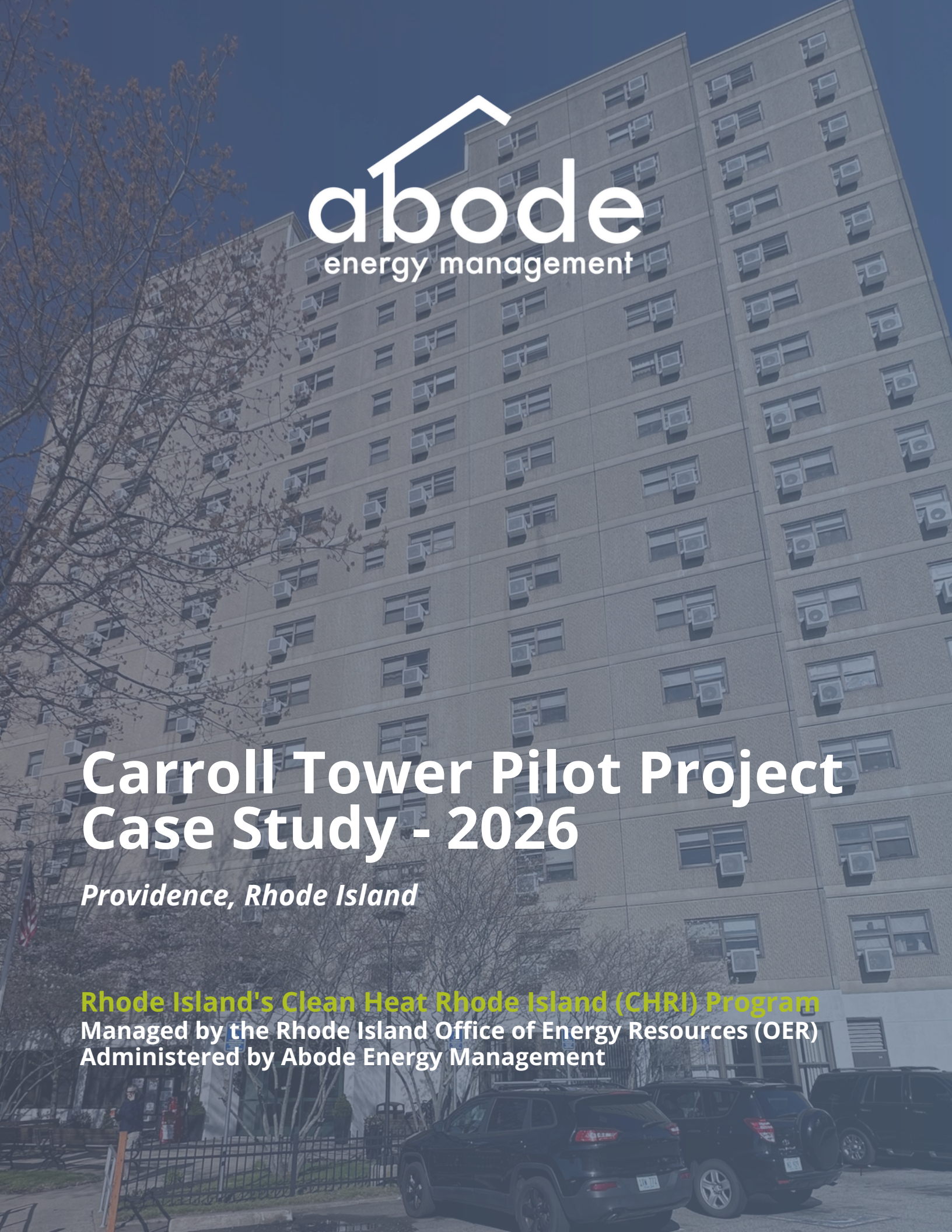


abode
energy management

Carroll Tower Pilot Project Case Study - 2026

Providence, Rhode Island

Rhode Island's Clean Heat Rhode Island (CHRI) Program
Managed by the Rhode Island Office of Energy Resources (OER)
Administered by Abode Energy Management

Executive Summary

The Carroll Tower pilot project represents a landmark deployment of window heat pump technology in public housing, carried out under Rhode Island's Clean Heat Rhode Island (CHRI) program. Managed by the Rhode Island Office of Energy Resources (OER) and administered by Abode Energy Management, this initiative replaced decades-old electric baseboard heating at Carroll Tower, a 15-story, 194-unit affordable housing building at 243 Smith Street, Providence, with Gradient All-Weather 120V™ window heat pumps.

