

# ET Summit 2024

Presented by



# DOE's Commercial Heat Pump Accelerator

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# DOE's Residential Cold Climate Heat Pump Challenge

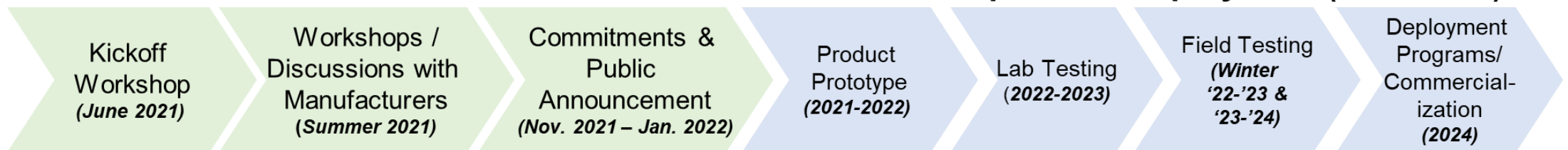


Nov. 1<sup>st</sup>, 2021: Launch with VP Harris and Sec. Granholm in NY

- DOE initiated the [Residential Cold Climate Heat Pump \(CCHP\) Challenge](#) in 2021 to raise the bar for **residential centrally ducted all-electric CCHP** performance beyond commercially available units
- Goal:
  - **Improved and reliable** heat pump performance in **cold climates**
  - **Reduced on-site GHG** emissions and **improved demand flexibility** in residential buildings
- Approach:
  - **Lab testing** and **data-driven field validation** of pre-commercial units
  - Qualitative assessment of **non-energy benefits** using homeowner surveys

## Specification Development (2021-2022)

## Product Development & Deployment (2022-2024)



# What Is The problem We're Trying to Solve?

- **Commercial building space conditioning accounts for approximately 40% of commercial energy use**
- Heat pump rooftop units (RTUs) are estimated to reduce GHG emissions and energy costs by up to 50% compared with conventional RTUs (with natural gas heating)

How Will DOE Act? Two Complementary Efforts:

- **Supply: Commercial Building Heat Pump Technology Challenge - Produce advanced commercial building heat pump technology**
- **Demand: Commercial Building Heat Pump Campaign - Work with end users and other stakeholders to increase the adoption of both existing and emerging technologies to meet market demand**

# DOE's Commercial Building Heat Pump Accelerator

The Accelerator will work with building owners / operators, manufacturers, and other stakeholders to accelerate the development and adoption of heat pump RTUs to achieve integrated energy efficiency and electrification of buildings.



## Campaign

- Accelerate adoption of today's heat pump RTUs, including all electric and dual fuel products
- Highlight organizations that have adopted or plan to adopt HP RTUs for their sustainability goals
- Provide resources to help building owners understand their options
- Showcase successful adoption of HP RTUs in case studies

## Technology Challenge

- Advancing commercial cold-climate heat pump RTU technologies
- Participating manufacturers will develop prototypes, test their performance and durability, and lead field validations with Better Buildings partners.
- Target commercialization as soon as 2027

# DOE Heat Pump Accelerator: Technology Challenge

## Critical objectives for new units (Ph. 1)

- Improve cold weather performance and minimize heating capacity degradation
- Minimize electrical capacity upgrade requirements
- Minimize peak demand impacts
- Minimize GWP impacts of refrigerant selection and management
- Balance weight and structural upgrade requirements with performance improvements
- Improve overall system reliability or keep equal to existing systems, e.g., 15 to 20-year lifetimes
- Design for ease of maintenance and component replacement
- Minimize the impacts on initial system costs and total costs of ownership
- Maintain safe and reliable operations

## Manufacturing Partners

- Aeon, Inc.
- Addison
- Carrier Global Corporation
- Daikin
- Lennox International, Inc.
- Rheem Manufacturing Company
- Trane Technologies
- York International

## Accelerator Campaign Resources

Helping to educate and support decision making for building owners and facility managers

