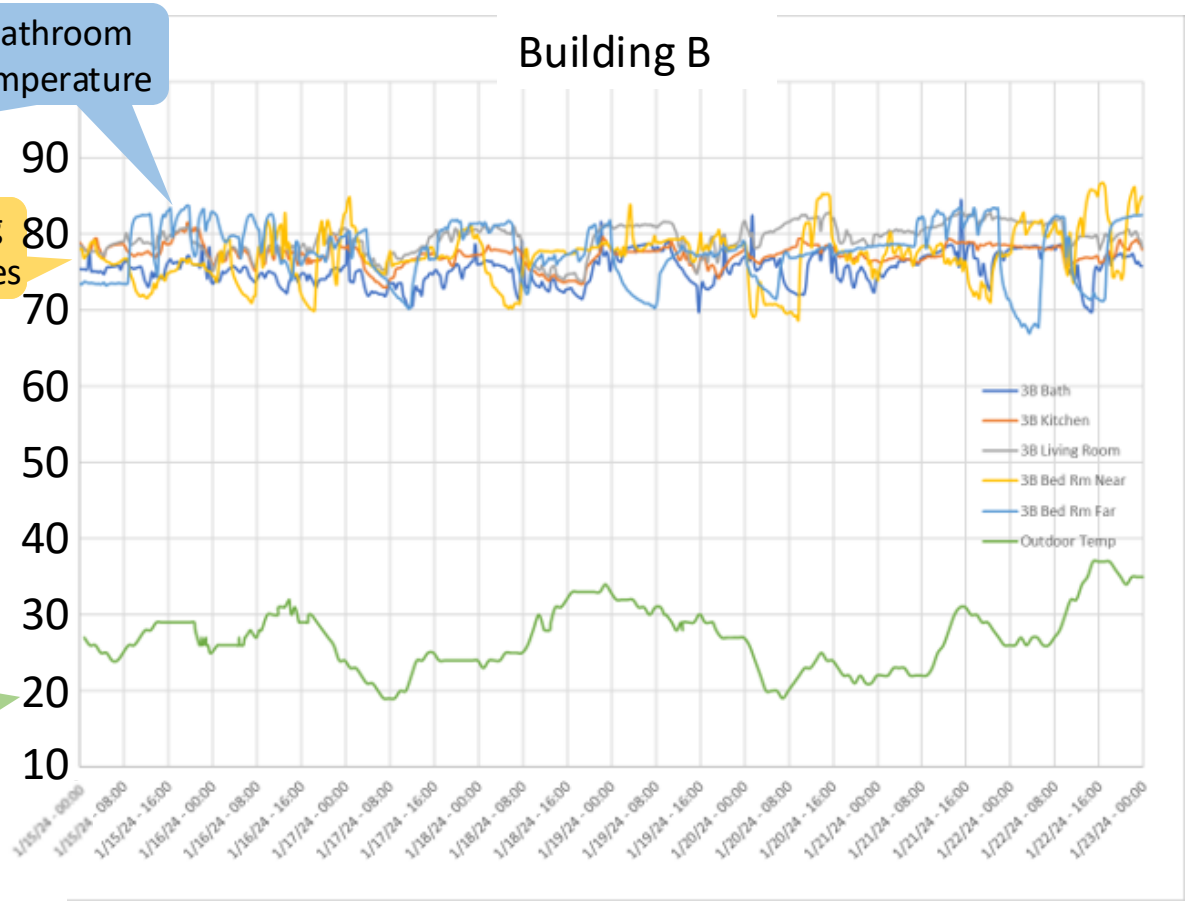


Preliminary Results: Consistent, comfortable temperatures

Control Apartment (Steam System)