The installation was completed in just 12 days with minimal disruption to residents, demonstrating that large-scale building electrification can be achieved efficiently and cost-effectively.

For the first time in the building's 50+ year history, all residents now have access to integrated, year-round heating and cooling, a meaningful quality-of-life improvement for this elderly population.

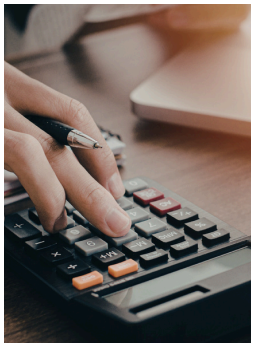
Primary Impact

Residents now have access to integrated, year-round heating and cooling for the first time in the building's 50+ year history.

194 units
Low-income Elderly Residents & Emergency Shelter Designation

12 Days
Installation Time Building-wide

~60%
Est. Energy Savings vs. Electric Baseboard



$1.2M
Total Budget Pilot investment

Project at a Glance

Building	Carroll Tower, 243 Smith Street, Providence, RI
Owner / Manager	City of Providence / Providence Housing Authority (PHA)
Program	Clean Heat Rhode Island (CHRI) — Income Eligible Component
Program Sponsor	Rhode Island Office of Energy Resources (OER)
Program Administration	Abode Energy Management
Technology Provider	Gradient (All-Weather 120V Window Heat Pump)
Installer	Envr Air
Building Profile	15-story high rise; 194 units (122 studios, 65 one-bed, 7 two-bed)
Residents	Low-income elderly residents; designated emergency shelter
Prior Heating System	Electric baseboard heat; no central AC; some window AC units
Installation Duration	12 days (building-wide)
Units Installed	277 Gradient heat pumps across 194 apartments

Background & Program Context

Equity

Located in a federally designated disadvantaged community with low-income elderly residents

Efficiency

Building infrastructure was compatible with plug-in heat pumps, requiring no major electrical upgrades

Resilience

As a designated emergency shelter, year-round climate resilience was especially critical for safety

Clean Heat Rhode Island

Clean Heat Rhode Island (CHRI) is a heat pump program offering financial incentives to assist homeowners and renters with the purchase and installation of high-efficiency electric heat pumps, with an emphasis on environmental justice communities. Funded through Regional Greenhouse Gas Initiative (RGGI) funds, it is part of Rhode Island's broader Act on Climate mandate to reduce greenhouse gas emissions to net zero by 2050.

Approximately one-third of Rhode Island's emissions originate from the thermal sector, with residential space heating as the dominant contributor. CHRI's strategic electrification approach, converting fossil fuel and resistance heating systems to efficient electric heat pumps, is a key pathway to decarbonizing this sector.

Why Carroll Tower?

Carroll Tower was selected for the CHRI pilot because it met several critical program criteria:

- Located in a federally designated disadvantaged community
- 194 apartments housing low-income elderly residents with electric baseboard heating
- Building infrastructure compatible with window-mounted plug-in heat pumps (no major electrical upgrades required)
- Non-profit/public ownership structure aligned with program equity objectives
- Designated emergency shelter, making climate resilience especially critical

Prior to this installation, roughly 90 residents had independently acquired window air conditioning units to cope with summer heat, but the majority had no cooling at all, and all residents relied on inefficient, expensive electric baseboard heaters during winter months.