- One-on-one technical support
- Case studies of successful HP RTU projects
- Guidance documents and decision trees to support site-level and portfolio-level evaluations
- Fact sheets to provide simple information on HP RTUs
- Estimates on the energy, economic, and emissions comparisons for different geographic and climate regions
- Utility / government incentive guides

### Heat Pump Rooftop Unit Campaign: Fact Sheet

**Overview**  
Many small-to-medium commercial buildings

Source: Adobe Stock Images

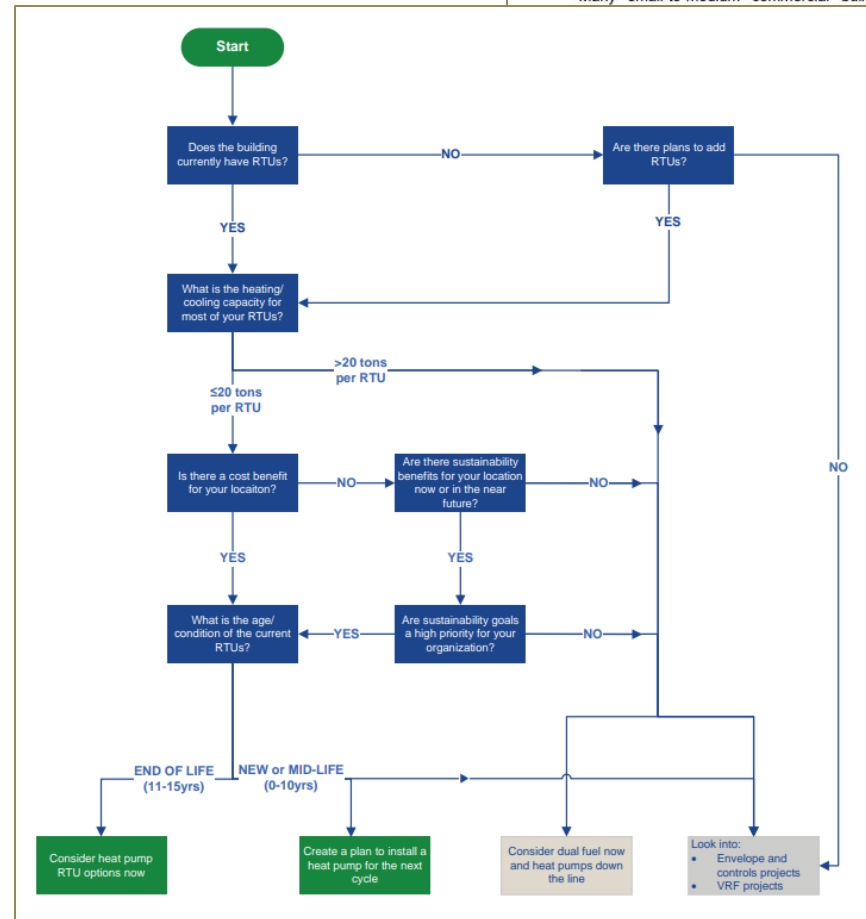
#### Why Consider HP RTUs?

Heat pump RTUs can offer attractive energy, emissions, and economic savings for commercial building owners in mild-to-moderate climates today, as well as significant emissions benefits in some cold-weather regions.

High-efficiency heat pump RTUs not only reduce emissions for space heating, but also offer increased energy efficiency for space cooling and ventilation, further reducing HVAC-related emissions.

The Heat Pump RTU Campaign aims to raise awareness of this commercially available technology with Better Buildings partners, commercial property owners and managers, manufacturers, service providers, utilities, and other stakeholders to accelerate adoption of heat pump RTUs in support of energy efficiency, decarbonization, and sustainability goals.

Visit the [Campaign website](#) to learn more and join the Heat Pump RTU Campaign.



