



Cold Climate Electrification FAQs

Updated August 2022



Can heat pumps work in cold climates?

For Climate Week, Governor Mills Celebrates Maine's Progress Toward Installing 100,000 Heat Pumps by 2025



September 24, 2021

Efficiency Maine Trust and MaineHousing report installing more than 28,000 high-efficiency heat pumps in Maine buildings over the past year.

Dover-Foxcroft, MAINE – During a visit to Dave's World in Dover-Foxcroft today, Governor Janet Mills announced that more than 28,000 high-efficiency heat pumps have been installed in Maine buildings over the past year, marking a major milestone toward the governor's target of installing 100,000 new heat pumps by 2025.

Can heat pumps perform (without backup) in my coldest hours?

All ASHPs see reduced **efficiency** and **capacity** in sub-freezing temperatures. “Cold climate ASHPs” do a better job (at higher cost)

A home’s ability to handle any given temperature depends on...

- The specific system used
- Oversizing factor
- Home envelope performance
- Duration of cold snap

Figure 41. Test Plots for NEEA 2

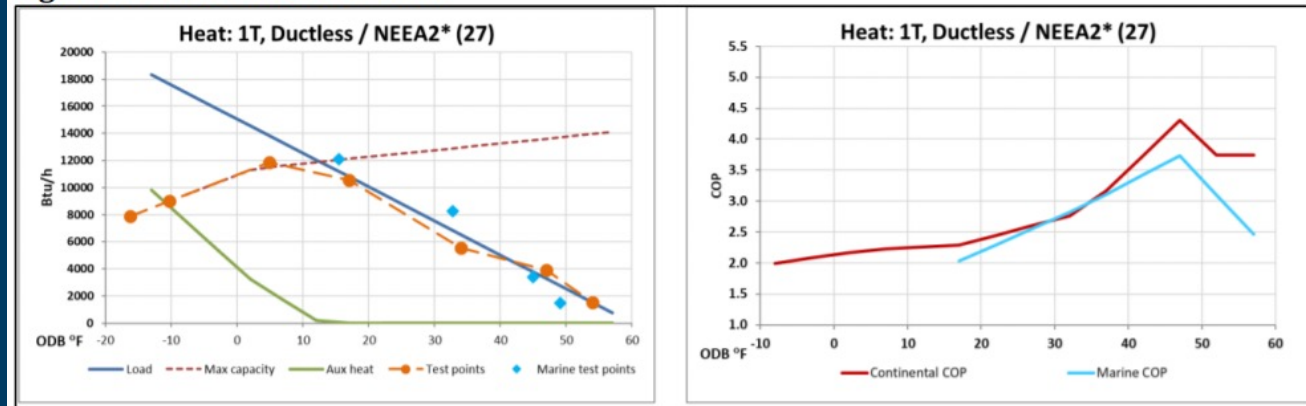
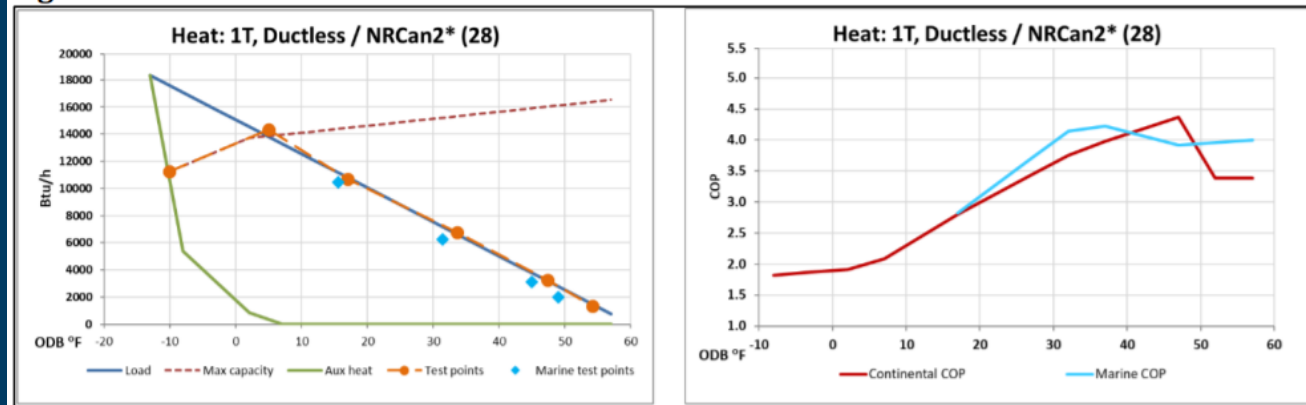