Pilot Goals

The Carroll Tower deployment was designed to answer key questions that will inform future CHRI program design and replication:

- Demonstrate measurable energy cost savings for residents replacing electric resistance heating
- Validate improved comfort and potential health benefits from year-round climate control
- Prove viability for buildings that are difficult to retrofit with traditional HVAC systems
- Understand installer experience working with window heat pumps
- Track resident experience living with and operating window heat pumps
- Assess installation logistics, noise levels, and mechanical limitations in a multifamily setting
- Develop program recommendations for scaling to additional buildings

Technology: Gradient All-Weather 120V™ Window Heat Pump

The Gradient All-Weather 120V™ heat pump was selected for Carroll Tower because it eliminates the primary barriers that have historically blocked electrification in older multifamily buildings: the need for costly electrical upgrades, invasive construction, and extended resident displacement.

Key Product Highlights

- Plugs into a standard 120V outlet, no electrical upgrades required
- Installs in <30 minutes with 2 people and basic hand tools
- Provides both heating & cooling year-round in a single unit
- Operates in outdoor temperatures as low as -13°F
- ENERGY STAR certified/rated Most Efficient 2025
- Built-in WiFi, app control, and remote monitoring for building managers
- Variable-speed compressor (inverter) for quiet, efficient operation
- Internal condensate pump, no plumbing work needed
- Covers rooms up to 500 sq. ft. with 5-year parts warranty

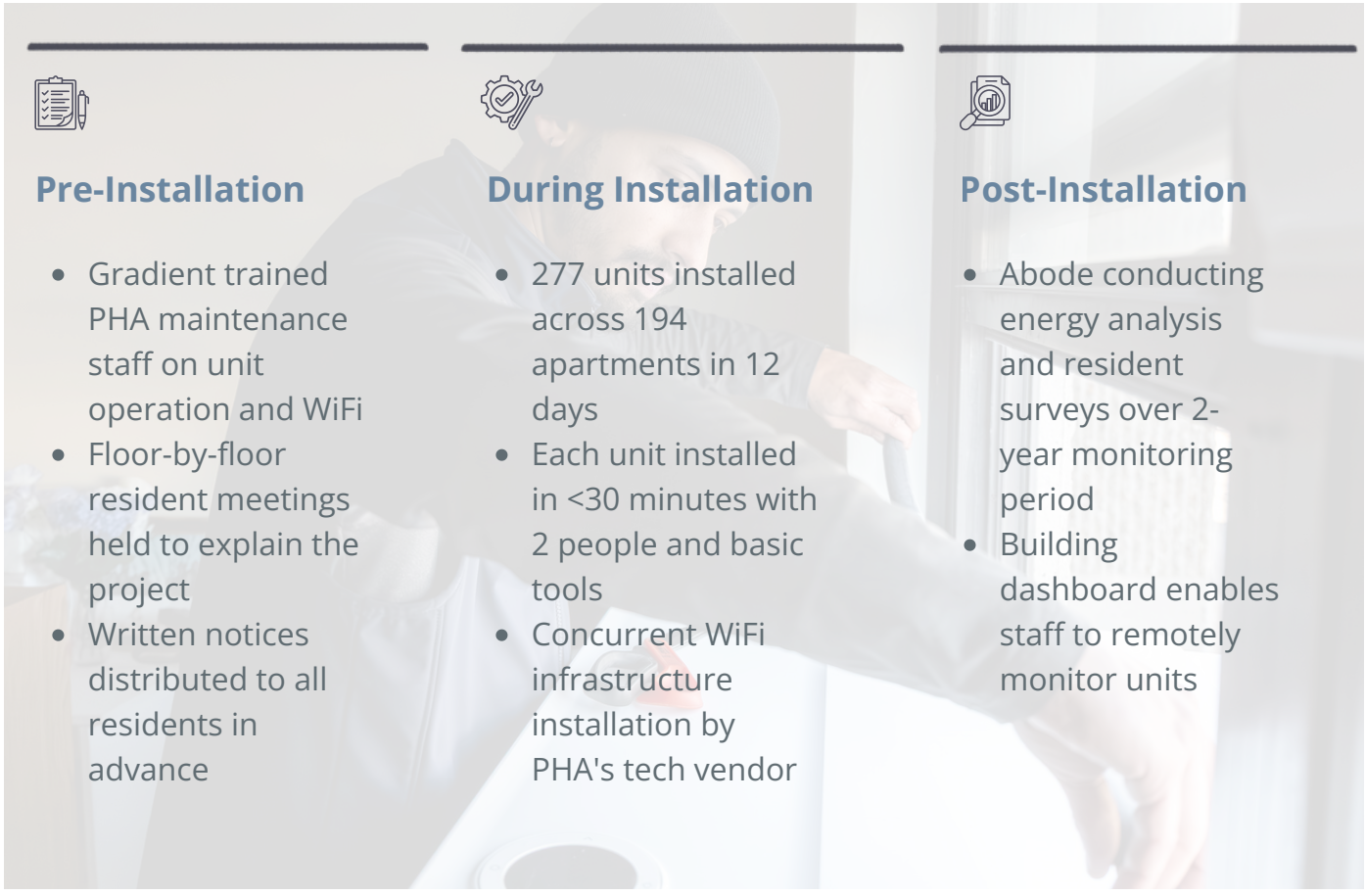
Model	CCHP11
Power Supply	120V, 1Ph, 60Hz
Cooling Efficiency	CEER 16.8 / SEER2 ~19–23
Heating Efficiency	HEER 9.4 / HSPF2 ~9.3
Min. Heating Temp.	-13°F outdoor
COP @ 47°F	4.04 (rated)
Noise (indoor)	38–53 dB(A)
Refrigerant	R32 factory charged

