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The Electric Furnace Fix

How Replacing Air Conditioners with Heat Pumps Reduces Electric Heating Bills and Winter Peak Demand in the South

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Artificial Intelligence Disclosure

Artificial intelligence (AI) tools were used in a supporting role during this project in three ways: to find and summarize published sources; to draft and edit text for selected sections; and to check calculations and run one sensitivity analysis. For source review, AI tools located and summarized public material. The authors checked every fact, statistic, quotation and citation against the original source. For drafting, AI tools produced first drafts of selected subsections and callout boxes from outlines, sources and model results that the authors provided. The authors then substantially revised that text. The estimates of peak demand, energy and bill savings come from the heat pump model developed by the authors. AI tools were used to check workbook formulas and to calculate the design-temperature sensitivity in Appendix B from the model's outputs, and the authors confirmed those results in the model. All AI-assisted material was reviewed, revised and incorporated by the authors. RAP and ACEEE are solely responsible for the report's analysis, conclusions and final content.

Executive Summary

Across 14 southern states, 7.85 million families heat their homes with electric resistance furnaces and cool them with central air conditioners. For those families, switching to a heat pump pays back its entire upfront cost in three years on average and simultaneously removes gigawatts of demand from winter peak.

Those families are not hard to find. They are already on utility billing systems receiving electricity services and will need to replace their central air conditioners within the next 15 to 20 years. The replacement is inevitable because, eventually, all air conditioners break. The question then becomes: Does the family replace their unit with another air conditioner, locking in another 15 years or more of inefficient heating, or install a heat pump? That decision is determined almost entirely by whether well-designed policies and programs are in place and known to the consumer when the family's unit breaks.

The 14 states analyzed in this report — Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia[1] — include a combined 31.3 gigawatts of coincident winter peak demand attributable solely to inefficient and unnecessary electric resistance heating, an amount equal to 104 300-megawatt natural gas peaker power plants running simultaneously or to removing approximately 3.9 million electric heated homes from the grid each winter.[2] A full regional deployment of heat pumps would also eliminate roughly 12.9 terawatt hours of annual electricity consumption from inefficient heating, the annual electricity use of about 1.06 million U.S. households.[3]

Our analysis shows that the economics are compelling for customers. The incremental cost of a heat pump over a standard-minimum central air conditioner averages $562 per home across the 14 states. Heating with a heat pump saves the average household approximately $252 per year on its electric bill, resulting in an average simple payback period of three years. Over 15 years, cumulative customer bill savings across all 14 states total $29.6 billion against a total program investment of $4.79 billion. That's an average benefit-to-cost ratio (BCR) of 6:1. Every state in the analysis exceeds a 3:1 BCR, meaning that every dollar invested in the incremental cost of a heat pump generates a minimum of three dollars in customer bill savings.

For utilities and grid operators managing winter reliability, the capacity value and related savings are substantial and too important to ignore. Over a 15-year design life, the cost

[1] All within the U.S. Census South Region. Note EIA RECS data did not have sufficient data for homes with this HVAC configuration in West Virginia and Delaware for inclusion in this analysis.

[2] For scale there are 3.7 million housing units in the state of Virginia. See U.S. Census Bureau. (2026, May). *National, state, and county housing unit totals: 2020-2025.* https://www.census.gov/data/tables/time-series/demo/popest/2020s-total-housing-units.html

[3] It would take approximately five 300 MW power plants running continuously at full output for a year to produce the same amount of electricity.

of winter peak capacity from heat pumps is only 11% to 16% of the estimated cost of new gas peaker capacity, meaning supply costs are between five and eight times more expensive than the capacity savings from heat pumps.[4]

Although most utilities in the South still plan around a summer peak, the region's reliability risk is moving toward the winter, which is the focus of this report. As of 2025, NERC (North American Electric Reliability Corporation) classifies the Carolinas and much of Tennessee as dual-peaking, reports that Georgia, Alabama and Mississippi are trending toward winter peaks and finds that the riskiest hours occur on increasingly cold winter mornings when demand from electric resistance heat is highest. The region's worst reliability events of the past five years were Winter Storms Uri and Elliott, and utilities, including Georgia Power, Duke and TVA, now plan to higher winter reserve margins or have set record winter peaks.

