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U.S. DEPARTMENT OF ENERGY

Commercial Building HVAC Accelerator

Midwest Energy Solutions Conference

January 28, 2026

U.S. DEPARTMENT of ENERGY

Better Buildings & Better Plants

Better Buildings & Better Plants is an initiative of the U.S. Department of Energy (DOE) designed to improve the lives of the American people by driving leadership in energy innovation.

Through Better Buildings & Better Plants, DOE partners with leaders in the public and private sectors to **save on energy costs in the nation's homes, commercial buildings, and industrial plants** by accelerating funding and sharing successful best practices.

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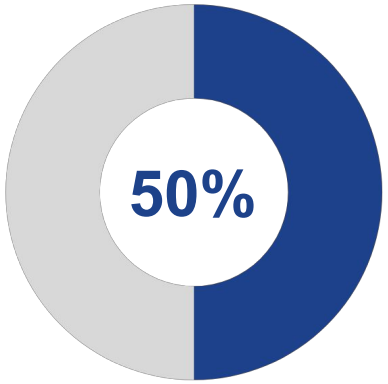
Involvement opportunities and available resources:

- **Commercial Building HVAC Accelerator – Today's Topic!**
- Better Buildings Challenge
- Better Plants Challenge
- Technology Research Teams + resources
- Webinars, live and on-demand
- Better Buildings Solution Center with 3,000+ solutions
- Annual summit
- And more!

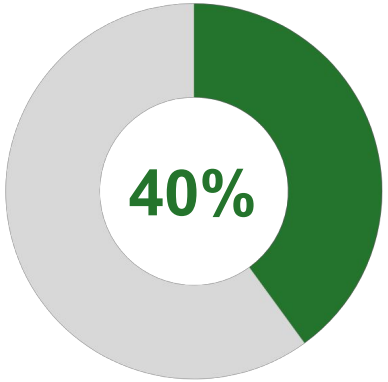
https://betterbuildingssolutioncenter.energy.gov/

Commercial Building HVAC Accelerator Background

The Commercial Building HVAC Accelerator works with stakeholders to accelerate the development and adoption of advanced rooftop units (RTUs) to **reduce energy costs** and achieve greater comfort in commercial buildings.



Advanced rooftop units (RTUs) are estimated to **reduce utility bills by up to 50%** compared with conventional RTUs



Commercial building space conditioning accounts for approximately **40% of commercial energy use**

Accelerator Breakdown

The **Commercial Building HVAC Accelerator** is comprised of two complementary efforts to advance RTU technology and increase adoption to **lower energy costs**.

Technology Challenge

- The technology challenge addresses the **supply side**
- Works with leading manufacturers to produce **advanced HVAC technology** to meet market demand
- Supports **pilots and validation** of industry-developed technology

Campaign

- The campaign addresses the **demand side**
- Works with end users and other stakeholders to **increase awareness and adoption** of both existing and emerging technologies
- Creates educational resources and case studies to support end users

Current Accelerator Partners

Current partners in the Accelerator include leading building owners, manufacturers, engineering & consulting firms, and industry organizations.

- AAON, Inc.
- Addison
- Amazon
- Boulder County, CO
- Budderfly
- Building Decarbonization Coalition (BDC)
- Carrier Global Corporation
- Center for Energy and Environment, Minnesota (MN CEE)
- ClimateMaster
- Collaborative Labeling and Appliance Standards Program (CLASP)
- Columbia Association
- Daikin
- DaVita
- Effecterra
- Enersion
- Flooid Power Systems
- General Motors
- IKEA US Retail LLC
- Institute for Governance & Sustainable Development (IGSD)

Commercial Building HVAC Technology Challenge

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Commercial Building HVAC Technology Challenge Overview

The Technology Challenge works with HVAC manufacturers and building portfolio owners to develop the **next generation of RTU technologies.**

HVAC Manufacturer Partners

AAON, Carrier, DAIKIN, LENNOX, LG, Johnson Controls, Rheem, TRANE TECHNOLOGIES

Building Owner Partners

amazon, Columbia Association, target, LIFE TIME, PROLOGIS

Key technology challenge activities include:

- Developing a performance specification
- Evaluating prototype RTUs in the lab
- Verifying prototype RTUs with Better Buildings & Better Plants partners

