NASEO
National Association of State Energy Officials

NASEO Buildings Committee Meeting:

Emerging Technologies and State Leadership in Commercial Building Electrification

Welcome! We'll begin shortly.

November 8, 2024

Buildings Committee

The NASEO Buildings group convenes the State and Territory Energy Offices and NASEO Affiliate members for discussions and best practice exchange on energy use in the built environment. Key committee priorities include building energy codes, Energy Service Performance Contracting, energy efficiency improvements in existing buildings (particularly within K-12 school facilities), and Home Energy Labeling.

Leadership

Julie Staveland
Co-Chair, Michigan

Susanne DesRoches
Co-Chair, New York

Kris Anderson
Georgia

Katie Bergfeld
District of Columbia

Adam Berry
Colorado

Blake Shelide
Oregon

Ed Carley
NASEO Contact

Jasmine Xie
NASEO Contact

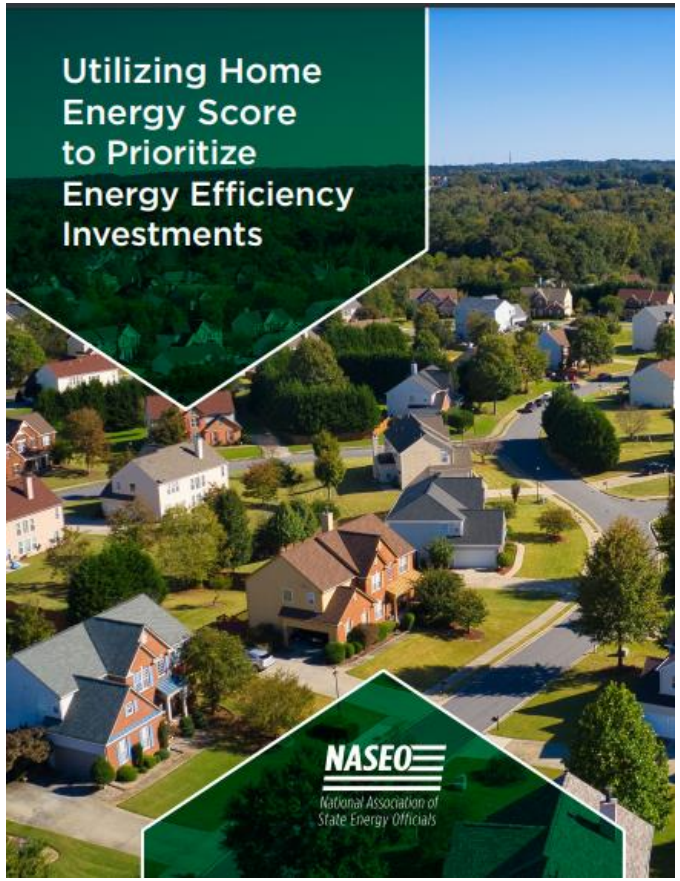
Agenda

NASEO Buildings Committee: Emerging Technologies and State Leadership in Commercial Building Electrification