Heat pump programs that significantly reduce coincident peak demand can be grid reliability tools that help customers avoid paying for more expensive generation capacity. Every gigawatt of electric resistance demand converted to heat pump load unlocks winter capacity, which offsets the need and cost of building additional power generation.

Five policy levers, which can be used in tandem, enable decisionmakers to capture this opportunity at scale. These levers are available today to electric utilities and utility regulators, as well as state and local policymakers:

- Implement upstream, midstream and customer rebates that close the incremental cost gap at the point of sale.
- Require inclusive utility investment programs that extend access to heat pumps, regardless of credit history.
- Improve building energy use by establishing building energy codes that prohibit electric resistance as a primary heating source and strengthen weatherization and pre-weatherization programs.
- Institute workforce development programs to increase the number and quality of trained heat pump installers.
- Require accurate capacity accounting in integrated resource plans to credit heat pump capacity value against supply-side resources.[5]

[4] Lazard. (2026). *Levelized Cost of Energy+ (LCOE+)*, 19th ed. https://www.lazard.com/research-insights/levelized-cost-of-energyplus

[5] The analysis in this paper is meant to address the technical and economic potential for supplying customers with central ducted air conditioning and primary electric resistance heat with heat pumps. The policy recommendations within this report are meant to address achievable potential.

Introduction

In the South, the largest untapped capacity resource is undeployed energy efficiency measures. Millions of single-family and multifamily homes across the South heat with electric resistance furnaces and cool with conventional central air conditioners.[6] Those furnaces are functionally the same technology as plug-in space heaters or hair dryers that convert every watt of electricity they consume into exactly one watt of heat. These homes do not need to change fuels, run new electric wiring or remove gas appliances to switch to a heat pump. They only need to install a more efficient heating appliance — a heat pump — to yield three or more watts of heat for every watt of electricity used.

The AC-unit-to-heat-pump transition is a single equipment swap that replaces the AC unit at its natural end-of-life point, likely when it breaks down. The average central AC lasts about 18 years in the South, and approximately 5% to 7% of installed units are replaced each year.[7] This natural end-of-life replacement cycle represents approximately four to five hundred thousand opportunities each year to save families money on their electric bill and reduce winter peak demand across the South.

Despite the scale of this opportunity, the transition has been slow. According to our research, few regulators in the states we analyzed have required programs aimed at this measure, and existing utility programs are small relative to the 7.85 million candidate homes.

Most state building codes still permit new electric furnaces as a primary heating source despite heat pumps being much more cost effective. Each year without action delays hundreds of thousands of opportunities to replace electric resistance heat with heat pumps by about 15 years or more.

The policies identified in this report can deliver increased heat pump installations in the South for the customers who can benefit from them the most. This report presents an original analysis of 14 states with some of the largest stocks of homes that use electric resistance heating and central AC and quantifies the customer bill impacts and winter peak reduction potential of increasing heat pump deployment across the region. We frame those results as a capacity resource by comparing the levelized cost of heat pump incentives to the cost of building new peaking generation. We subsequently identify the specific program and policy levers available to regulators, utilities and policymakers to capture that value.