Apartment with Window Heat Pump Units

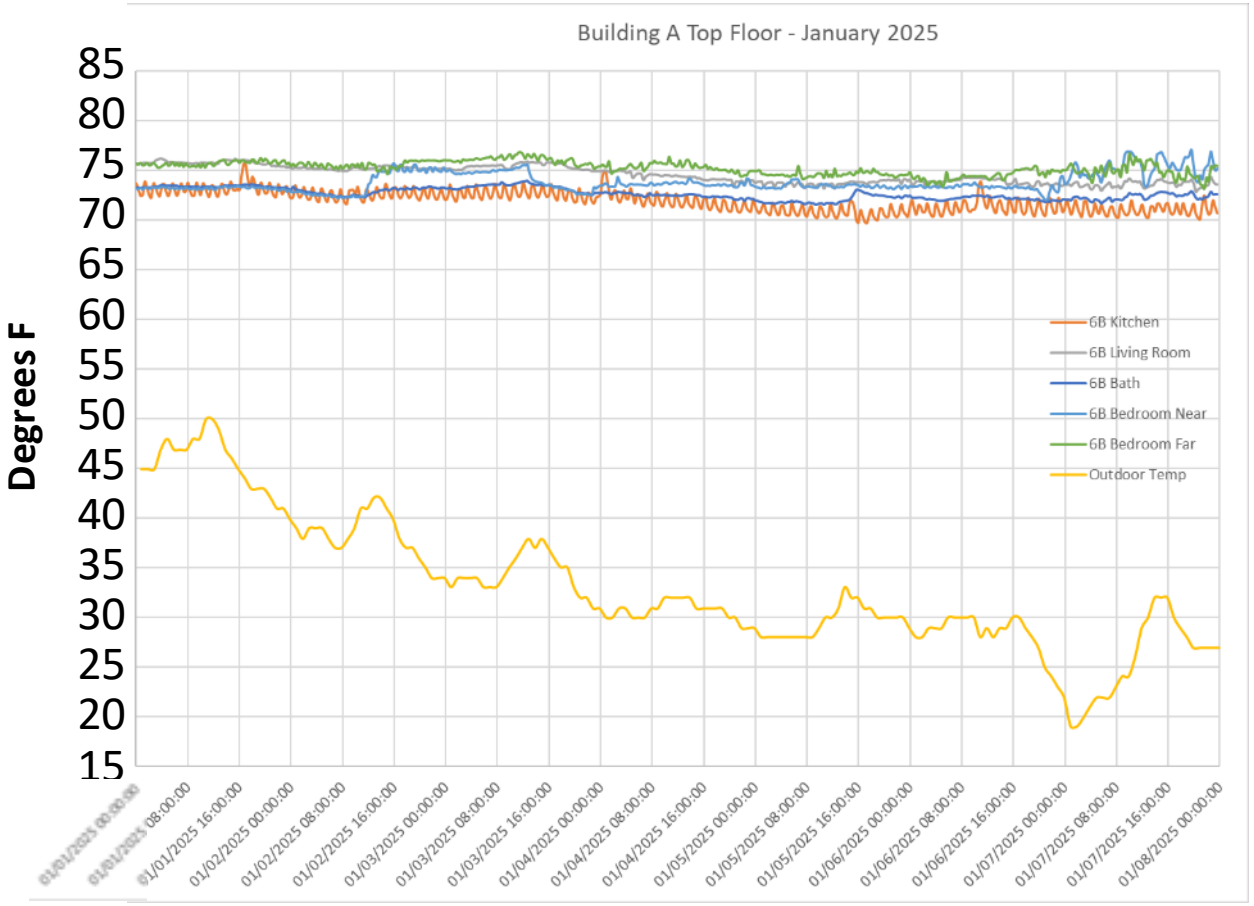


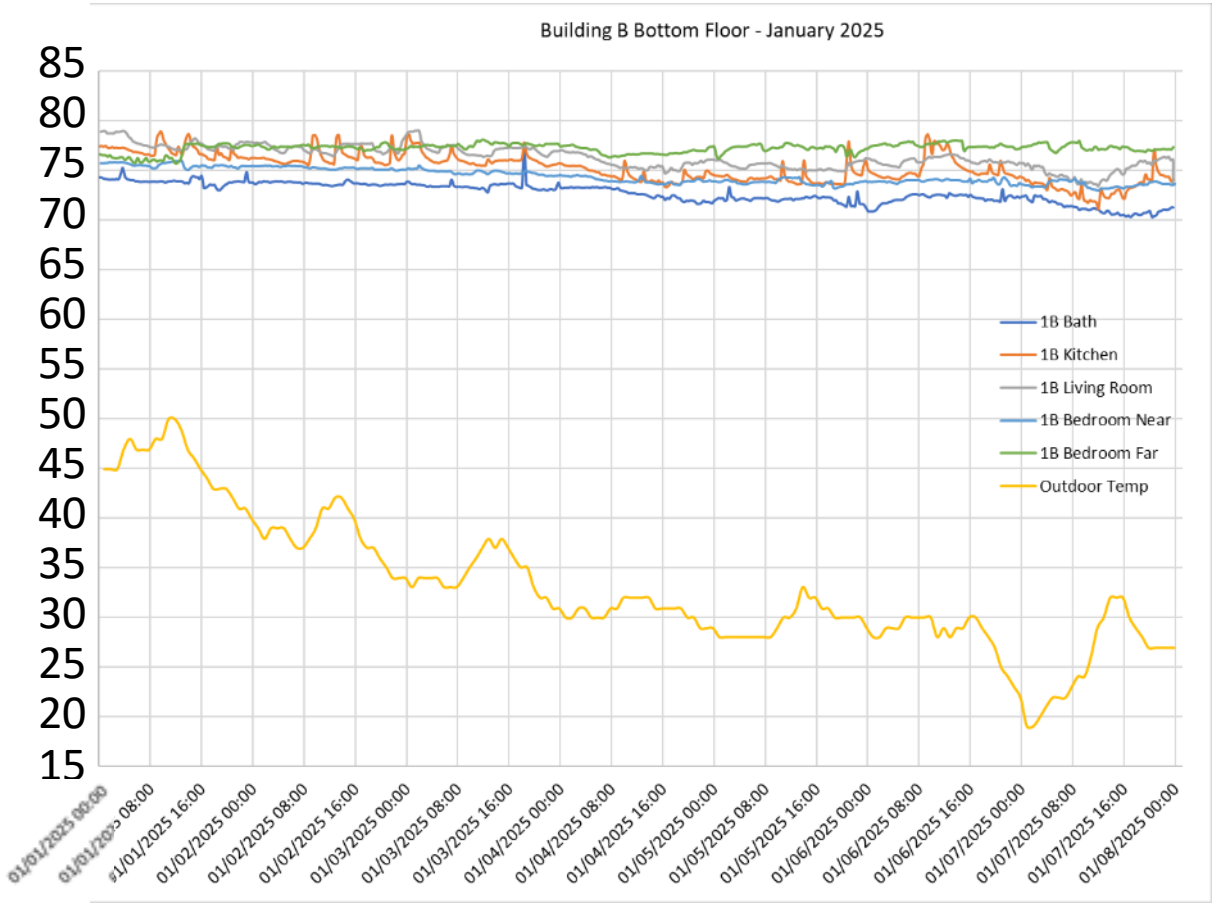
Bathroom temperature

Bedroom & Living Room Temperatures

Outdoor temperature

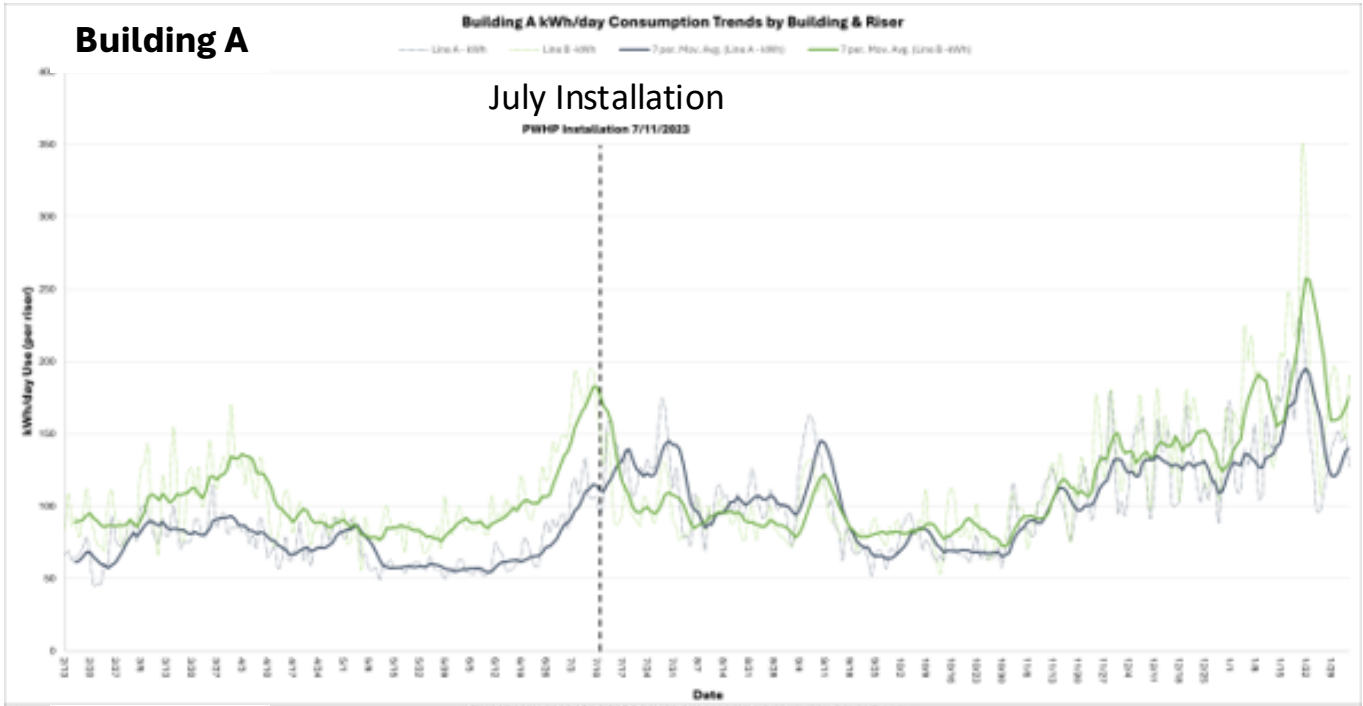
Consistent temperatures despite fluctuating outdoor temps

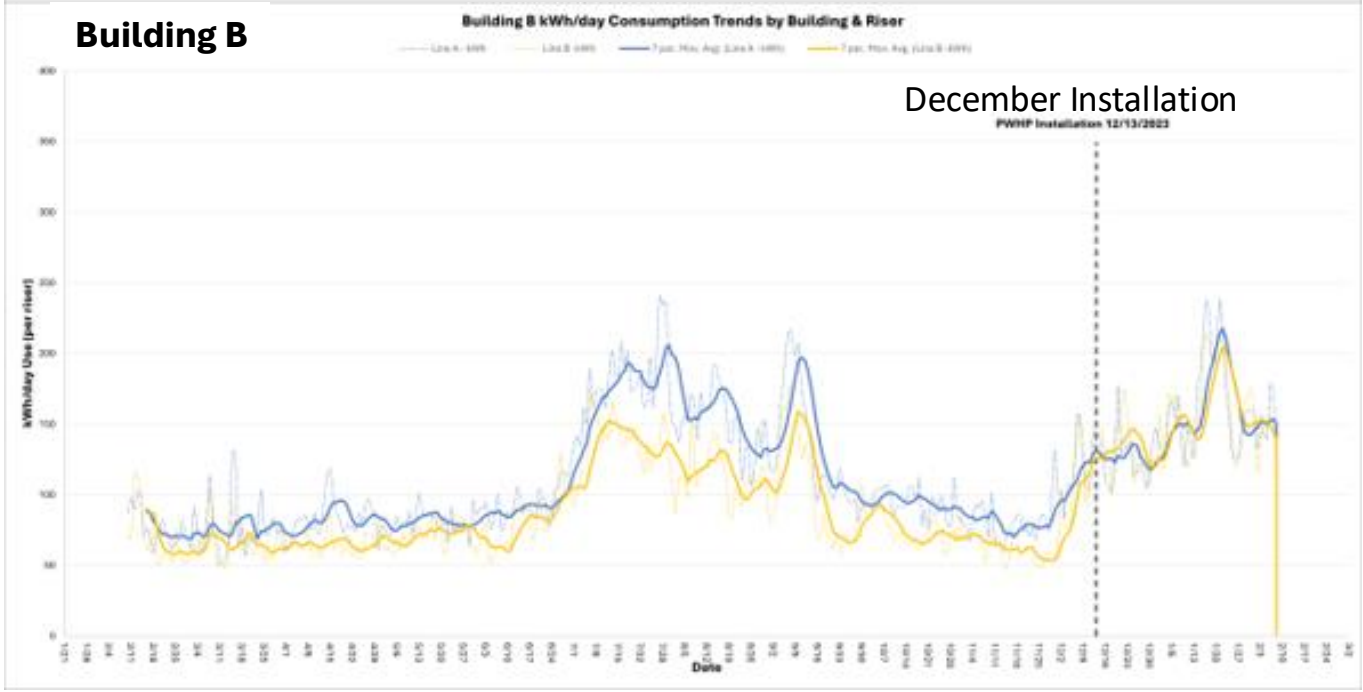




Increase in kWh per day, but not a large one, despite doubling the number of heat pumps installed vs. the number of removed window ACs