*Draft Versions*

## Current Accelerator Case Studies

### Los Angeles Unified School District (CA)

- Replaced 65% of decentralized HVAC units with electric heat pumps
- Reduced heating emissions by 33%
- Saved ~\$140,000 monthly on utility costs

### Columbia Association (MD)

- Replacing gas-fired RTUs with dual fuel RTUs as existing equipment fails
- Projected to reduce natural gas use by 70% in early pilot
- Reserved the facility's spare electrical capacity for future HPWHs



Case Study

COMMERCIAL BUILDING HEAT PUMP CAMPAIGN

#### LAUSD: Heat Pump Rooftop Units

Los Angeles Unified School District (LAUSD) is one of the largest districts in the nation with a portfolio of 13,500 buildings and 81 million square feet distributed across California.



#### IMPACTS OF HEAT PUMP ROOFTOP UPGRADES

▶ <b>Organization Name, Location</b>	Los Angeles Unified School District (LAUSD), Los Angeles California
▶ <b>Building Type, Number, Size</b>	School Buildings, 13,500 buildings, total of 70 million square feet of building space
▶ <b>Project Description</b>	LAUSD has replaced 65% of their decentralized HVAC units with electric heat pumps, with plans to achieve 100% by 2040 (year)
▶ <b>Emissions Savings</b>	LAUSD plans to reduce GHG emissions by 50% in 10 years (compared to a 2014 baseline).
▶ <b>Energy Performance and Savings</b>	LAUSD plans to reduce energy intensity by 20% compared to a 2014 baseline
▶ <b>Financial, Comfort, Maintenance, and Other Benefits</b>	The benefits of heat pumps include low noise, fully electric heating and cooling, and ease of maintenance



Case Study

COMMERCIAL BUILDING HEAT PUMP CAMPAIGN

#### Columbia Association: Dual Fuel Heat Pump Rooftop Units

Columbia Association (CA) is a nonprofit community services corporation that manages 500,000 square feet across 50 public and community facilities in Columbia, Maryland. They are a long-time partner of the Better Buildings Initiative and participated in the original *Advanced RTU Campaign*, which focused on high efficiency packaged rooftop units (RTUs), as well as the *Low Carbon Pilot*.

When considering pathways to meet their decarbonization goals, Columbia Association looked to incorporate electric heat pump technologies for space and water heating applications. However, to satisfy the climate and heating needs for full electrification of their buildings they turned to dual fuel heat pumps, which combine an efficient electric heat pump RTU with natural gas backup heating.

#### Project Overview

There are many factors that played a role in the decision to replace gas heat RTUs with dual fuel heat pump RTUs.

1. Columbia Association's buildings are located in Maryland, which is a mild climate, but can require significant heating in the colder months.
2. Many of the buildings in Columbia Association's portfolio require heating loads above what is currently available on the market for package



#### IMPACTS OF HEAT PUMP ROOFTOP UPGRADES

▶ <b>Organization Name, Location</b>	Columbia Association, Columbia Maryland
▶ <b>Building Type, Number, Size</b>	500,000 square feet of public and community building space including fitness clubs, community centers, indoor swimming pools, golf clubs, etc.
▶ <b>Project Description</b>	Dual Fuel Heat Pump RTUs to reduce emissions
▶ <b>Emissions Savings</b>	Reduce emissions by 18 metric tons/year
▶ <b>Energy Performance and Savings</b>	Avoid 3,500 therms/year in gas consumption
▶ <b>Financial, Comfort, Maintenance, and Other Benefits</b>	The benefits of dual fuel units include comparable cost and facility comfort, minimal retrofits, and ease of maintenance



# We want to work with YOU!



- Do you know a key account or other customer that has installed HP RTUs to meet their sustainability goals?
- Do you know someone that is considering their HVAC options for reducing emissions at their commercial facilities?
- *Let's work together to develop case studies and other resources to raise awareness for Heat Pump RTUs*



<https://betterbuildingsolutioncenter.energy.gov/accelerators/commercial-building-heat-pump>









## INSTRUCTIONS TO PRESENTER:

If this slide applies, fill in the blanks. If not, delete.

This project was funded by...

For more information, contact <program manager name> at <email>.

The project report can be found at <link>.

## **Sam Petty**

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