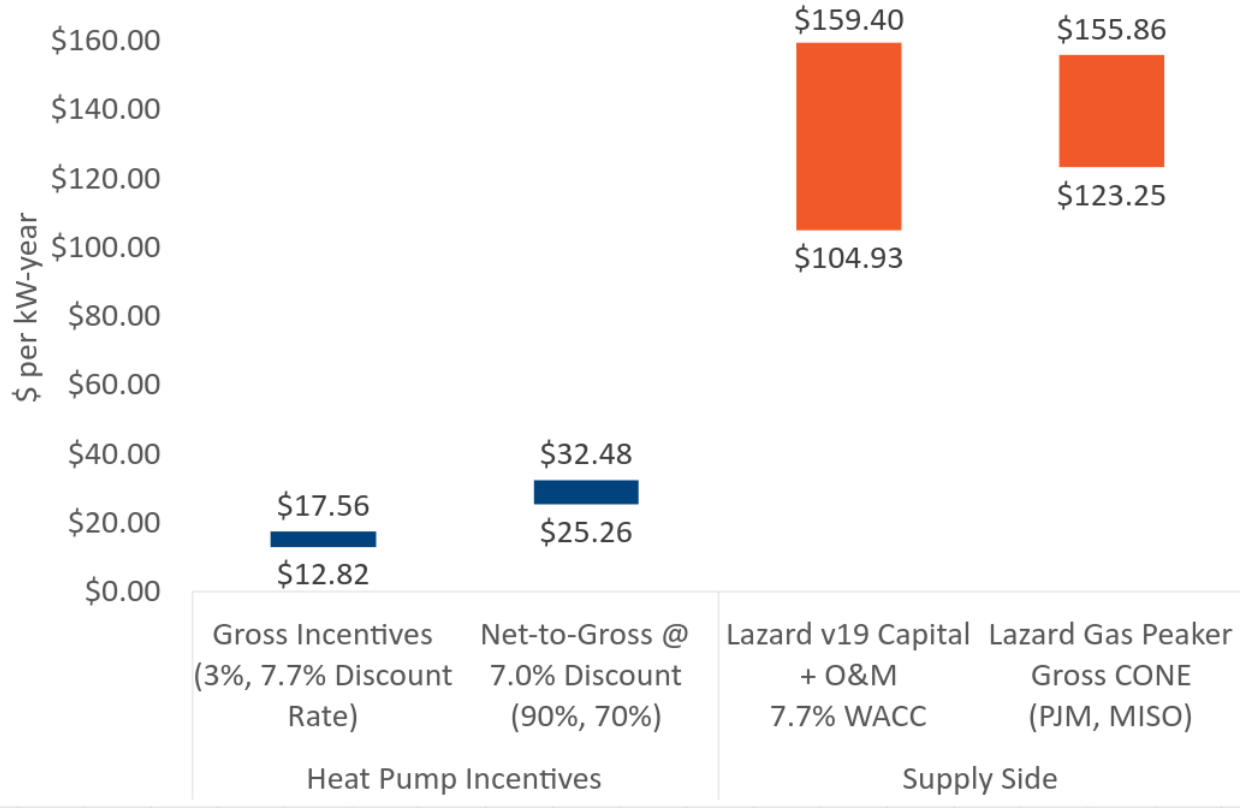
The findings are directly applicable to integrated resource planning proceedings, avoided cost determinations, building code proceedings and rate cases. Our key

[6] Throughout this report, “homes” means occupied housing units in the EIA’s 2020 Residential Energy Consumption Survey (RECS) that heat with an electric resistance furnace and cool with central air conditioning. This includes single-family homes and units in multifamily buildings with two or more units. The analysis treats them as one population and does not report results separately by housing type.

[7] Regulations.gov. (2016, December 5). *2016-12 final rule technical support document: Energy efficiency program for consumer products: Residential central air conditioners and heat pumps,* Table 9.5.2. eRulemaking Program. https://www.regulations.gov/document/EERE-2014-BT-STD-0048-0098

takeaway is that a well-designed heat pump incentive program can deliver winter capacity at roughly $12.82 to $32.48 per kilowatt-year, a fraction of the cost of any supply-side alternative ($105-$159/kW-year), as well as electricity bill savings to customers of over $2,000 on average over the life of the heat pump. These savings should factor into how regulators evaluate utility resource plans and how utilities prioritize their demand-side management and energy efficiency program portfolios.

Figure 1. Levelized Cost of Winter Capacity: Heat Pump Incentives vs. Supply-Side Alternatives



Sources: See Lazard. (2026, July). *Levelized Cost of Energy+ Analysis*, 19th ed., for gas peaker capital cost ($1,100-$1,650/kW), fixed O&M ($10-$17/kW-year), WACC (7.7%), facility life (30 years) and Gross CONE from firming analysis (PY 2025/2026); author calculations.