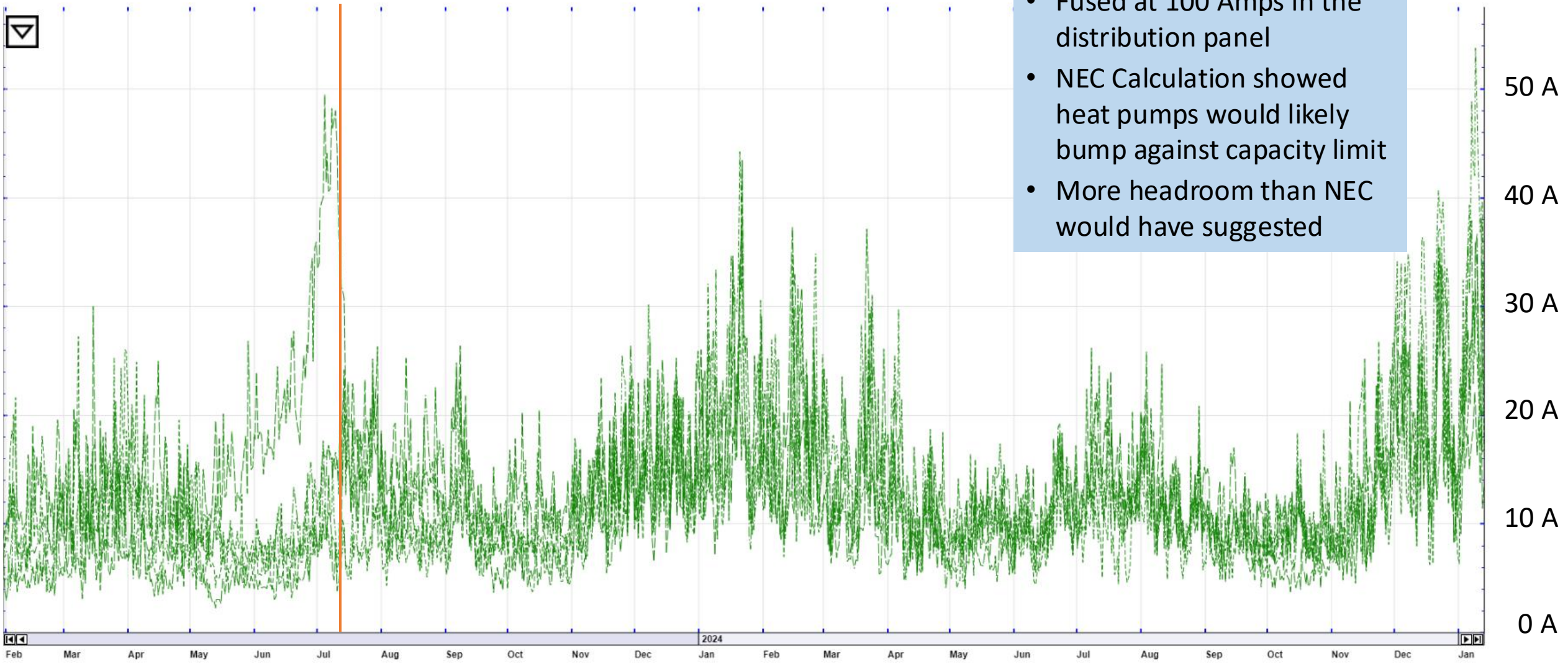
- Slight drop in summer kwh/day after building A install
- Winter demand peak was about the same as the summer peak in building B despite doubling the number of heat pumps vs window ACs
  - Note: 2023-24 heating season was relatively mild, but still had a few periods colder than 17 degrees F



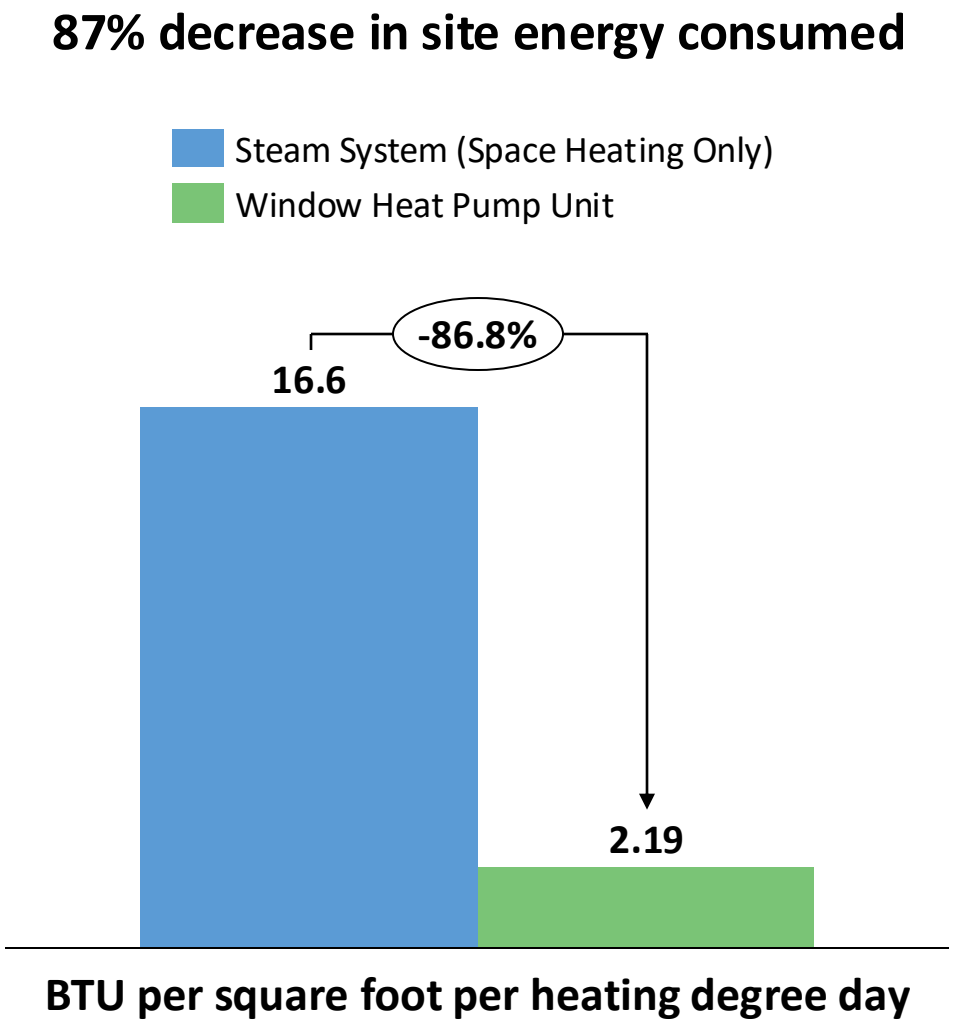


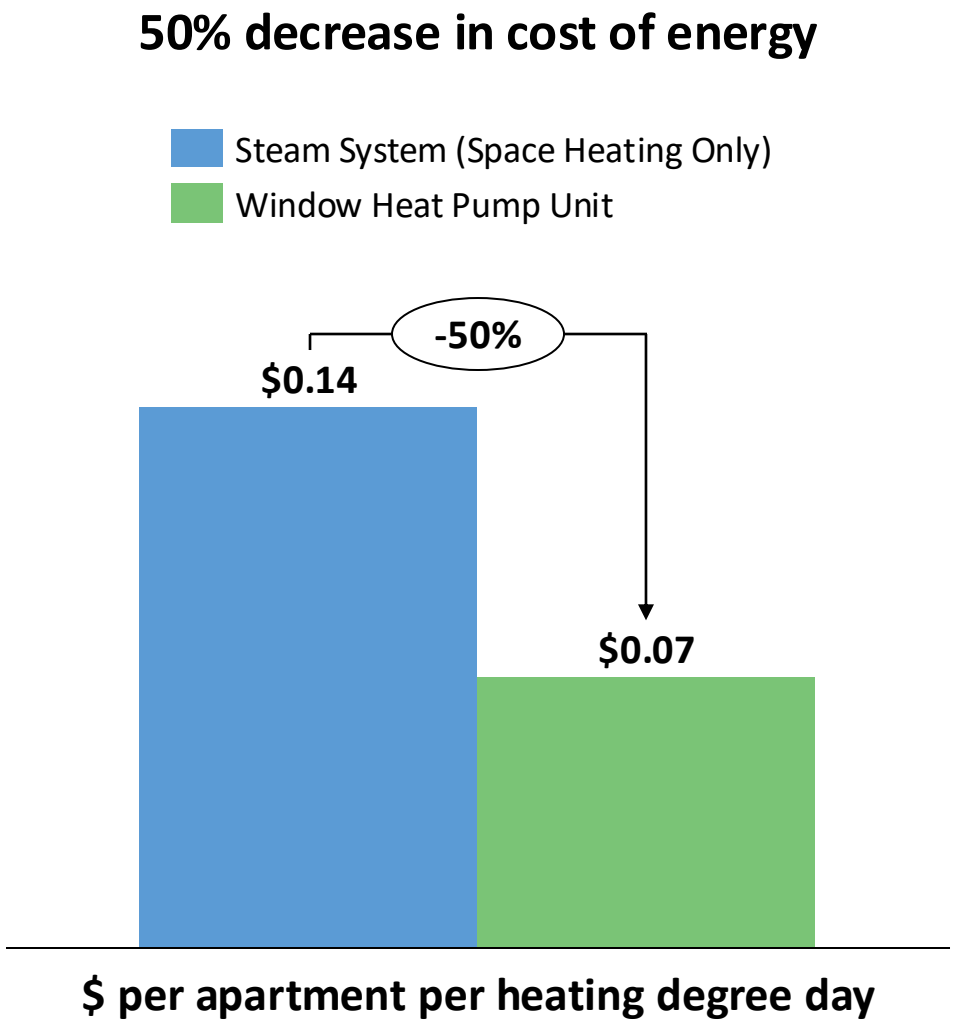
Metering showed that existing risers were only being loaded to ~30% of max capacity

- Risers rated for 130 Amps
- Fused at 100 Amps in the distribution panel
- NEC Calculation showed heat pumps would likely bump against capacity limit
- More headroom than NEC would have suggested