Technology Challenge Objectives

Improving RTU Performance at an Attractive Market Price

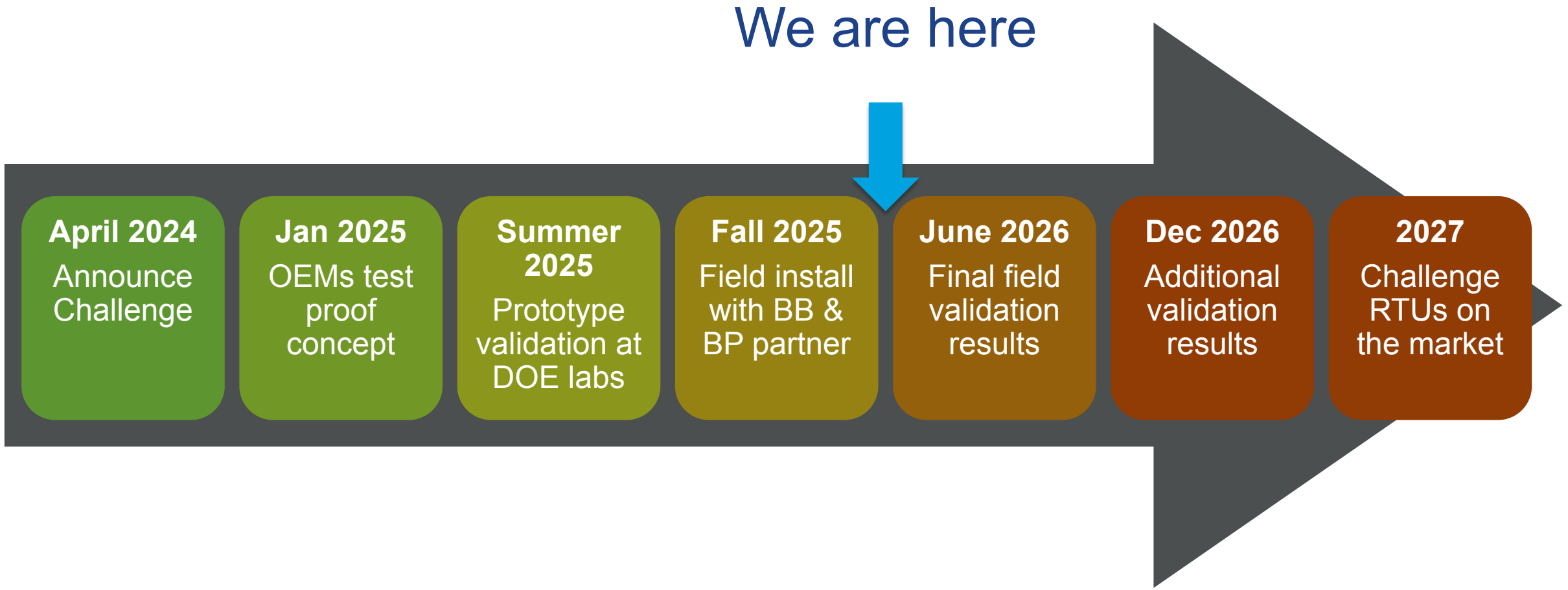
- Develop new and affordable heating solutions with today's technology
- Increase capacity and raise coefficient of performance (COP) at low ambient temperatures
- Focus on 10 to 20-ton capacity RTUs and building portfolio owners with direct relationships with manufacturers

Additional Considerations

- Minimize need for electrical capacity upgrades
- Minimize peak demand impacts
- Minimize backup heat runtime in cold conditions
- Enable electric resistance and gas backup heat
- Minimize weight increases

Photo by Sam Petty, US DOE

Technology Challenge Timeline



Field Validation Update

Progress To Date

- 6 installations have been completed so far, with several more planned this year

Focus Areas

- Installation, commissioning, controls, and operational procedures
- Operational capacity and efficiency
- Supplemental heat operation
- Defrost operation, energy, and peak demand

Photo by Michael Myer, PNNL

Commercial Building HVAC Campaign

Commercial Building HVAC Campaign Overview

The Campaign **helps commercial building owners reduce operating costs** by increasing the adoption of innovative advanced HVAC technologies. DOE provides building owners with resources to support installations and highlights their success stories.

Key campaign activities:

Highlight organizations that have adopted or plan to adopt advanced HVAC technologies

Showcase successful adoption of advanced HVAC technologies in case studies

Provide resources and direct technical support to help building owners understand options

Campaign Case Studies

Case studies describe how organizations overcame barriers to adopt advanced RTUs and their experiences with the technology, along with **realized cost savings** in different scenarios.

2 case studies are already published, and 7 more are under development.