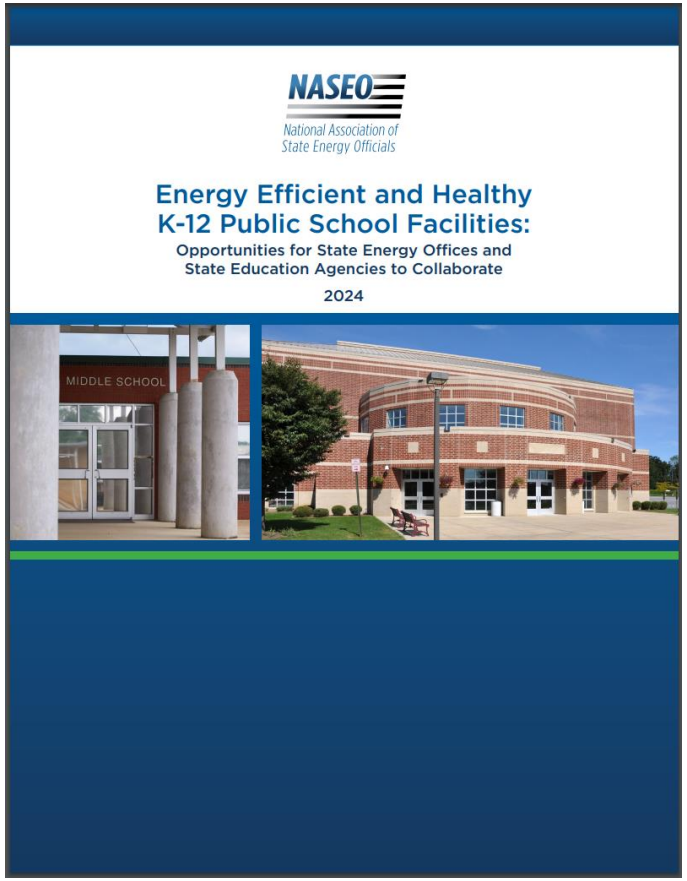
2:00 p.m. – 3:00 p.m. ET

- NASEO: Resource Roundup
- Panel Presentations
  - Moderator: Susanne Desroches, New York State Energy Research Authority
  - Speaker: Emily Salzberg, Washington Department of Commerce
  - Speaker: Michael Blunschi, U.S. Department of Energy
  - Speaker: Allison Skidd, Rheem
- Q&A and Discussion

Recent Reports and Resources



Utilizing Home Energy Score to Prioritize Energy Efficiency Investments (November 2024)



Energy Efficient and Healthy K-12 Public School Facilities: Opportunities for State Energy Offices and State Education Agencies to Collaborate (October 2024)

Recent and Upcoming Events

Recent:

- October 21 – 24, 2024: DOE Building Technologies Office Peer Review: NASEO partner projects – PV-GEMS, UDERMS iCommunity, HEATER
- November 4, 2024, 3:00 – 4:00 p.m. ET: NASEO Webinar: Empowering Local Education Agencies – The Role of State and Territory Energy Offices in School Energy Upgrades (recording and slides)

Upcoming:

- November 13, 2024, 2:00 – 3:00 p.m. ET: Washington Update Call: Post-Election Assessment (NASEO Members Only)
- November 18, 2024, 2:00 – 3:00 p.m. ET: NASEO National Rebates Update Call (State and Territory Energy Offices Only)
- November 22, 2024, 3:00 – 4:30 p.m. ET: State Code Implementation Technical Advisory Group Meeting #4 *(register here)*
- December 9, 2024, 2:00 – 3:00 p.m. ET: NASEO Energy Data Working Group Meeting *(register here)*
- December 12, 2024, 2:00 – 3:00 p.m. ET: NASEO-EPA State Benchmarking and BPS Implementation Cohort: Building Owner Engagement (State and Territory Energy Offices Only) *(registration to be announced)*

Thank you!

NASEO Contacts

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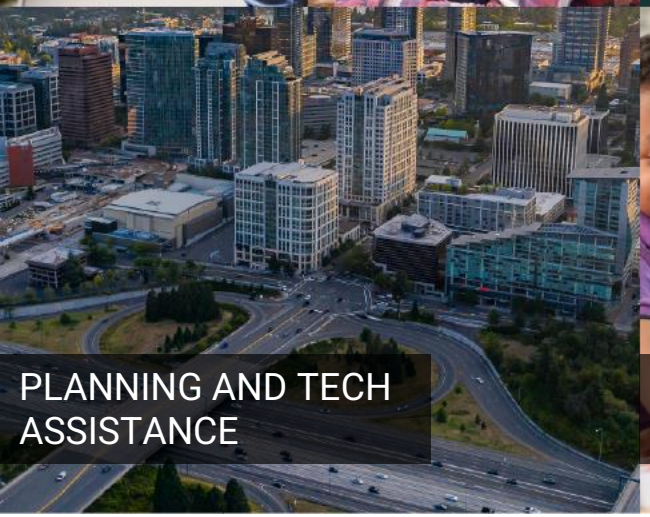
State Leadership in Decarbonizing Commercial Buildings