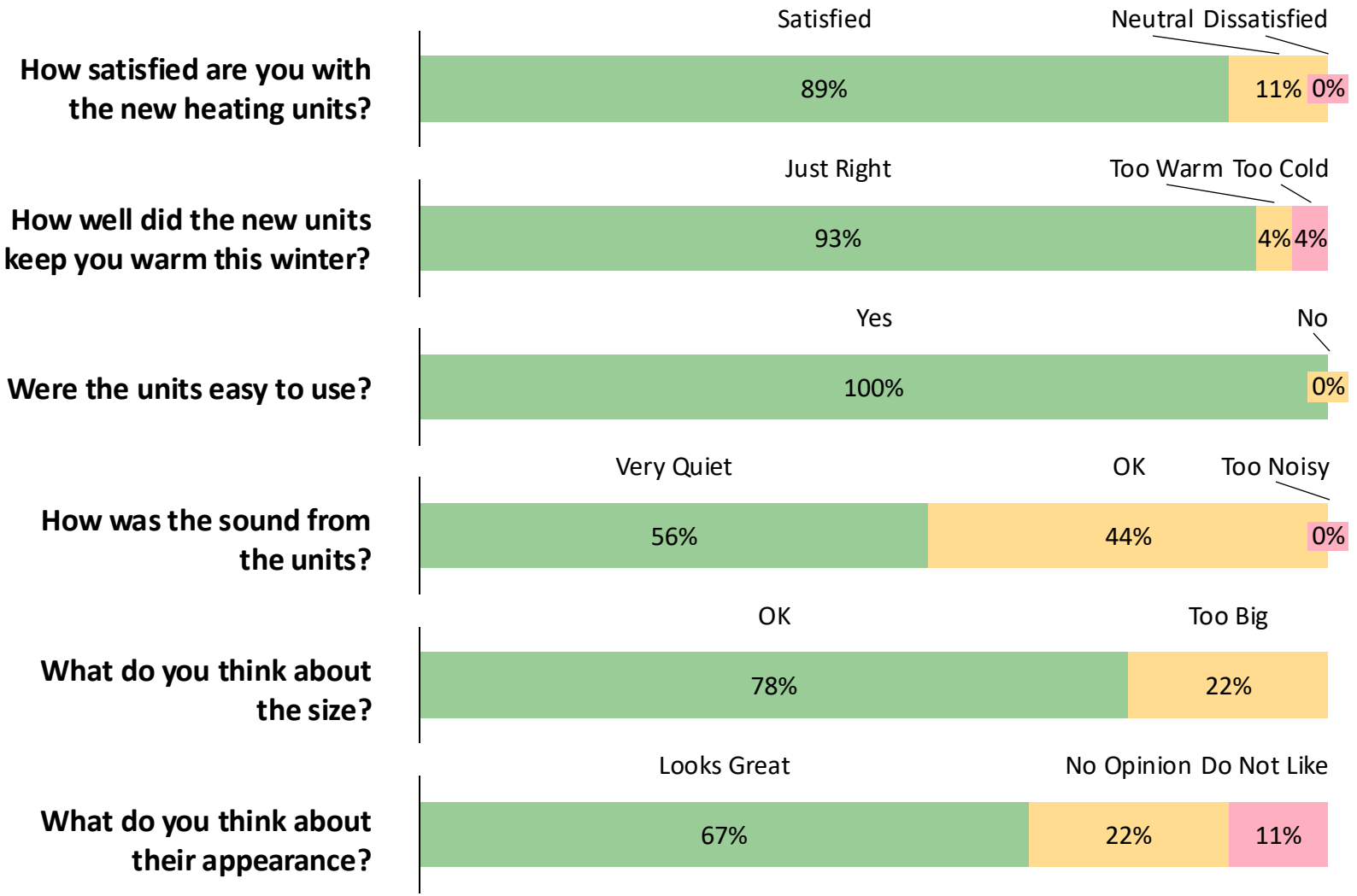
Preliminary Results: 87% decrease in site energy use and 50% decrease in energy cost





Based on average results from both manufacturers

Preliminary Results: Initial resident feedback: very positive



Notes: n = 72 responses

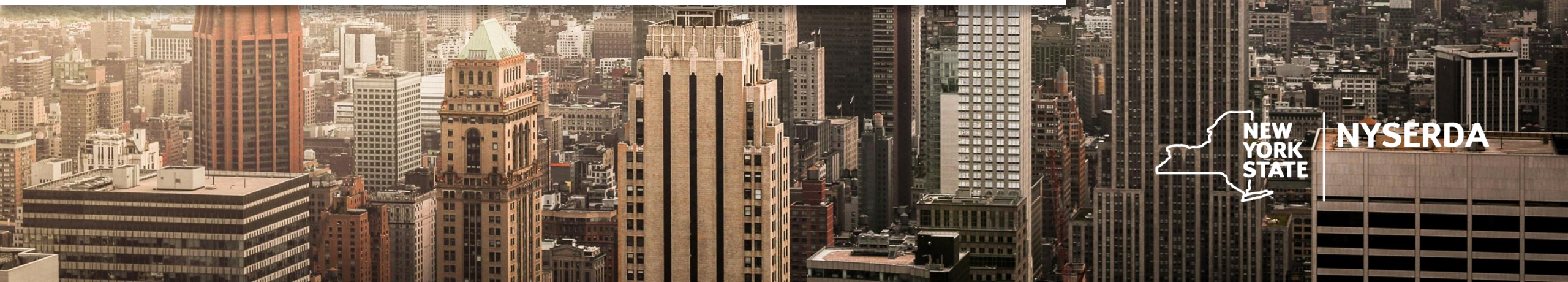
Lessons Learned

- **Successes**
  - Produced and demonstrated viability of 120V cold climate room heat pumps within three years of RFP launch
  - Exceeded expectations for both efficiency and price point
  - Residents almost unanimously preferred the heat pumps
  - Demonstrated a new model for public–private partnerships through customer-centric process of R&D
  - Involved residents in the M&V and feedback process

- **Challenges**
  - Buy-in from key stakeholders takes time to develop
  - Questions about long-term reliability and O&M can only be answered through more runtime and larger sample sizes
  - Obstacles in existing building codes and hazmat regulations must be examined and very possibly amended.

Clean Heat for All

Window Heat Pump Demonstration Program



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Packaged Window Heat Pumps (PWHPs)

Potential Market Impact & NYSERDA Program Strategy

ACEEE Study:

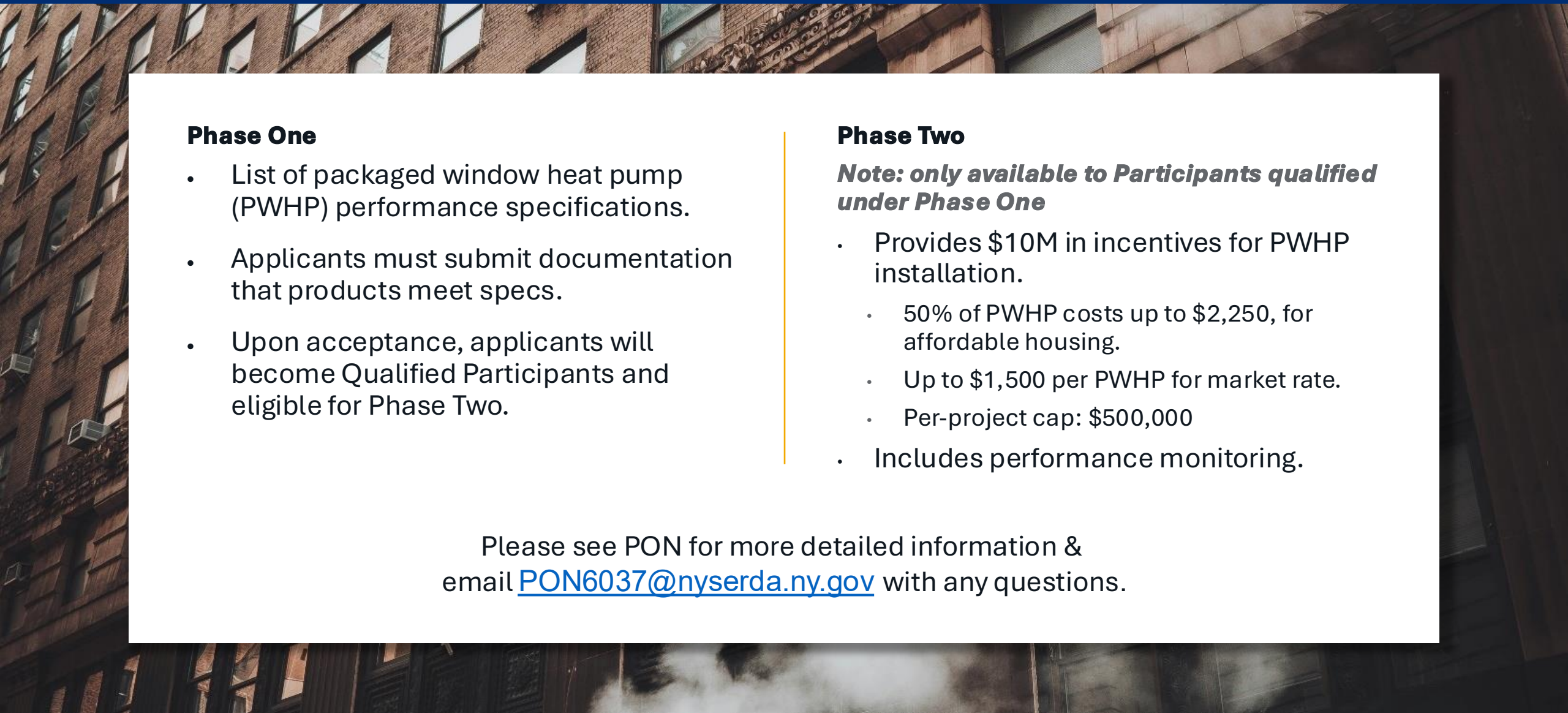
- Avg. PWHP retrofit cost: **$14,500/apartment.**
- Avg. 'large-scale heat pump' retrofit cost: **$22,000-$30,000/apartment.**

Cadmus cost data analysis (HPD retrofits):

- Avg. VRF or mini-split cost (including electrical upgrades): **$40,000/apartment.**

PWHPs can enable a quicker, more cost-effective transition to a clean energy economy in NY. NYSERDA's Window Heat Pump Demonstration Program is a bridge to larger-scale PWHP adoption.