Published and developed case studies include:

- 2 retail sites
- 2 office sites
- 2 industrial sites
- 2 education sites
- 1 community site

Published Case Studies

Los Angeles Unified School District (CA)

- Replaced 65% of decentralized HVAC units with advanced electric systems, including RTUs and other systems to serve 70 million ft^2 of school building space
- **Saved ~$140,000 monthly on utility costs**

Read the full case study here.

Columbia Association (MD)

- Planning to replace conventional RTUs with high efficiency dual-fuel RTUs in public and community building spaces as existing equipment fails
- Projected to **reduce on-site natural gas demand by 70%** in early pilot
- Reserved the facility's spare electrical capacity for future mechanical equipment load

Read the full case study here.

Key Takeaways from Case Studies

BUILDING TYPES

Sites span a wide range, demonstrating wide applicability.

ACHIEVING GOALS

Sites demonstrate or project achievement of individual organizational goals.

EXISTING EQUIPMENT

Most sites replace traditional RTUs with more advanced dual-fuel or electric RTUs.

COST SAVINGS

Sites with data reported show site energy savings from 17 to 70%.

MOTIVATIONS

Internal goals, financial incentives, local regulations, existing equipment condition, and more.

BENEFITS

Comparable or lower lifecycle costs, comparable comfort, and lower noise.

BARRIERS

More Common:

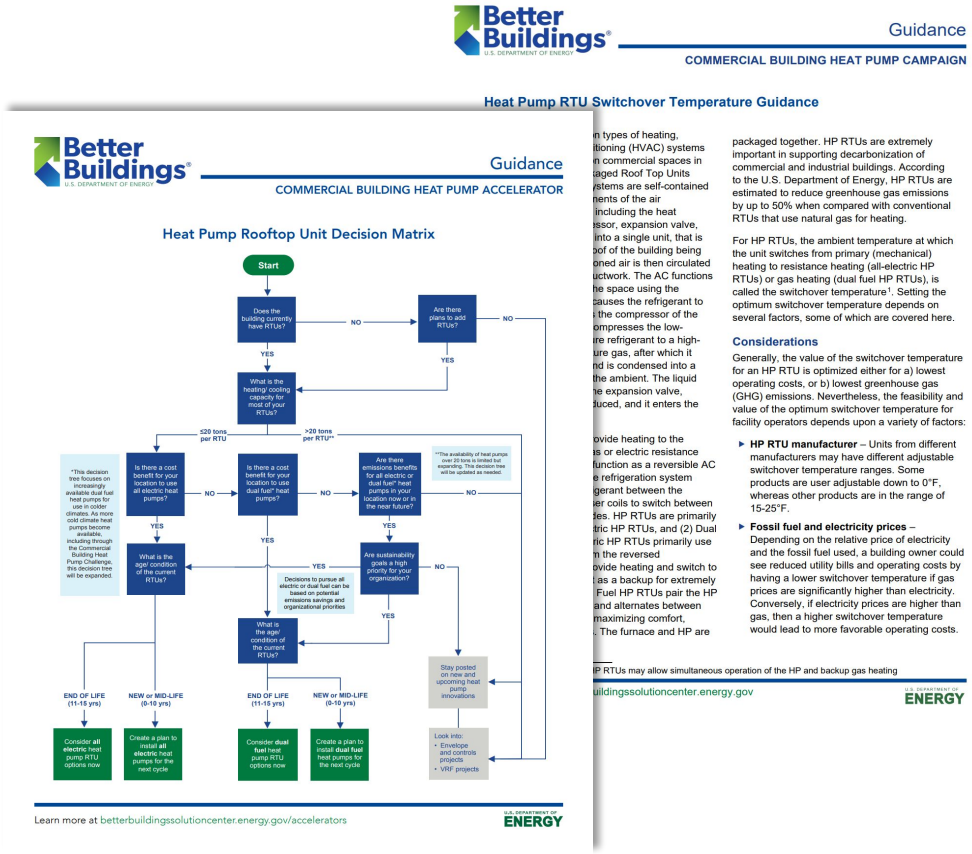
- Upfront capital required
- Correct sizing
- Increased weight required
- Installation coordination with normal building operations

More Unique:

- Limited industrial-scale options
- Noisy fans
- Controls integration with building system
- Procurement delays
- Installation quality control

Other Resources Help Educate and Support Decision Making

- **Decision matrix** to help decision-makers determine which advanced HVAC technology may best support their building needs
- **RTU switchover temperature guidance** to provide information on types of advanced RTUs and considerations for switchover temperatures
- **Fact sheets** to provide simple information on advanced HVAC technologies
- **Energy cost comparison estimates** for different geographic regions



Better Buildings® U.S. DEPARTMENT OF ENERGY — Guidance

COMMERCIAL BUILDING HEAT PUMP CAMPAIGN

Heat Pump RTU Switchover Temperature Guidance

Better Buildings® U.S. DEPARTMENT OF ENERGY — Guidance

COMMERCIAL BUILDING HEAT PUMP ACCELERATOR

Heat Pump Rooftop Unit Decision Matrix

Start

Does the building currently have RTUs?