EMILY SALZBERG

11/8/24

Washington State Department of Commerce

We strengthen communities



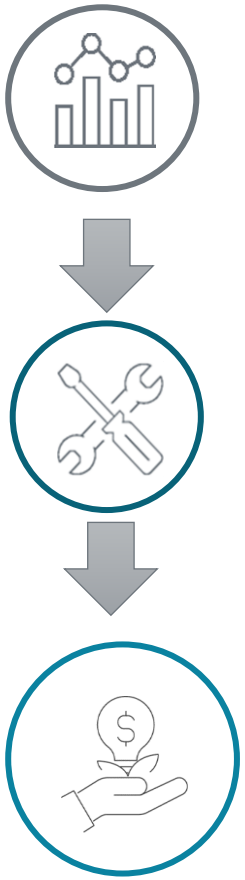
State Efficiency and Environmental Performance

Governed by Executive Order 20-01

- SEEP works with state agencies to achieve reductions in greenhouse gas emissions and eliminate toxic materials from state agency operations.

State Efficiency and Environmental Performance (SEEP) – Washington State Department of Commerce

Clean Building Performance Standard



- Benchmarking
- Operations & Maintenance Program
- Energy Management Plan
- Tier 1 ONLY - Compliance with an energy performance metric
  - Meeting the EUIt **OR**
  - Investment Criteria
  - Exemptions

Incentive Programs for Clean Buildings

- Early adopter incentives
  - $75 million for Tier 1
  - $150 million for Tier 2
- Energy audits for publicly owned buildings
  - $20 million for ASHRAE Level 2 audits
- Clean buildings performance grants
  - $45 million, $15.5 specifically for public buildings

Energy Efficiency Retrofit Grants

- $14 million for eligible public buildings including:
  - local governments
  - school districts
  - federally recognized tribes
  - state agencies
- Can pursue compliance with Clean Buildings Performance Standards
- Small communities receive 20% of funding
- Key award criteria:
  - Savings to Investment ratio < 1
  - Simple payback < 35 years

State Project Improvement Grants

- $4,850,000 awarded in 2024
- For state agencies and higher education institutions with planned capital projects they already have budget approval for. These grants can pay for the incremental cost of energy efficient measures.
- Key award criteria:
  - Projected SIR >1 (Savings to Investment Ratio)
  - Projected reduction in CO2 emissions

Emily Salzberg
MANAGING DIRECTOR

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Washington State Department of Commerce

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www.commerce.wa.gov/energystrategy

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Commercial Building Heat Pump Accelerator Update

Michael Blunschi

Commercial Buildings Integration (CBI)

Overview – Accelerator Rationale & Approach

Why: Up to 50% Reduction in GHG Emissions from New Units

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: 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 (led by Guidehouse)