Figure 48. Test Plots for NRCan 2



Source: NEEA, CSA EXP-07 [Interim Testing Report](#), 2020

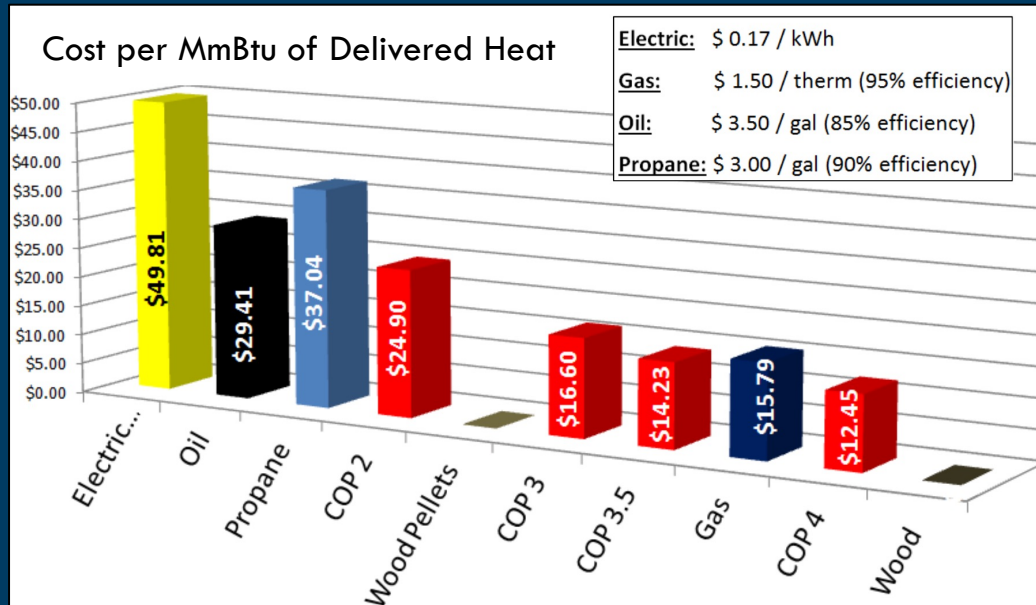
Will my community save on energy bills?

This depends on the preceding factors plus...

- Annual weather profile (including cooling season)
- Utility rates (including any tiered/TOU structure)
- Existing system type