Installation Approach

The installation of the equipment was done by Envr Air, a climate logistics company specializing in the deployment of heating and cooling equipment at scale. Their model is built around speed, coordination, and minimal disruption to residents and building operations.

For Carroll Tower, the crew was purpose-built for the scope of work: a Project Manager overseeing the full operation, two installation teams of two running simultaneously, a two-person assembly and runner team keeping equipment staged and ready. While one team is installing, equipment is already prepped and moving.

What made that possible was the preparation that happened well before installation day. Envr Air starts with a detailed site evaluation, identifying obstacles like elevator access and parking logistics. The team gets fully proficient with the specific equipment being deployed before work begins. Trial installations are completed on-site to validate the process in real conditions. From there, a full strategy is developed covering logistics, staging, and scheduling, then loaded into project management software. Stakeholders are informed of exactly what is happening and when, and the plan is adjusted in real time as conditions on the ground change. This structure is how 277 units got installed in a 15-story building in 12 days.



Pre-Installation

- Gradient trained PHA maintenance staff on unit operation and WiFi
- Floor-by-floor resident meetings held to explain the project
- Written notices distributed to all residents in advance

During Installation

- 277 units installed across 194 apartments in 12 days
- Each unit installed in <30 minutes with 2 people and basic tools
- Concurrent WiFi infrastructure installation by PHA's tech vendor

Post-Installation

- Abode conducting energy analysis and resident surveys over 2-year monitoring period
- Building dashboard enables staff to remotely monitor units

Energy Savings & Impact

Based on the building's energy profile and Gradient's measured performance data, the Carroll Tower deployment is projected to deliver significant annual energy and emissions reductions, representing the transition from electric resistance baseboard heating (100% efficiency) to heat pump technology (200–400% efficiency, COP 2.0–4.0).

The estimated annual cost savings of approximately $94,500 across 194 households equates to roughly $487 per apartment per year. This includes savings for the 105 apartments that previously had no air conditioning, for whom the heat pumps deliver a new net comfort benefit at lower annual energy cost than any alternative cooling system would have required.