Window Heat Pump Demonstration Program (PON 6037)



Phase One

- List of packaged window heat pump (PWHP) performance specifications.
- Applicants must submit documentation that products meet specs.
- Upon acceptance, applicants will become Qualified Participants and eligible for Phase Two.

Phase Two

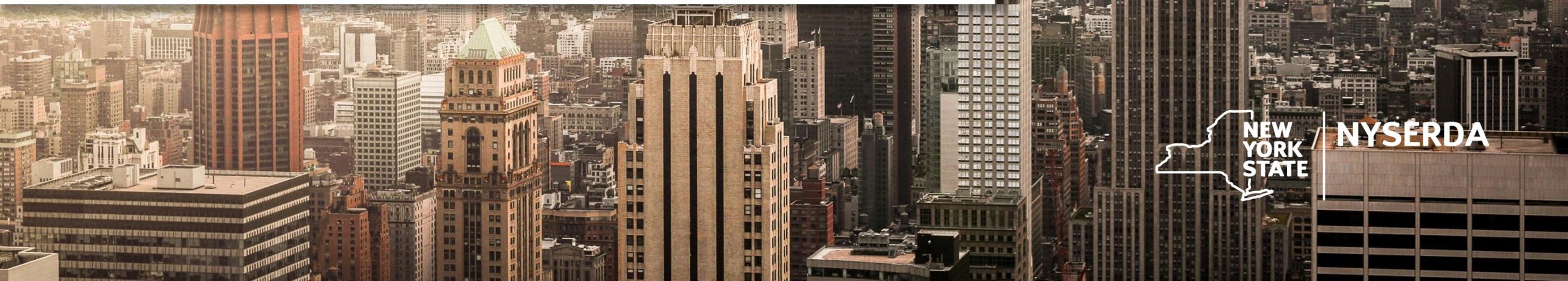
Note: only available to Participants qualified under Phase One

- Provides $10M in incentives for PWHP installation.
  - 50% of PWHP costs up to $2,250, for affordable housing.
  - Up to $1,500 per PWHP for market rate.
  - Per-project cap: $500,000
- Includes performance monitoring.

Please see PON for more detailed information & email PON6037@nyserda.ny.gov with any questions.

Clean Heat for All

Packaged Terminal Heat Pump Program



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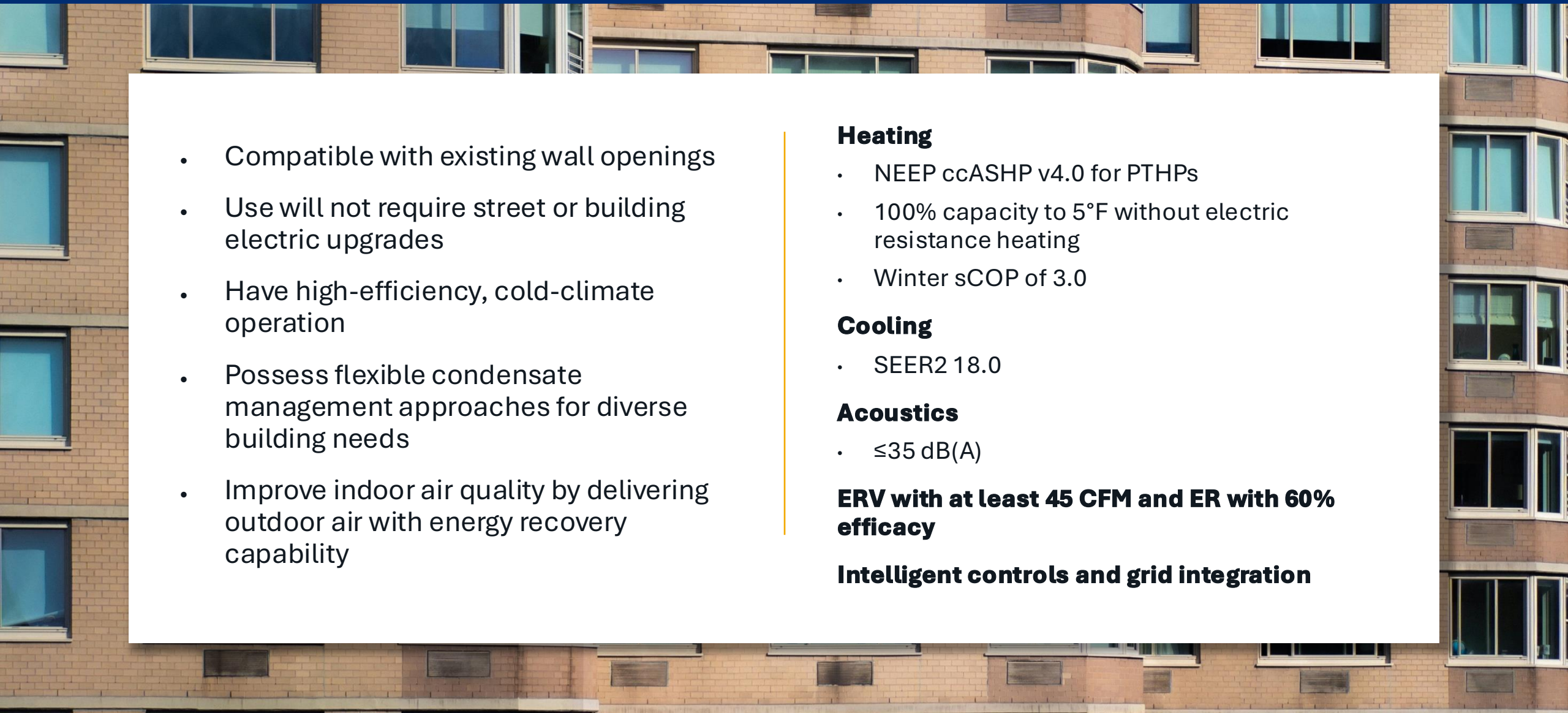
Manufacturer and Building owner engagement informed the development of technical and operational specifications

Owners and Operators

Manufacturers

Issued product specifications aimed to be ambitious yet attainable and address key barriers to adoption



- Compatible with existing wall openings
- Use will not require street or building electric upgrades
- Have high-efficiency, cold-climate operation
- Possess flexible condensate management approaches for diverse building needs
- Improve indoor air quality by delivering outdoor air with energy recovery capability

Heating

- NEEP ccASHP v4.0 for PTHPs
- 100% capacity to 5°F without electric resistance heating
- Winter sCOP of 3.0

Cooling

- SEER2 18.0

Acoustics

- ≤35 dB(A)

ERV with at least 45 CFM and ER with 60% efficacy

Intelligent controls and grid integration

The PTHP Program sought proposals for 3 categories of through-wall heat pumps

Classic PTAC

Typical Dimensions
- ≥ 16” H x ≥ 42” W (10 CFR 431.92.)

Typical Features
- 240V
- Gas or electric resistance heating

Hydronic PTAC

Typical Dimensions
- 16" H x 42" W
- 15 1/2" H x 40 3/4" W
- 15 1/2" H x 36 3/4" W

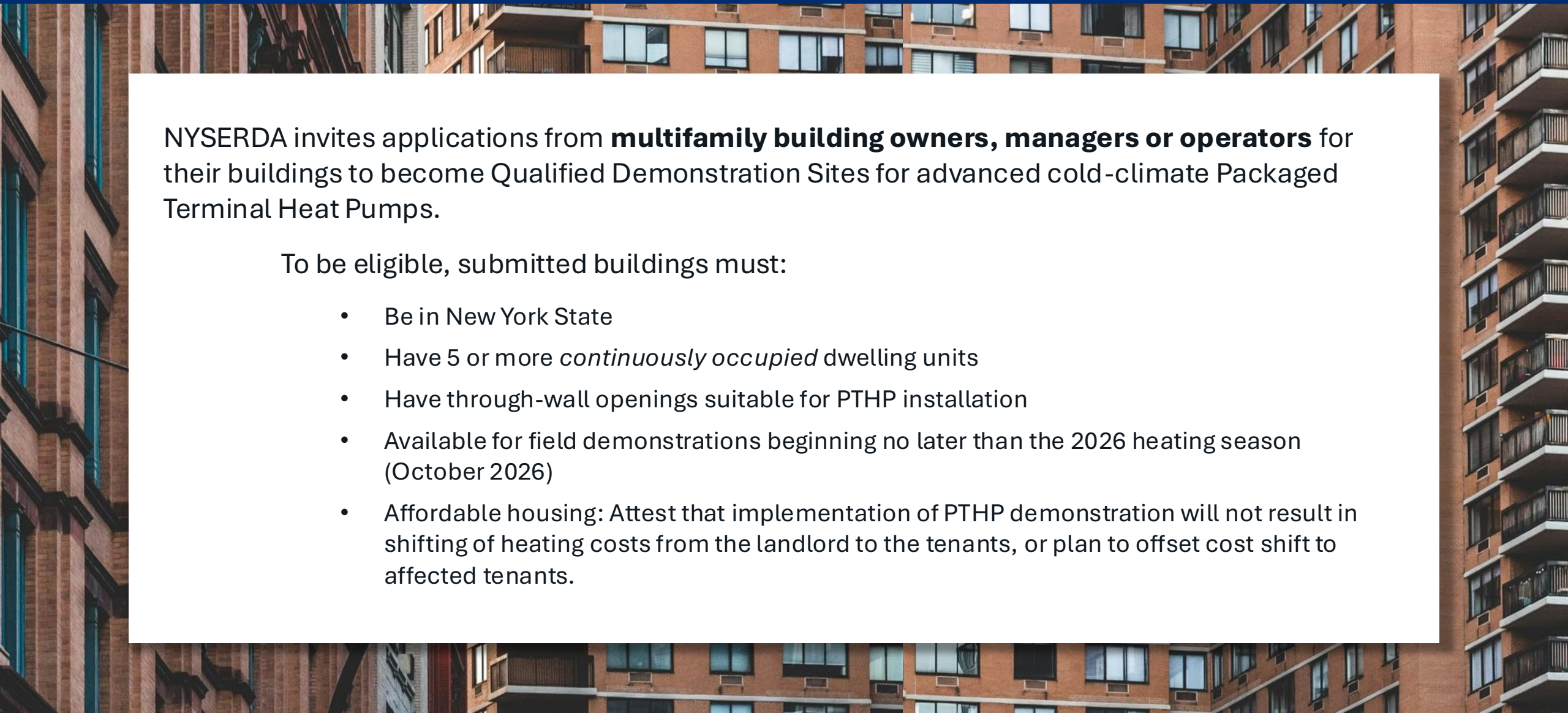
Typical Features
- 120V or 240V
- Hydronic heating coils