~IECC Zone 7

~IECC Zones 5-6



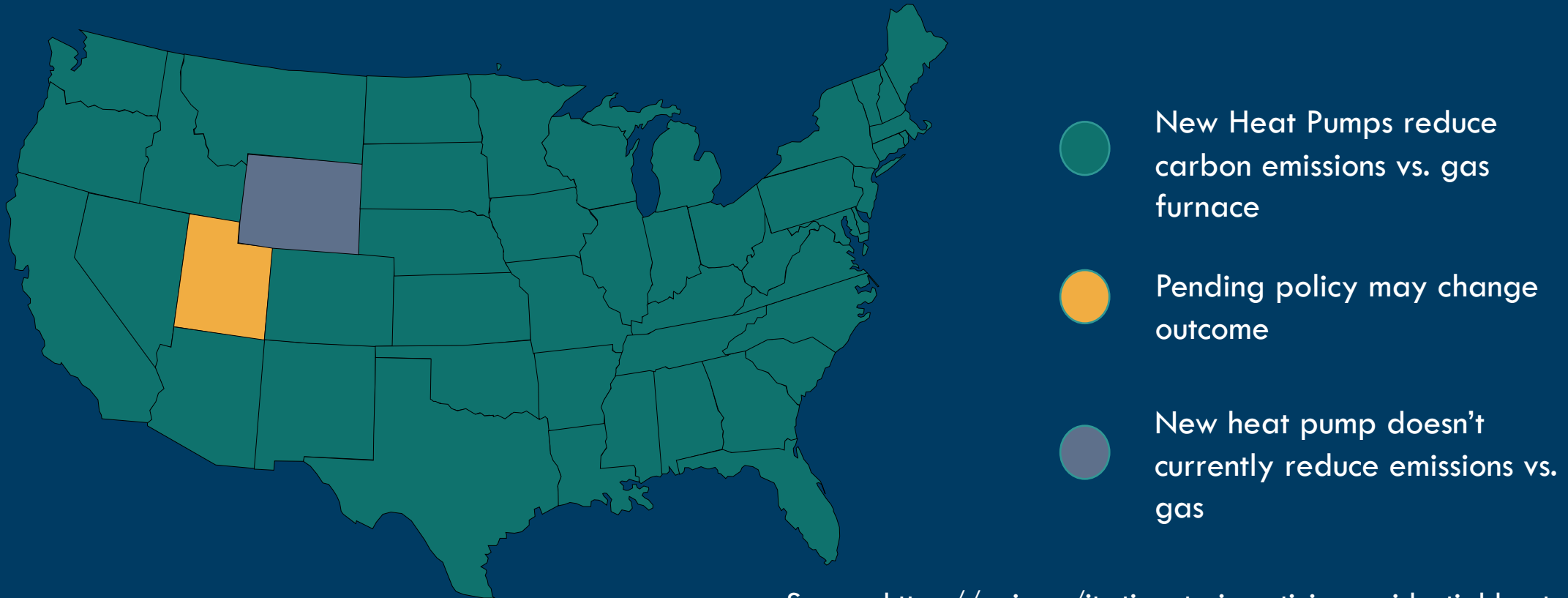
Illustrative example of the varying cost of delivered heat, including heat pumps at four different system efficiencies (COPs)

System	Subarctic	Very Cold	Cold/Dry	Cold/Humid
NEEA 1	1.68	2.19	2.70	2.45
NEEA2*	1.80	2.29	2.66	2.50
NEEA 3	1.60	1.97	2.26	2.13
NEEA 4	1.80	2.42	3.02	2.75
NEEA 5	1.35	1.52	1.62	1.58
NEEA 6	1.74	2.29	2.81	2.56
NEEA 7	1.74	2.18	2.47	2.36
NRCan1	**	1.55	2.01	2.47
NRCan2	1.92	2.60	3.20	2.94
NRCan3	1.49	1.88	2.26	2.08
NRCan4	1.63	2.01	2.30	2.17
NRCan5	1.67	2.11	2.52	2.31
NRCan6	1.59	2.06	2.58	2.31

Source: NEEA, CSA EXP-07 [Interim Testing Report](#), 2020

Will we see carbon savings despite the fossil fuels on our grid?

Emissions Impact by State—Heat Pumps vs. Gas Furnace (Continental United States)



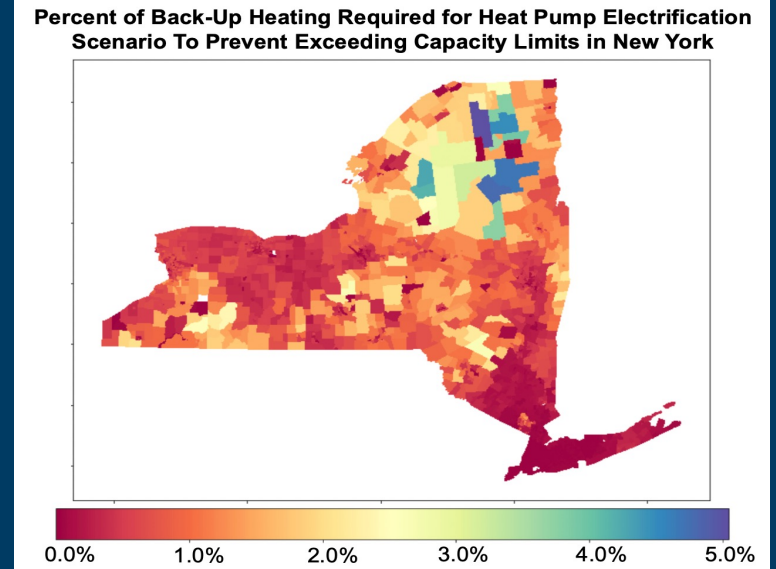
Source: <https://rmi.org/its-time-to-incentivize-residential-heat-pumps/>

Will we need backup heat?