- 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

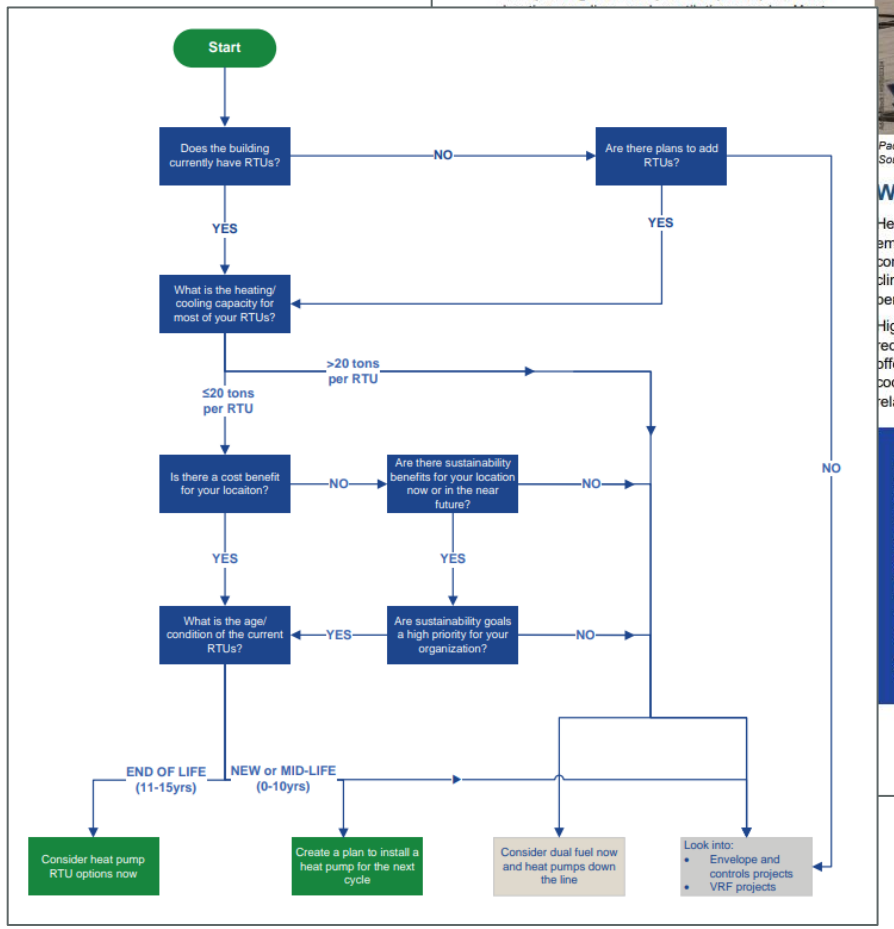
Challenge (led by NREL)

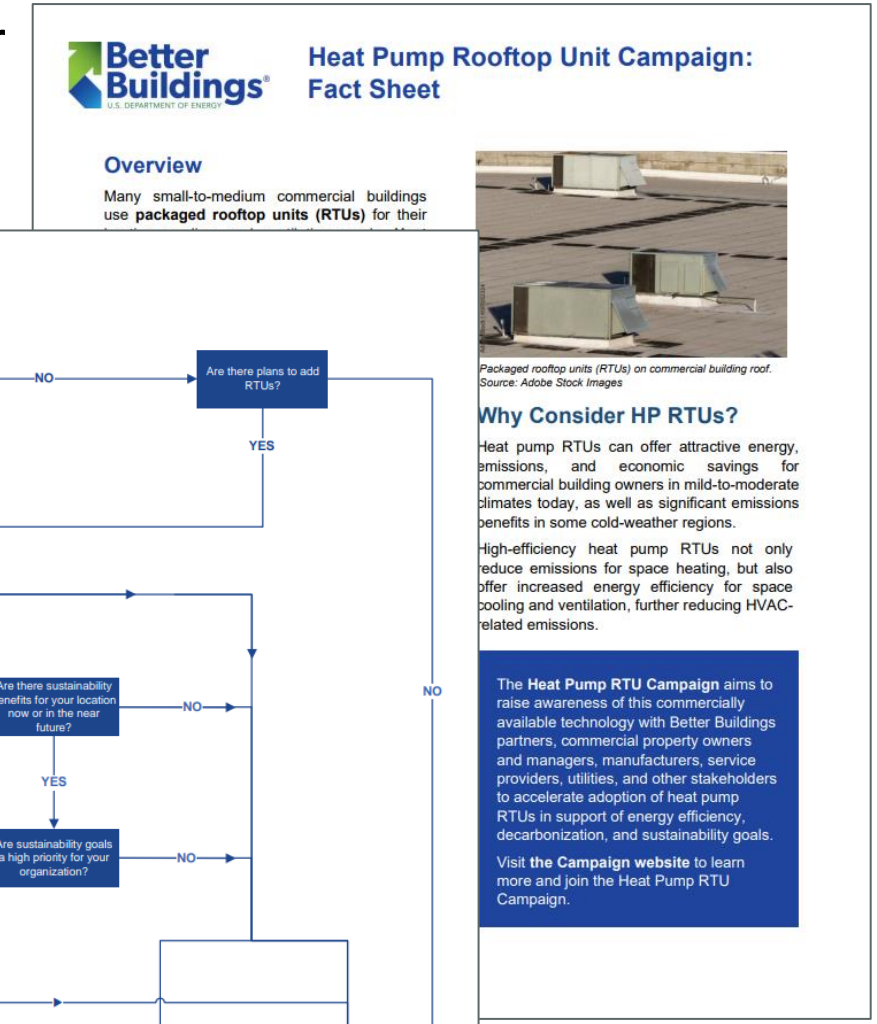
- Advancing commercial cold-climate heat pump RTU technologies
- Participating manufacturers will develop prototypes, test their performance and durability, and lead field validations with Better Buildings partners.
- Target commercialization as soon as 2027