Through-Wall AC

Typical Dimensions
- 14 1/4" H x 24 1/4" W
- 15 3/4" H x 26" W
- 15 3/4" H x 23 3/4"

Typical Features
- 120V
- No heating

Apply to host PTHP Field Demonstrations (RFQL 5937)



NYSERDA invites applications from **multifamily building owners, managers or operators** for their buildings to become Qualified Demonstration Sites for advanced cold-climate Packaged Terminal Heat Pumps.

To be eligible, submitted buildings must:

- Be in New York State
- Have 5 or more *continuously occupied* dwelling units
- Have through-wall openings suitable for PTHP installation
- Available for field demonstrations beginning no later than the 2026 heating season (October 2026)
- Affordable housing: Attest that implementation of PTHP demonstration will not result in shifting of heating costs from the landlord to the tenants, or plan to offset cost shift to affected tenants.

Learn More / Apply to these NYSERDA Programs!

Through Wall Heat Pump Demonstration Program (RFQL 5937)

Window Heat Pump Demonstration Program (PON 6037)

California Needs Room Heat Pumps Too!

Elaine Miller, Senior Strategy Manager, CalMTA
October 15, 2025

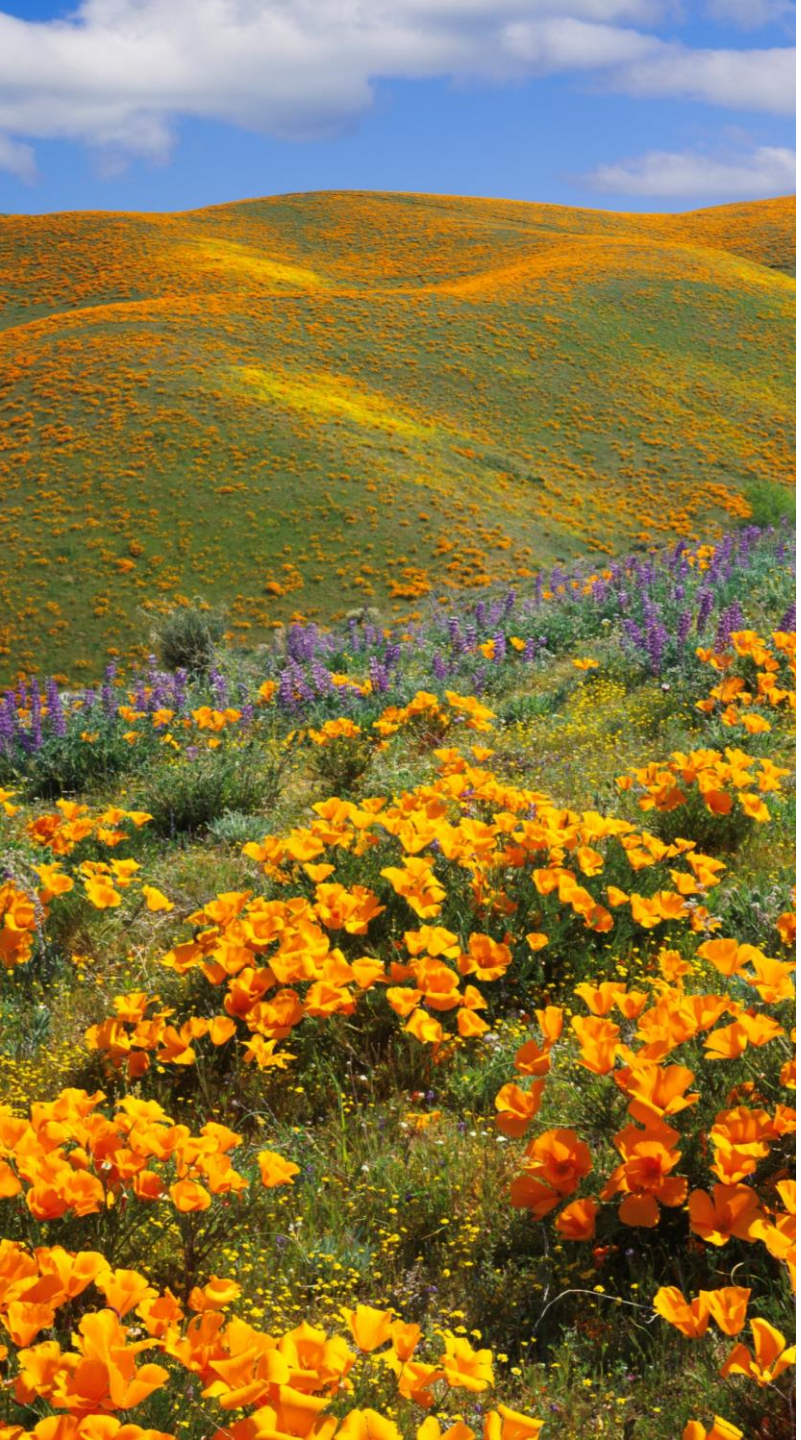
CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

Current CA opportunity… and challenge

Heating and cooling represent the largest energy consumption end-uses for homes in California.

- More than 3 million individual AC units in use across the state and 50% of households using gas appliances for heating.
- RHPs are a great solution, especially for MF, especially for ESJ communities.
- … but current products don't work in over 70% of MF rooms and over 50% of SF rooms* in CA housing stock.

** based on assessment of bedrooms and living rooms*



Meet CalMTA

- CPUC created a Market Transformation Framework
- Funded for $310 million through 2030
- Resource Innovations named Administrator and supported by other expert firms
- CalMTA develops & manages MT initiatives (MTIs) with MT Advisory Board input
- First two initiatives are in CPUC review; would deliver over $1B in TSB over their 20-year lifetimes

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations

Programs and ideas in process

Room Heat Pumps

Induction Cooking

Commercial Rooftop Units

Residential Heat Pump Water Heating

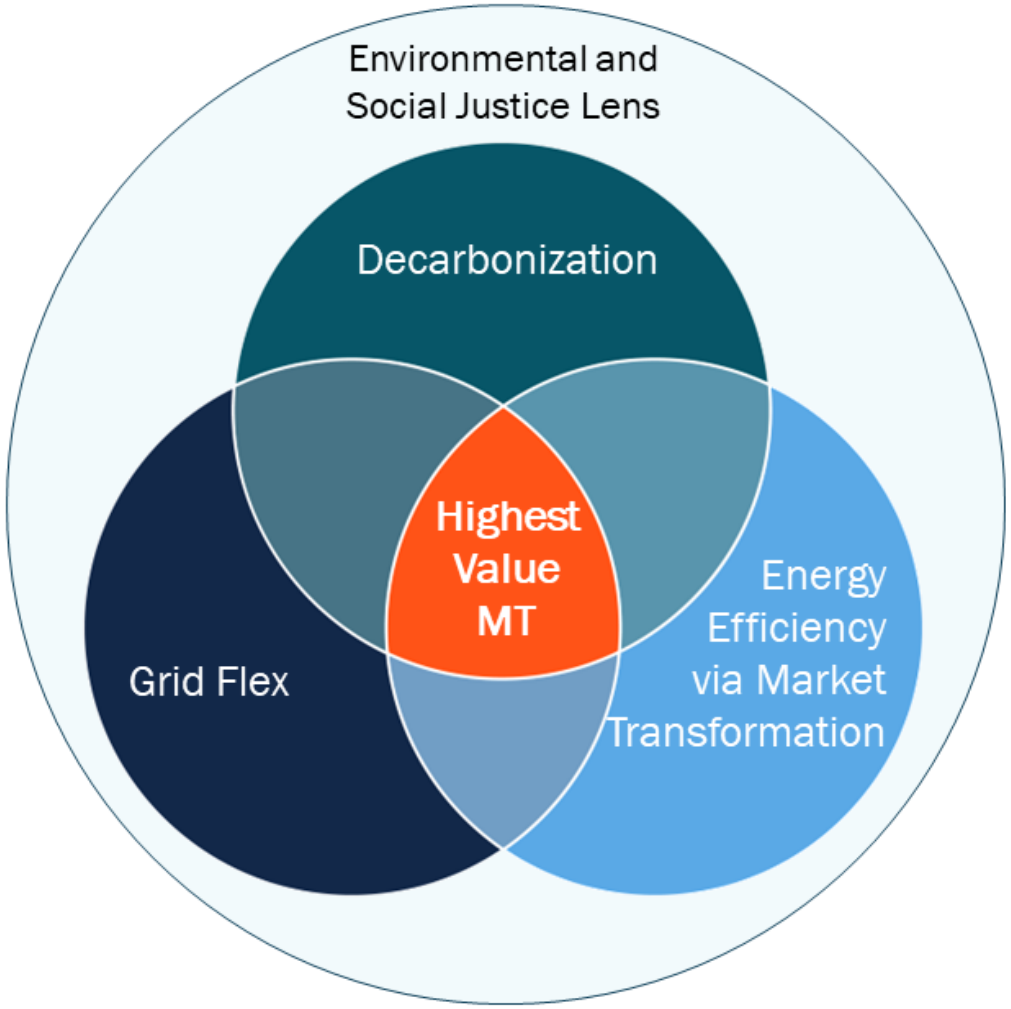
Commercial Replacement & Attachment Window Solutions