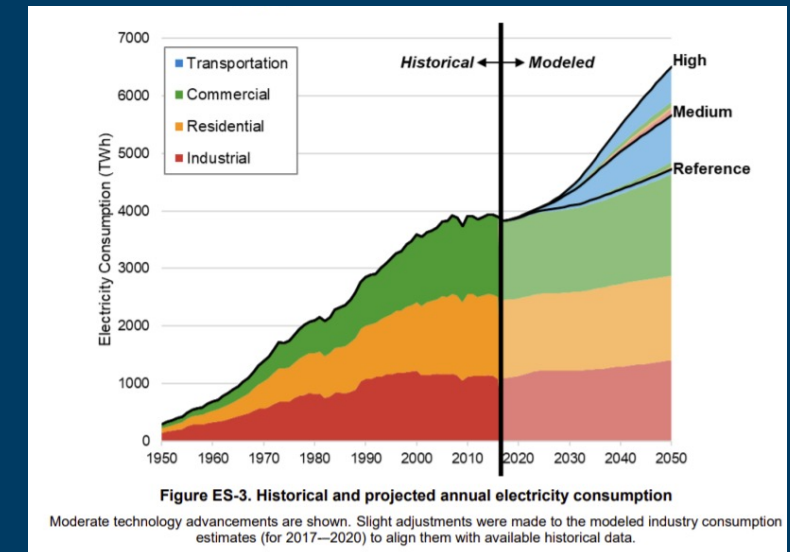
Short answer: Sometimes, but both the need for backup systems and the resulting grid impacts are often overstated and based on outdated assumptions.

Proof Points

- NEEA's [EXP-07 Interim Testing Report](#) results:
 - Across 12 units lab tested, backup resistance tripped at 3-16 °F
- RMI's [Economics of Zero Energy Homes Cold Climate Addendum \(2018\)](#)
 - Backup resistance utilized in 3% of hours in IECC climate zone 5, 5% in zone 7
- RMI analysis in Holyoke, MA using a Mitsubishi ccASHP (unpublished)
 - Heat pump unit never lost more than 20% of nameplate capacity
 - 3.12 seasonal COP (13% drop from nameplate COP rating of 3.59)
- Upcoming Cadmus MA/NY field testing study
 - Found average 46% utilization for HPs installed with backup, 69% without backup
- Columbia U's [Electricity Load Implications of Heating Decarb Pathways \(2020\)](#)
 - 0-5% of homes require non-electric backup to meet current grid constraints
- City and County of Denver's [Clean Heating and Cooling Plan \(2021\)](#)
 - Found Denver could electrify at least 50% of buildings before increasing grid peak