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




Better Buildings
U.S. DEPARTMENT OF ENERGY

Heat Pump Rooftop Unit Campaign: Fact Sheet

Overview

Many small-to-medium commercial buildings use **packaged rooftop units (RTUs)** for their

Packaged rooftop units (RTUs) on commercial building roof. 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.

Accelerator Campaign Resources

Key Considerations Document

Heat Pump RTU

Summary Checklist

This summary checklist is intended to provide a rough quantitative gauge of whether HP RTUs are suitable for your organization. All "yes" answers in the checklist should be tallied and matched with the key below to assess suitability.

Theme	Description	Yes	No	N/A
Location and Use	○ Is the building located in a climate zone suitable for an all-electric HP solution?	☐	☐	☐
	○ Are there emissions and utility bill savings projected in this location?	☐	☐	☐
	○ Is the building type suitable to pursue an all-electric HP solution?	☐	☐	☐
Cost	○ Are electricity and fuel rates favorable to move towards an all-electric solution?	☐	☐	☐
	○ Is the organization willing to forgo upfront and operating costs concerns in favor of a lifecycle view?	☐	☐	☐
	○ Does a lifecycle cost analysis show a reasonable payback/ROI?	☐	☐	☐
	○ Are government and/or utility incentives available to offset upfront costs?	☐	☐	☐
Emissions	○ Does the organization have emission reduction goals?	☐	☐	☐
	○ Does the organization prioritize emissions reductions vs. costs?	☐	☐	☐
	○ Are the local grid emission factors favorable to achieve emissions reductions?	☐	☐	☐