NO → Are there plans to add RTUs?

YES → What is the heating/ cooling capacity for most of your RTUs?

≤20 tons per RTU / >20 tons per RTU**

Is there a cost benefit for your location to use all electric heat pumps?

Is there a cost benefit for your location to use dual fuel* heat pumps?

Are there emissions benefits for all electric or dual fuel* heat pumps in your location now or in the near future?

What is the age/ condition of the current RTUs?

Are sustainability goals a high priority for your organization?

Decisions to pursue all electric or dual fuel can be based on potential emissions savings and organizational priorities

What is the age/ condition of the current RTUs?

END OF LIFE (11-15 yrs) / NEW or MID-LIFE (0-10 yrs)

Consider all electric heat pump RTU options now

Create a plan to install all electric heat pumps for the next cycle

Consider dual fuel heat pump RTU options now

Create a plan to install dual fuel heat pumps for the next cycle

Stay posted on new and upcoming heat pump innovations

Look into:
- Envelope and controls projects
- VRF projects

Learn more at betterbuildingssolutioncenter.energy.gov/accelerators

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Heat Pump RTU Switchover Temperature Guidance

...n types of heating, ...itioning (HVAC) systems ...n commercial spaces in ...kaged Roof Top Units ...ystems are self-contained ...nents of the air ...including the heat ...ssor, expansion valve, ...into a single unit, that is ...oof of the building being ...oned air is then circulated ...uctwork. The AC functions ...he space using the ...causes the refrigerant to ...the compressor of the ...ompresses the low- ...re refrigerant to a high- ...ure gas, after which it ...nd is condensed into a ...the ambient. The liquid ...e expansion valve, ...tuced, and it enters the ...

...ovide heating to the ...s or electric resistance ...function as a reversible AC ...e refrigeration system ...gerant between the ...er coils to switch between ...es. HP RTUs are primarily ...tric HP RTUs, and (2) Dual ...ric HP RTUs primarily use ...n the reversed ...ovide heating and switch to ...as a backup for extremely ...Fuel HP RTUs pair the HP ...and alternates between ...maximizing comfort, ... The furnace and HP are ...

packaged together. HP RTUs are extremely important in supporting decarbonization of commercial and industrial buildings. According to the U.S. Department of Energy, HP RTUs are estimated to reduce greenhouse gas emissions by up to 50% when compared with conventional RTUs that use natural gas for heating.

For HP RTUs, the ambient temperature at which the unit switches from primary (mechanical) heating to resistance heating (all-electric HP RTUs) or gas heating (dual fuel HP RTUs), is called the switchover temperature[1]. Setting the optimum switchover temperature depends on several factors, some of which are covered here.

Considerations

Generally, the value of the switchover temperature for an HP RTU is optimized either for a) lowest operating costs, or b) lowest greenhouse gas (GHG) emissions. Nevertheless, the feasibility and value of the optimum switchover temperature for facility operators depends upon a variety of factors:

- **HP RTU manufacturer** – Units from different manufacturers may have different adjustable switchover temperature ranges. Some products are user adjustable down to 0°F, whereas other products are in the range of 15-25°F.
- **Fossil fuel and electricity prices** – Depending on the relative price of electricity and the fossil fuel used, a building owner could see reduced utility bills and operating costs by having a lower switchover temperature if gas prices are significantly higher than electricity. Conversely, if electricity prices are higher than gas, then a higher switchover temperature would lead to more favorable operating costs.