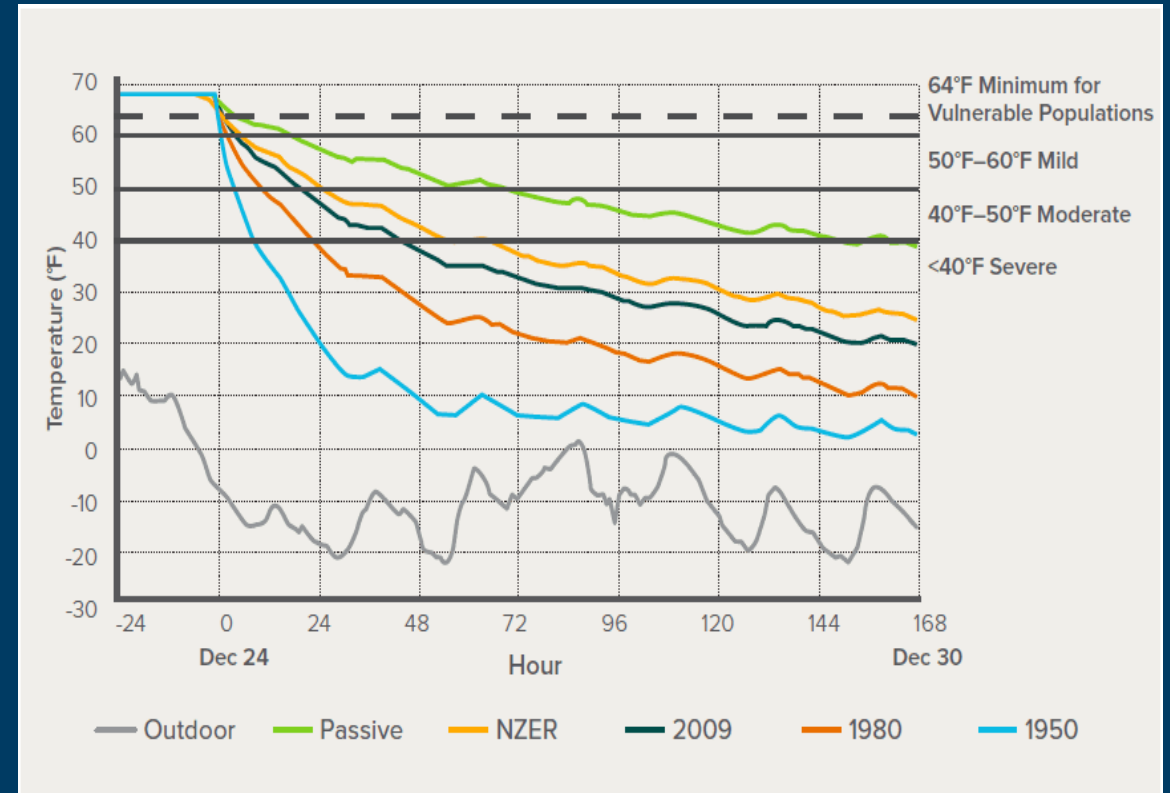
Source: Columbia University, [Electricity Load Implications of Space Heating Decarbonization Pathways \(2020\)](#)



Source: NREL [Electrification Futures Study \(2018\)](#)

What about when the grid goes down?

- Gas equipment typically requires electricity to operate safely
- All-electric homes with on-site solar and battery storage can maximize resilience
- Envelope improvements are the key to surviving extreme weather events



RMI, [Hours of Safety in Cold Weather, 2020](#)

What homes can I target for electrification now?

New Construction

- Clear value proposition
- Better envelopes
- More room to optimize system design for cold performance

Climate Advocates

- Bill increase not a dealbreaker
- Still need to ensure performance

Resistance, Propane, & Oil

- Clear value proposition
- Enough of your market to catalyze supply chain actors
- Analyze the three separately

A/C Installations

- Heat pumps: two systems in one
- Little risk of triggering electrical upgrades
- Opportunity to test heat pumps with furnace still in place

Heat Pump Water Heaters

- Often (slightly) better economics
- Space concerns and other installation limitations

Dual Fuel Heat Pumps

- Reduce gas consumption 70%+
- Major gas transition concerns
- Potential bridge solution in certain contexts

How can I ensure quality installations?

- Ensure any local analysis **addresses contractor questions/concerns**
- Invest in **workforce development** programs
- Provide **quality assurance**
 - Maintain a verified contractor list (potentially in coordination w/ utility)
 - Avoid administrative burdens: post-install customer surveys are easy and effective
- Lean on **available specs/product lists** for cold climate ASHPs
 - Today: NEEP's specification & product list
 - Tomorrow: ENERGY STAR specification & product list
 - Soon: New testing standards from CSA will give us better data

Where can I go to learn more?

- RMI Economics of Electrifying Buildings 3.0 (ETA: late '22)
- City & County of Denver's [Renewable Heating and Cooling Plan](#)
 - Pgs 21-24: grid impact analysis
 - Pgs 29-32: installed cost and bill impact analysis
- E3's [The Economics of All-Electric New Construction in Utah](#)
- NEEP's [ccASHP Specification](#) and [Consumer & Installer Resources](#)
- NEEA's [Advanced Water Heater Spec](#)
- MEEA [Advanced Heat Pump Coalition](#)
- [Center for Energy & Environment \(CEE\)](#) and the [MN ASHP Collaborative](#)
- [Cold Climate Housing Research Center](#)