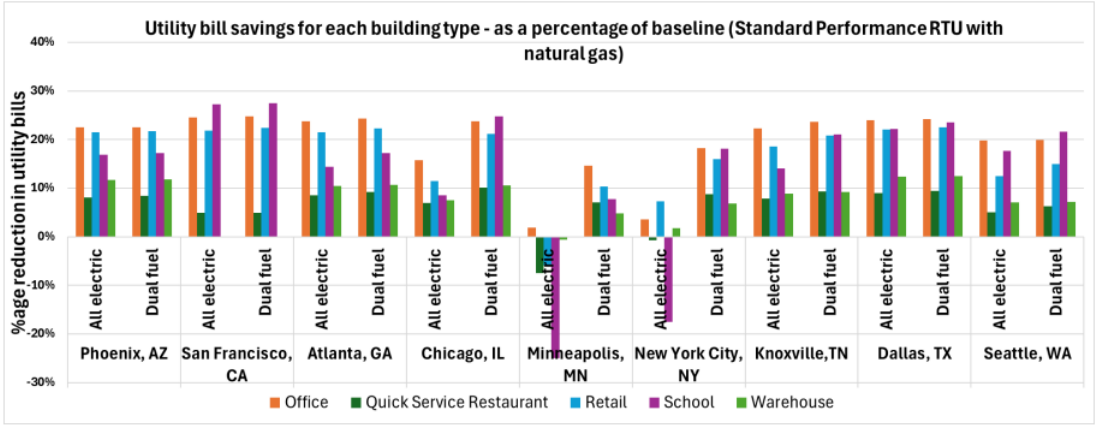


Figure 3. Utility bill savings of HP RTU upgrades in comparison to baseline space cooling and heating system.

Takeaways

- When focused solely on upfront costs, a switch to HP RTUs will rarely make sense for organizations due to the increased premium associated with higher efficiency equipment
- For organizations focused on operating costs, utility bills savings will depend depends on the local electricity and fuel prices
- Instead of only focusing on upfront or operating costs, it is essential to do a more holistic evaluation of costs via a lifecycle cost analysis – which provides metrics such as payback/ROI to make informed decisions.

Accelerator Campaign Resources

Switchover Temperature

[HP RTU Switchover Temperature Guidance.pdf]