...P RTUs may allow simultaneous operation of the HP and backup gas heating

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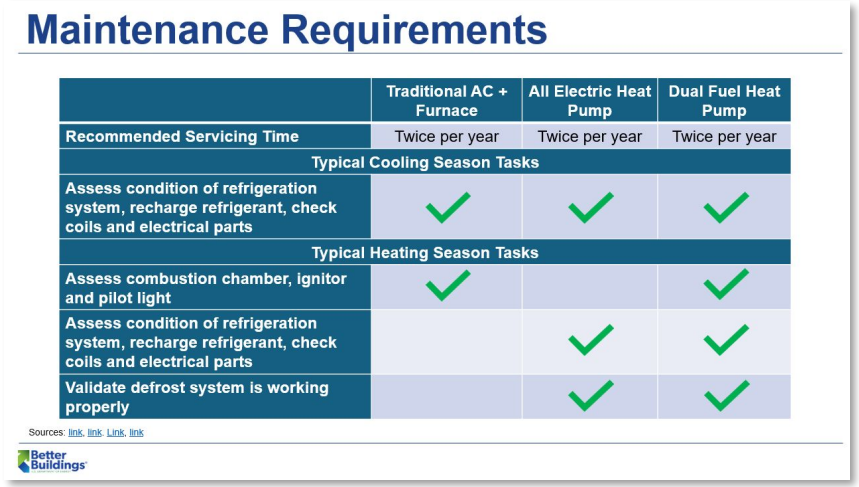
Upcoming Resources

- **Advanced HVAC Incentive Summary** to describe the different types of incentives that are offered on federal, state, and local levels
- **Accelerator Case Study Takeaways** to summarize the available case studies and aid with initial discussions
- **Advanced RTU Maintenance Considerations** to summarize available information on maintenance requirements, sourced from manufacturer literature and other resources
- **ComStock Analysis** slides with updates to reflect newest partner feedback and convey expected benefits of adopting advanced RTUs in various cities across the U.S.



Maintenance Requirements

	Traditional AC + Furnace	All Electric Heat Pump	Dual Fuel Heat Pump
Recommended Servicing Time	Twice per year	Twice per year	Twice per year
Typical Cooling Season Tasks			
Assess condition of refrigeration system, recharge refrigerant, check coils and electrical parts	✓	✓	✓
Typical Heating Season Tasks			
Assess combustion chamber, ignitor and pilot light	✓		✓
Assess condition of refrigeration system, recharge refrigerant, check coils and electrical parts		✓	✓
Validate defrost system is working properly		✓	✓

Sources: link, link, Link, link

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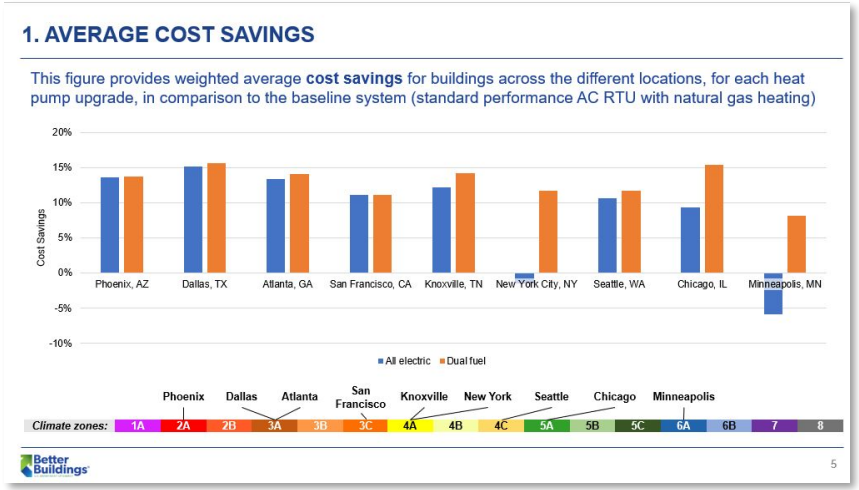

1. AVERAGE COST SAVINGS

This figure provides weighted average **cost savings** for buildings across the different locations, for each heat pump upgrade, in comparison to the baseline system (standard performance AC RTU with natural gas heating)

Better Buildings

5

Getting Involved

The campaign is **open to building owners and operators, utilities, and other supporting organizations** that may include non-profits, NGOs, associations, and trade organizations.

If your organization is interested, **send an email** to betterbuildings@ee.doe.gov.

Learn more in the Commercial Building HVAC Accelerator Fact Sheet.

Thank you!