Foodservice Water Heating Systems

Commercial Building Efficiency Accelerator

How we work

- Ensure selected initiatives meet MT criteria
- Collaborate with existing EE efforts
  - Avoid duplication
  - Faster scale
- Advance other state goals:
  - GHG reduction
  - Workforce education & training
  - Environmental and social justice (ESJ)
  - Grid health



Strategic market intervention

RHP market potential for California

	Market Potential Unit Estimates 2024-2045 (Millions)*
Multifamily households	1.21
Single-family households	1.84
TOTAL	**3.05**

* From CalMTA Room Heat Pumps Market Transformation Initiative Appendix B: Market Forecasting & Cost-Effectiveness Modeling Approach Appendix-B_MF-CE-Modeling_RHP.pdf

California programs interest in RHP

- Measure packages being developed for inclusion in **California Electronic Technical Resource Manual (eTRM)** and income-qualified **Energy Savings Assistance (ESA) Program**
- **TECH Clean California** (statewide initiative to accelerate adoption of HP technologies) evaluating for inclusion in multifamily program
- **California Heat Pump Partnership** (public-private alliance) interested in potential to support state's goal of 6M HPs adopted by 2030
- Comments submitted to encourage inclusion in future statewide **Plug Load & Appliance Program** and **HEEHRA Phase II** rebates (both retail channel)

Available products for CA

Primary focus is room air conditioners with reverse cycle

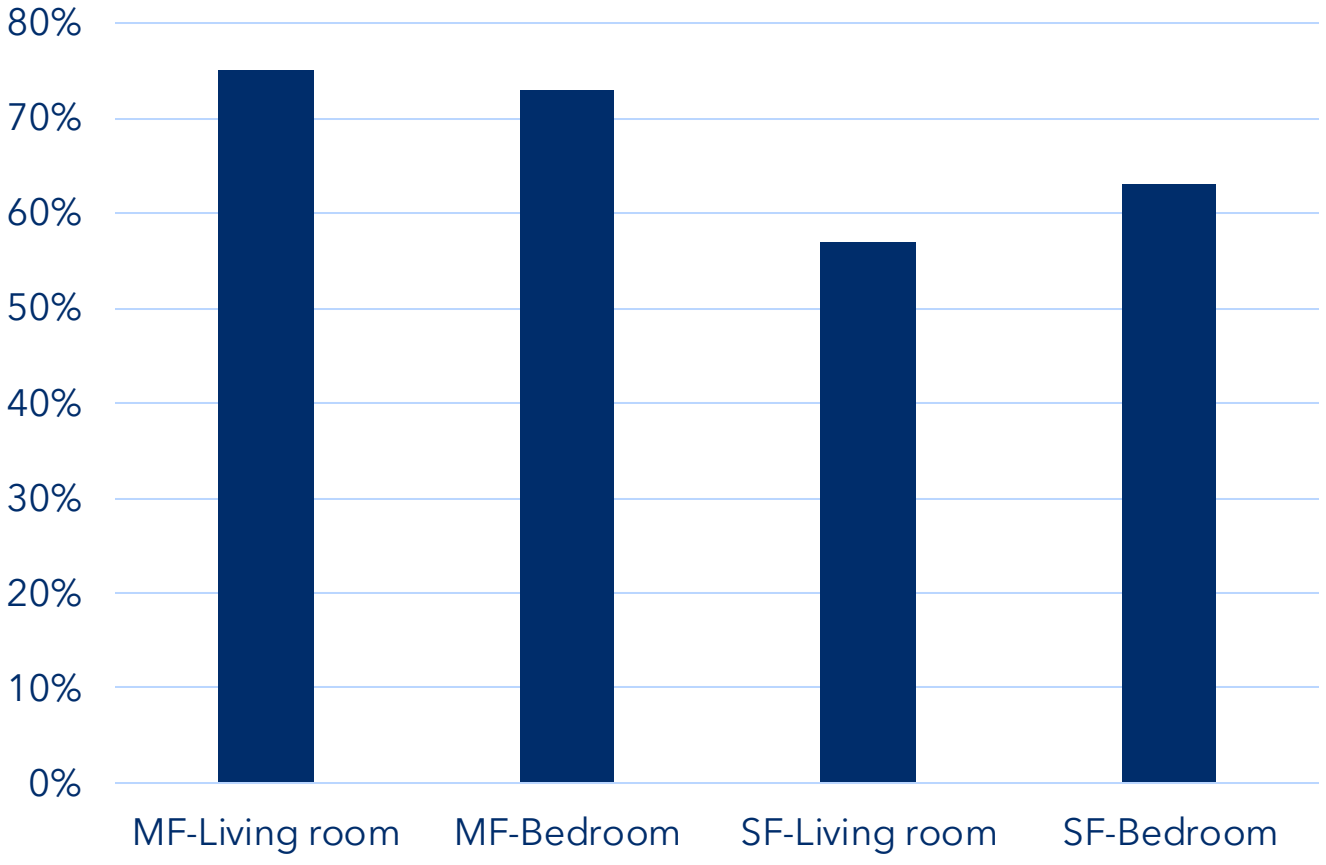
- traditional window heat pumps (d)
- saddlebag (b)
- U-shaped (c)
- through-the-wall (replacement only)

Available products for CA

Portable air conditioners with reverse cycle also included (a)

- Meets the need for vertical sliding and casement windows
- But current versions are not highly efficient and cannot operate at lower temperatures

Rooms without vertical sliding windows

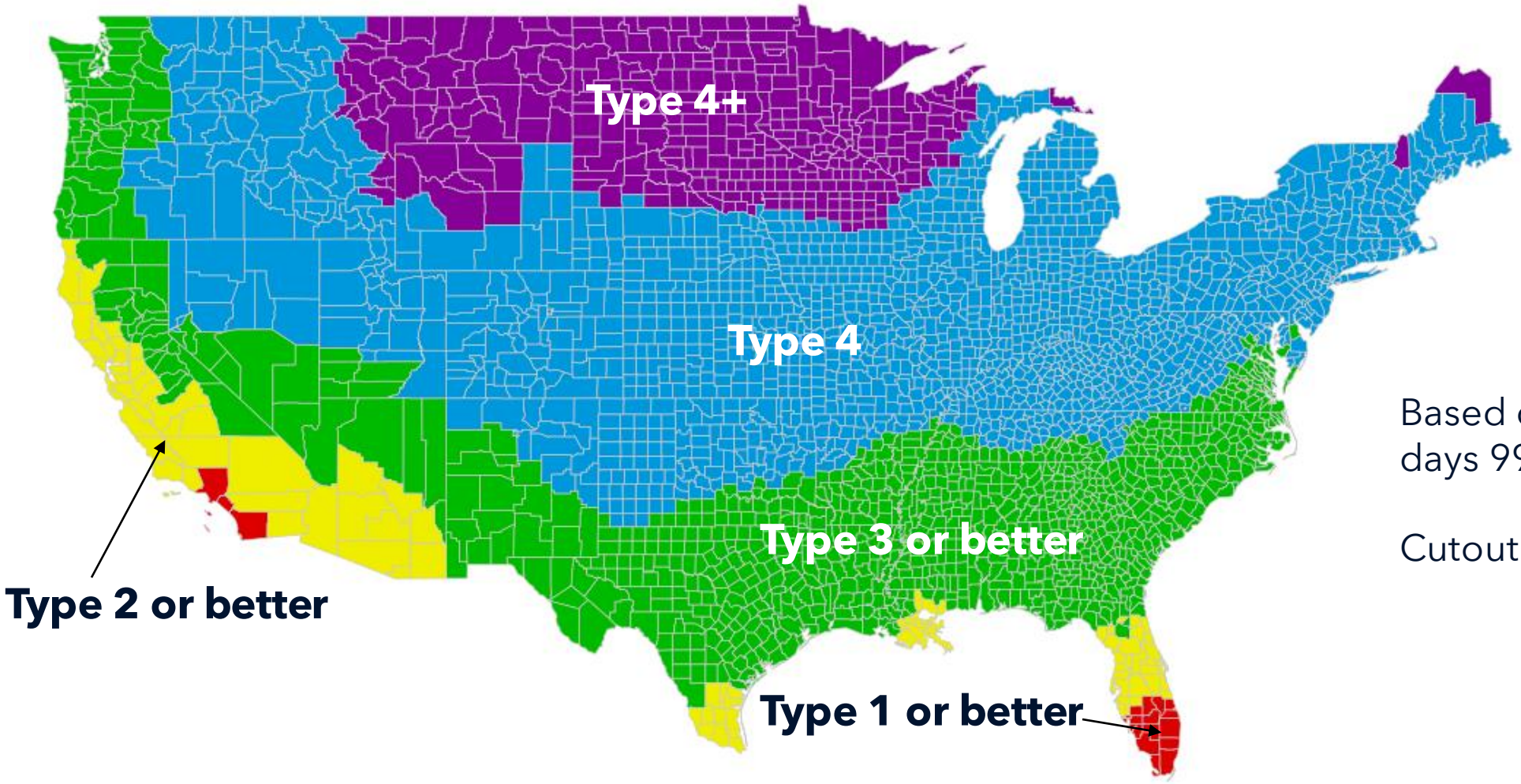


SF: n=3,167, MF: n=1,600

CalMTA window stock survey findings

- More than 70% of California MF homes cannot use a traditional window heat pump
- More than 50% of California SF homes cannot use a traditional window heat pump
- Draft report, estimated release November

What type of RHP do you need across the US?