- Brief guidelines on how to determine when to initiate backup heat

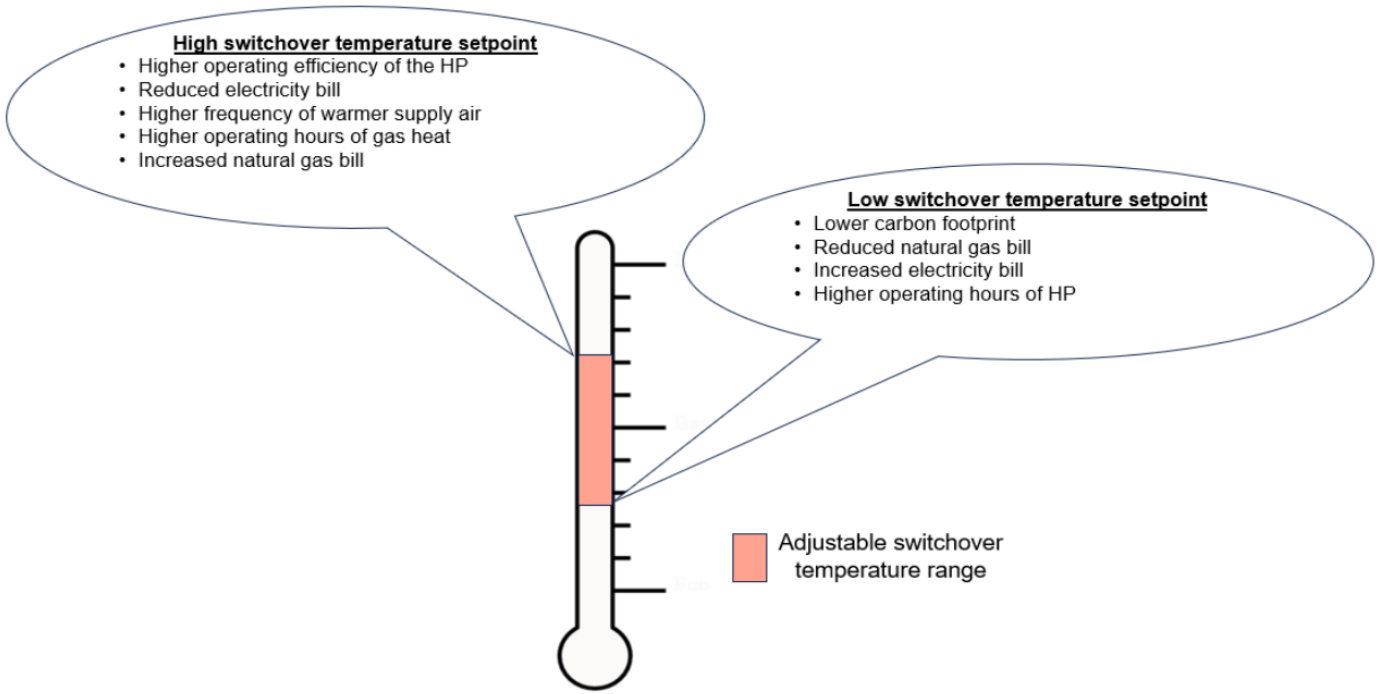
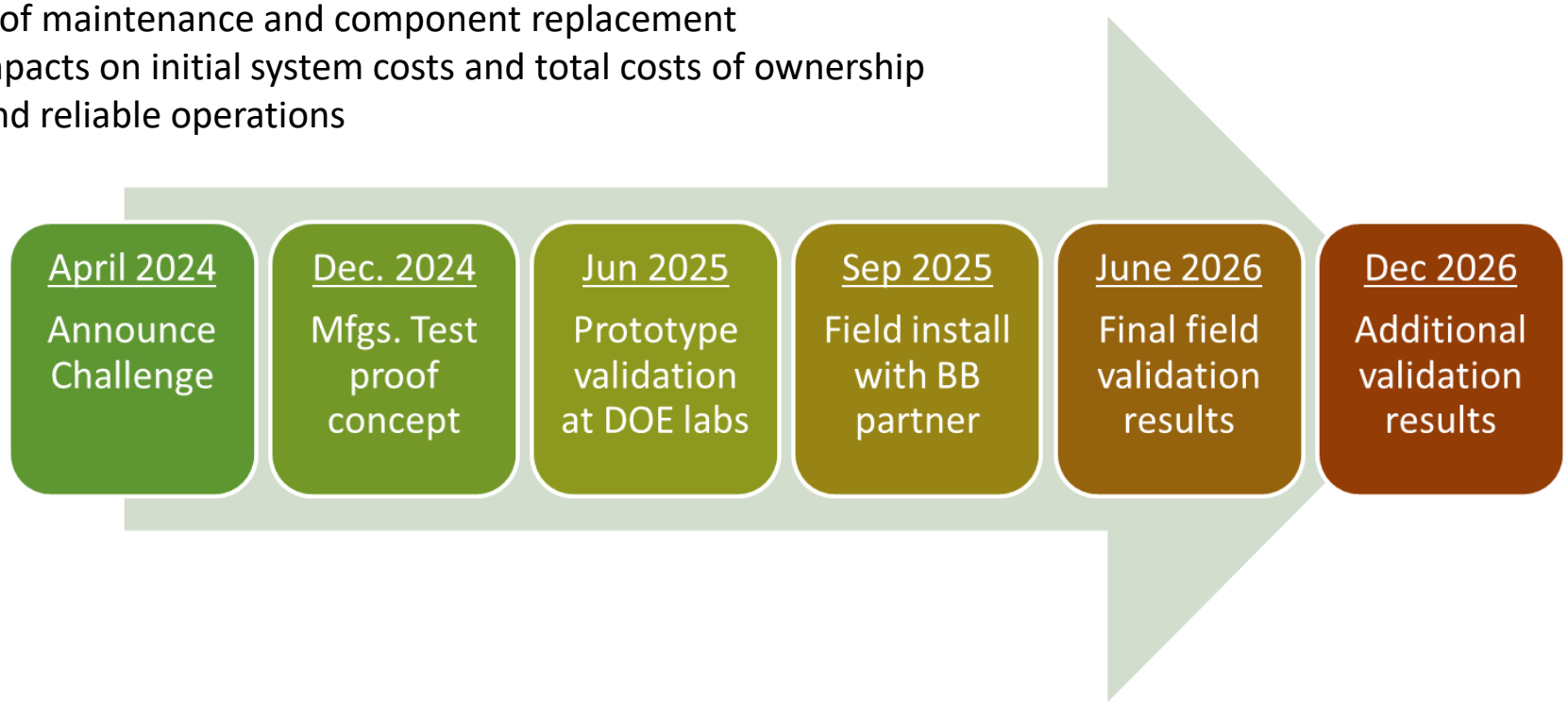