450,200 kWh

Annual Energy Savings

$94.5k

Annual Cost Savings

~60%

Heating Energy Reduction

219 tons

Annual GHG Reduction (CO_2E)

Cost Effectiveness Analysis

Metric	Full Project	Excl. WIFI	Notes
Total Project Cost	$1,237,452	$1,067,550	WIFI Costs: $169,902
Total Cost Per Unit	$4,397	$3,794	282 Units Total *
Cost Per Apartment	$6,392	$5,515	194 Apartments
Cost per Ton BTUS	$5,863	$5,059	@9,000 BTUS / Unit
Est. Annual Energy Savings	450,200 kWh		
Est. Annual Cost Savings	~$94,500		@ $0.21/ kWh
Est. Annual GHG Reduction	219 tons CO_2e		RI Grid Emmissions Factor

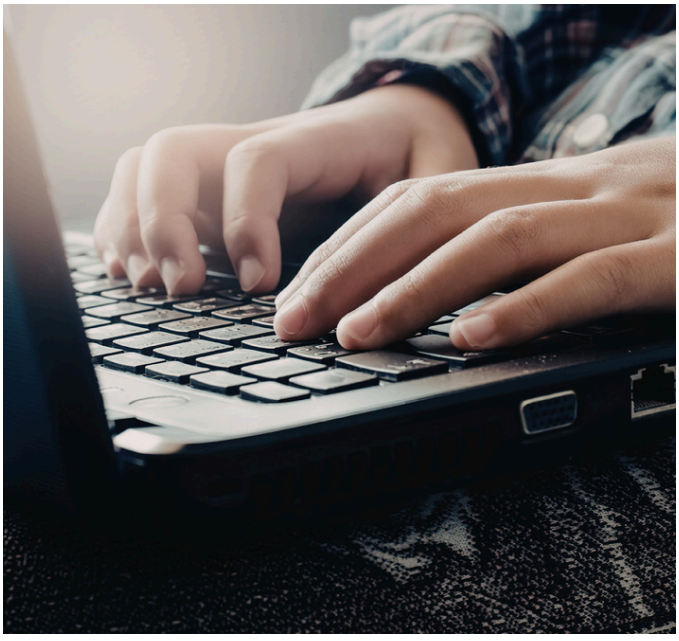
** We provided 5 additional backup units, as it is recommended to have 10-20% additional units on hand.*

Costs include:

- equipment
- shipping
- installation
- wifi-connection for 2 years
- project management

Decommissioning of the baseboard heating was done by the PHA building staff and is not included in the cost allocation.

No additional wiring was required for this project to provide a dedicated circuit for the Gradient units.



Building Controls Through Gradient Nexus

A key feature of the Carroll Tower deployment is Gradient's Nexus, a centralized control dashboard that can monitor and control all Gradient units within a building site.

Nexus gives PHA building staff real-time visibility and control over the heat pump units from a single interface

This capability transforms how the building staff manages its HVAC infrastructure, shifting from a fully resident-controlled model to a coordinated, building-level system.

Flexible, Resident-Sensitive Controls

Nexus's grouping functionality offers particular value in a public housing context serving a medically vulnerable population.

PHA staff can assign different temperature limits, or remove limits entirely, for individual apartments or defined groups. This means, for example, that residents with documented health conditions requiring specific temperature ranges can be placed in an unrestricted group, while the rest of the building operates under standard efficiency limits.

This capability allows PHA to balance building-wide energy management with individualized care for residents' health and comfort needs, a meaningful distinction in a building housing elderly residents who may be at elevated risk from temperature extremes.

It also provides a framework for accommodating medical accommodation requests through a building operations workflow rather than requiring one-off equipment exceptions.