Based on heating design days 99.6%

Cutout temperatures:

Type 1: 40°F
Type 2: 30°F
Type 3: 15°F
Type 4: -10°F

48% of population could use a Type 3 RHP

California window heat pump needs

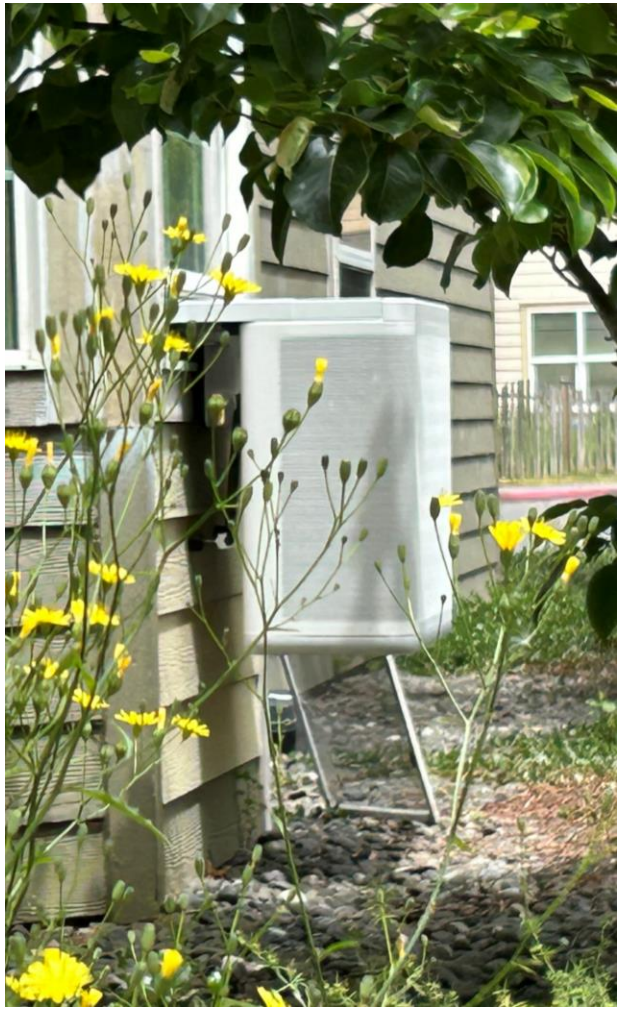
- Need a variable-speed, 120V plug-in HP for narrow windows installation
- Does not have to be cold climate - Type 3 (< 17°F) is acceptable

DRAFT PRODUCT SPECIFICATIONS

Description	Minimum value
Cooling capacity at 95°F (Btu/h)	8,000
Heating capacity at 47°F (Btu/h)	8,000
Capacity ratio (17°F/47°F)	70%
CEER (Btu/W-h)	14.4
HEER (Btu/W-h)	7.5
Design window opening width (in)	15*

**estimated to fit 75% of targeted horizontal sliding windows in CA*

CalMTA's statewide room heat pump MTI



Desired end state:

- Norm is to purchase RHPs instead of electric resistance heaters and AC window units
- RHPs are seen as a key technical solution to displacing GHG from inefficient heating

Representative interventions:

- Influence and accelerate manufacturer development of affordable, 120V RHPs that fit into slider windows
- Engage property management firms, and MF building owners through incentives or bulk purchase pricing coupled with marketing support
- Build consumer acceptance and awareness through marketing and education campaigns
- Deploy midstream stocking incentives that motivate retailers stock and sales

Building demand in CA

- Similar to Clean Heat for All but for slider windows
- No large, single point of aggregation in CA
- Looking at other demand aggregation approaches
  - Support inclusion of RHPs in customer EE programs, climate resilience programs
  - Support demonstration projects
  - Develop bulk purchases buy down agreements
  - Motivate retailers to assort more RHP products

Please contact me for more ideas

Elaine Miller, ecmiller@calmta.org, 503-490-9877

Transformative Energy Solutions

for the public good

Market transformation is a proven approach that works to remove market barriers so that energy efficient, equitable, and climate-friendly approaches become the new standard practice for all Californians.

Contact: Elaine Miller, ecmiller@calmta.org, **503-490-9877**

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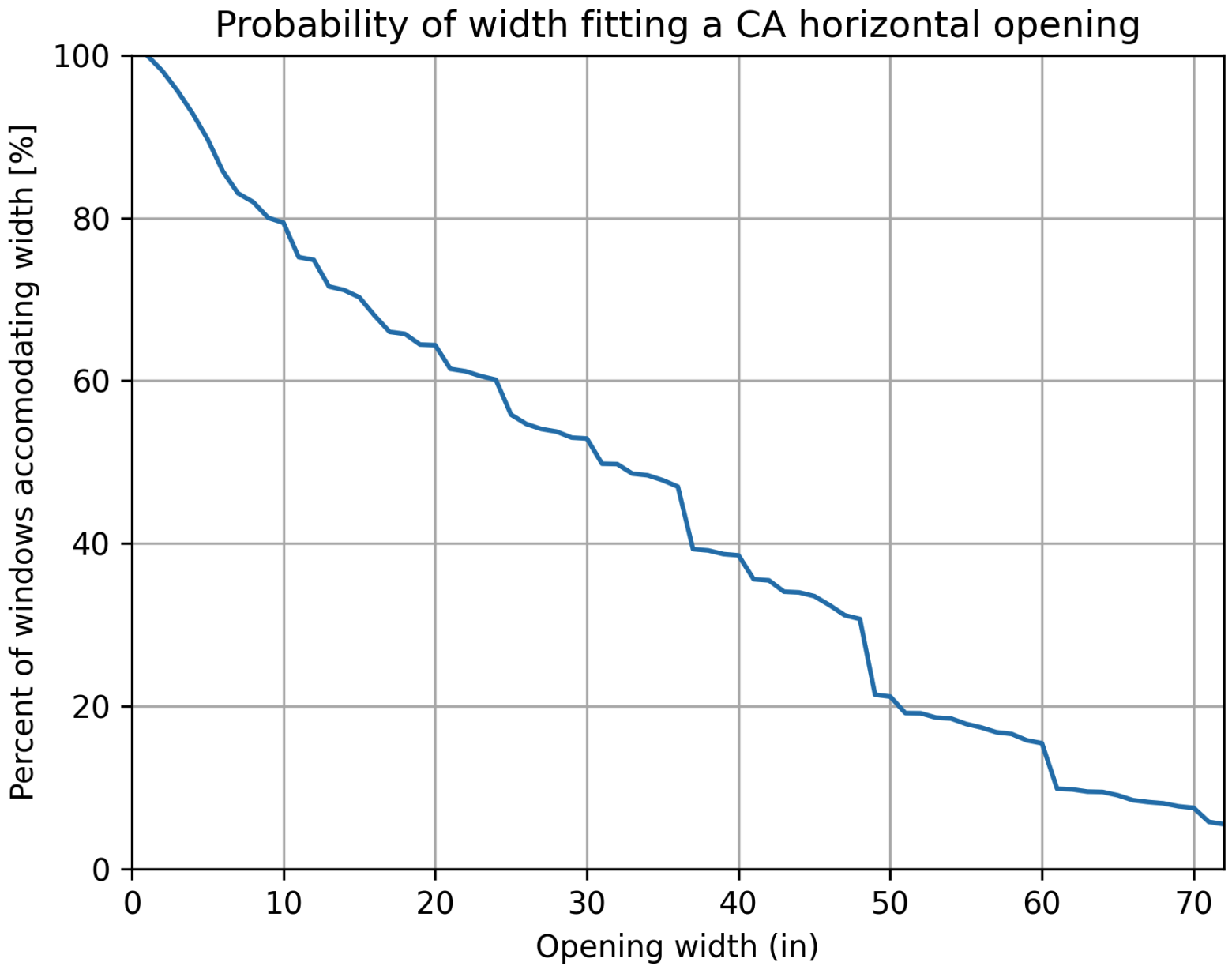
Probability of width fitting a CA horizontal opening
Percent of windows accomodating width [%]
100
80
60
40
20
0
0
10
20
30
40
50
60
70
Opening width (in)

Thank You