Figure 2. Pros and cons of having high or low switchover temperature for dual fuel HP RTUs (Adapted from CEE report TBD)

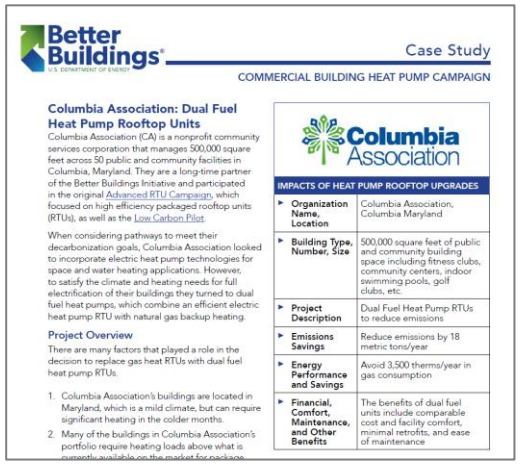
Technology Challenge Objectives & Timeline

Critical objectives for new units (Phase 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



Select Campaign Partners & Recently Posted Campaign Case Studies


Better Buildings 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.

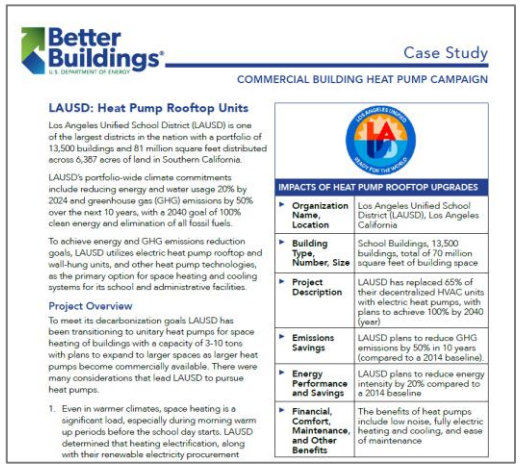
Project Overview

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

Columbia Association

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


Better Buildings 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 6,387 acres of land in Southern California.

LAUSD's portfolio-wide climate commitments include reducing energy and water usage 20% by 2024 and greenhouse gas (GHG) emissions by 50% over the next 10 years, with a 2040 goal of 100% clean energy and elimination of all fossil fuels.

To achieve energy and GHG emissions reduction goals, LAUSD utilizes electric heat pump rooftop and wall-hung units, and other heat pump technologies, as the primary option for space heating and cooling systems for its school and administrative facilities.

Project Overview

To meet its decarbonization goals LAUSD has been transitioning to unitary heat pumps for space heating of buildings with a capacity of 3-10 tons with plans to expand to larger spaces as larger heat pumps become commercially available. There were many considerations that lead LAUSD to pursue heat pumps.

1. Even in warmer climates, space heating is a significant load, especially during morning warm up periods before the school day starts. LAUSD determined that heating electrification, along with their renewable electricity procurement

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

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

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

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*

August 27 – Working Session with Technology Challenge Manufacturers

INNOVATION

DOE COMMERCIAL COLD CLIMATE HEAT PUMP CHALLENGE

- Optimize RTU heat pumps for heating, to serve a building independently
- Leverage success and learning from residential challenge
- Optimize for heating operation at 5 °F and sustained heating operation down to −10 °F
- Adapt to existing infrastructure and minimize cost