Rachel Lebedinsky

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Appendix

Case Studies in Progress – Electric Backup

Warehouse in CA

- Replaced existing rooftop HVAC equipment with advanced RTUs in a 700,000 square foot fulfillment building
- Projected to **reduce space conditioning energy use by 17%**
- Expected to increase local air quality

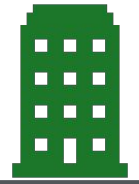
Manufacturing Facility in NY

- Installed 18 new advanced RTUs in a manufacturing facility to replace existing process heating boiler that provided steam to RTUs
- Expecting **~$330,000 in lifetime savings** compared to conventional RTUs

University in WA

- Constructed new athletic facility with cold climate advanced RTUs with on-board energy recovery ventilation
- Anticipated to supply 90% of the annual heating load
- Reduced natural gas costs

Case Studies in Progress – Electric Backup



Office Building in CA

- Installed 3 advanced RTUs and 1 cooling-only RTU in a two-story office building
- New RTUs are noticeably quieter and offer better temperature control

Grocery Store in CA

- Retrofitted entire building, including new advanced electric RTUs
- **Lowered total energy use by 44%** for the entire project

Case Studies in Progress – Dual-Fuel

Furniture Store in PA

- Upgrading HVAC system in store to advanced dual-fuel RTUs
- Exploring alternative system designs to distributed RTU systems

Mixed Use Commercial in NY

- Monitored performance of advanced dual-fuel RTUs
- New RTUs satisfied 99% of heating needs (gas heating only 1% of operating hours)
- New advanced RTUs consumed **70% less site energy** than conventional RTUs

Challenge Performance Specification: Heating

- Objectives: maximize capacity at low temperatures and increase COP
- Includes manufacturer feedback

Nominal Capacity [Btu/h]	Outdoor Air Temperature: -10°F		Outdoor Air Temperature: 5°F		Minimum $IVHE_c$
	COP2	Minimum Capacity Ratio	COP2	Minimum Capacity Ratio	
≥65,000 and <135,000	1.3	0.7	1.7	1	7.1
≥135,000 and <240,000					6.9
≥240,000 and <760,000					6.7

Notes

- Capacity ratio = $\frac{heating\ capacity\ @\ OAT}{cooling\ capacity\ @\ 95°F}$

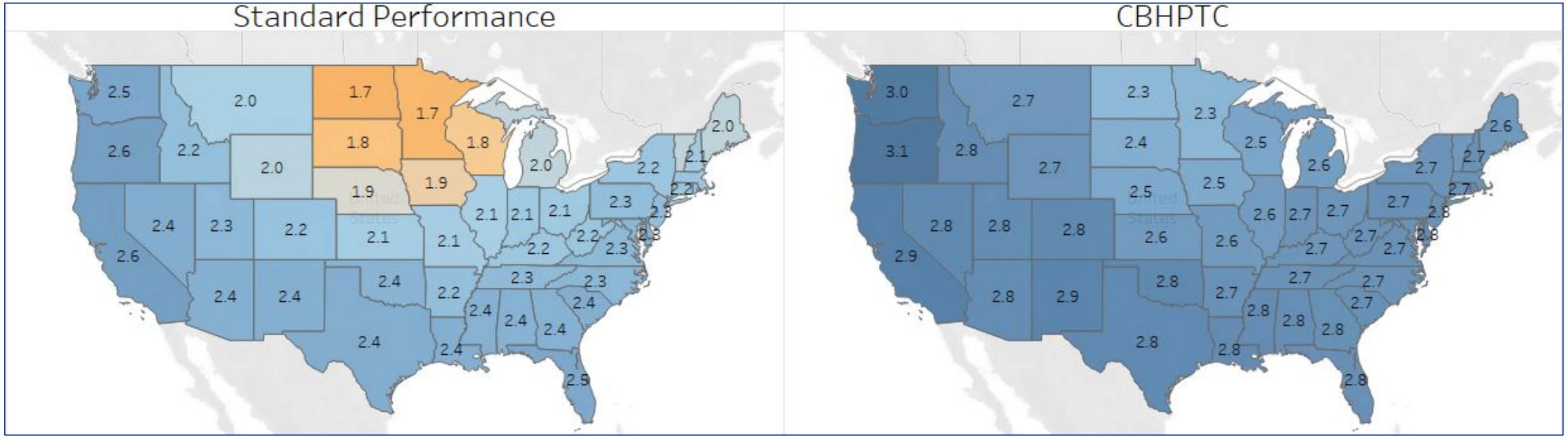
From AHRI 1340 – 2024:

- IVHEc = Integrated ventilation and heating efficiency for CZs 5-8
- COP2 = revised COP for new test standard

A 10 ton RTU will provide 10 tons of cooling @95F and 10 tons of heating at 5F

Efficiency Improvements

Median Annual Average Total Heating COPs by State



COPs presented include impacts of supplement heat, crankcase heat, and reverse-cycle defrost, but not supply fan.