- **Real-time monitoring of all unit statuses, operating modes, temperatures, and energy consumption**
- **Remote control of individual units or groups of units from a central interface**
- **Building-wide temperature limit setting, staff can cap maximum heating or cooling setpoints to manage energy consumption**
- **Apartment grouping; units can be organized by floor, wing, unit type, or any other logical grouping to apply settings efficiently**
- **Alert notifications for units that are offline, malfunctioning, or operating outside set parameters**
- **Access to two years of logged operational data per unit for energy analysis and reporting**

Partnership Structure

The success of Carroll Tower required sustained collaboration across public and private sector organizations:

RI Office of Energy Resources (OER)
Program oversight and RGGI funding; state commitment to clean energy in public housing

Abode Energy Management
Program administrator; project coordination, energy analysis, resident surveys, and final case study

Providence Housing Authority (PHA)
Building owner/manager; resident engagement, maintenance staff training, ongoing building operations

Gradient
Technology provider; supply of All-Weather 120V heat pumps, staff training, and ongoing monitoring support

Envr Air
Logistics-driven installation; completed building-wide deployment in 12 days with minimal resident disruption

What Partners are Saying

Our partners shared their thoughts about the impact, speed, and scalability of this model.

"Carroll Tower shows what's possible when housing authorities, state agencies, and technology partners come together around resident wellbeing. Providence Housing Authority is proving these projects can be cost-effective, fast, and minimally disruptive, while also improving comfort and safety for residents."

— Dr. Vince Romanin, Founder & CTO, Gradient

"This great heat pump project shows how Clean Heat Rhode Island can help modernize buildings that have historically been difficult to retrofit; delivering efficient heating and cooling technology that improves resident comfort while lowering long-term energy use."

— Chris Kearns, Acting Commissioner, RI Office of Energy Resources

"We're at a moment where the solutions exist, the business models work, and buildings that seemed too old or too complicated to electrify are no longer out of reach.

Carroll Tower proves it's scalable, affordable, and far less disruptive than anyone expected."

— Jesse Mastro, CEO & Founder, Envr Air

“This project represents an important investment in the comfort and wellbeing of our residents. Carroll Tower is one of two public housing buildings designated exclusively for the elderly, with an average resident age of 72."

Melissa Sanzaro, Executive Director, Providence Housing Authority

What Residents are Saying

Residents shared input on the building upgrade during a press conference on April 20, 2026

"On behalf of all the residents of Carroll Towers I want to thank everyone who made this project possible.

Thanks for bringing this vision to life and for showing that our comfort, health, and well-being matter.

It's our home, and today it's an even better place to live.

— Larry D'Alfonso, President,
Carroll Tower Tenants Association

"This is amazing equipment to us. We have AC, we have heat, and we have a very nice system for everybody.

These are my last years, and I want to be comfortable.

And now Carroll Towers has AC and the heating. wow, it's amazing."

Carlos Martinez,
Carroll Tower Resident

Lessons Learned & Replication Considerations

The Carroll Tower project generated important insights for housing authorities and program administrators considering similar deployments:

Contracting Complexity

The contracting process between Gradient, Envr Air, and PHA took 9 months, delaying the project from early 2025 to early 2026. Future projects should anticipate extended procurement timelines when working with public housing authorities and build in appropriate contingency.

WiFi Cost Estimation

The program's initial WiFi infrastructure cost estimate proved significantly understated, adding $170,000 to the budget. Projects that include connected device monitoring should obtain detailed networking bids early in project planning to avoid budget shortfalls.

Resident Engagement

Floor-by-floor resident meetings and advance written notices were essential to building trust and ensuring smooth access for installation crews. Community meetings were held to introduce residents to the technology and provide use instructions. This community engagement model should be standard practice for any building-wide retrofit.

Speed of Deployment

Envr Air's logistics model, combined with Gradient's plug-and-play design, enabled 277 units to be installed in 12 days. This timeline is a significant proof point for the scalability of window heat pump retrofits in multifamily buildings. Traditional HVAC retrofits of this scale typically require 6–12 months.

About Us and How to Reach Out for More

Abode Energy Management (Abode) is an energy management and consulting services firm based in Concord, Massachusetts. Abode is focused on creating innovative solutions to drive energy efficiency and carbon reduction in residential buildings. Their collective experience, in building performance, energy efficiency, decarbonization technologies, and contractor management, enables them to deliver engaging, impactful climate solutions for utilities, contractors, and homeowners

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