Figure 1 compares the levelized cost of capacity (LCOC) through heat pump replacement programs against the cost of building analogous new peaking capacity. Gross heat pump incentive costs range from $12.82 per kilowatt-year using a 3% public-policy discount rate to $17.56 per kilowatt-year using Lazard's weighted average cost of capital (WACC) of 7.7%. The analysis in this report uses a 7% discount rate, consistent with midrange public policy discount rate guidance, which yields a gross cost of $16.80 per kilowatt-year over a 15-year appliance lifetime. When applying demand-side management (DSM) evaluation adjustments of a 0.90 net-to-gross ratio for free ridership, a 15% program administration factor and an 85% effective load carrying

capability adjustment, the net LCOC figure rises to $25.26 per kilowatt-year, still less than half the lower bound of the supply-side capacity. A 15% program administration factor was chosen to approximate real-world program costs. In Texas[8], the cost of administration for a program is capped at 15% of a utility's total program costs, and, separately, midstream HVAC incentives are deployed with an 11% program delivery cost in Maine.[9]

The primary supply-side benchmark, $105 to $159 per kilowatt-year, is derived from Lazard LCOE+,[10] by annualizing capital costs of $1,100 to $1,650 per kilowatt and adding fixed O&M. Grid operators' cost of new entry (gross CONE) benchmarks for MISO (Midcontinent Independent System Operator),[11] SPP (Southwest Power Pool),[12] PJM (Pennsylvania-New Jersey-Maryland Interconnection)[13], and ERCOT (Electric Reliability Council of Texas)[14] for the 2025-2026 planning year provide a second reference ranging from $123 to $156 per kilowatt-year.

What Is a Heat Pump?

A heat pump is best understood as an air conditioner that can run in reverse. A standard air conditioner is a one-way appliance that moves heat out of a building to cool it. A heat pump can cool, but it can also pull heat from the outside air and deliver it indoors, even when it's cold outside.[15] Air conditioners and heat pumps are nearly identical except for a valve that changes which direction the system moves heat.[16]

Single-purpose air conditioners and dual-purpose heat pumps both use refrigerants (substances good at carrying heat) that cycle through a closed loop of pipes. Within these systems, an electric compressor squeezes the refrigerant into a liquid, forcing it to expel some of its carried heat at a desired location. These systems also allow the refrigerant to decompress into a gas, absorbing ambient heat from another desired

[8] Texas Administrative Code, § 25.181 - Energy Efficiency Goal, subsection (g), https://www.law.cornell.edu/regulations/texas/16-Tex-Admin-Code-SS-25-181

[9] Michaels Energy, Residential and Commercial Midstream HVAC Market Study Results, Appendix H, September 2018, https://www.efficiencymaine.com/docs/Appendix_H_Midstream_HVAC_Potential_Study.pdf

[10] Lazard, 2026, p. 28.

[11] MISO, Filing of Midcontinent Independent System Operator, Inc. Regarding Local Resource Zone CONE and Net CONE Calculations, Appendix A, October 2025, https://cdn.misoenergy.org/2025-10-15%20Docket%20No.%20ER26-139-000722804.pdf

[12] Missouri Public Service Commission, SPP Quarterly Update, page 17, May 2026, https://psc.mo.gov/CMSInternetData/Agenda%20Presentations/2026%20Presentations/5-28-26%20SPP%20Status%20Update.pdf

[13] PJM, Periodic Review of Default Gross CONE and Gross ACR Values, page 5, August 2026, https://www.pjm.com/-/media/DotCom/committees-groups/committees/mrc/2026/20260819/20260819-item-01a---1-periodic-review-of-default-cone-and-acr-values---presentation.pdf

[14] Brattle, ERCOT CONE Workshop, page 2, November 2025, https://www.brattle.com/wp-content/uploads/2026/02/ERCOT-CONE-Workshop-Trends-in-Costs-and-Sketch-of-a-2026-ERCOT-CONE-Study.pdf

[15] Malinowski, M., Dupuy, M., Farnsworth, D., & Torre, D. (2022). *Combating High Fuel Prices with Hybrid Heating: The Case for Swapping Air Conditioners for Heat Pumps*. CLASP. https://www.clasp.ngo/research/all/ac-to-heat-pumps/

[16] LeBel, M., Cowart, R., Eberle, L., Magavi, Z., & Iliff, A. (2026, June). *Seeking Balance: The Path Forward for Thermal Energy Network Regulation.* Regulatory Assistance Project and HEET. https://www.raponline.org/wp-content/uploads/2026/02/RAP-HEET-Thermal-Energy-Network-Regulation-June2026.pdf

location. A heat pump's reversing valve lets the indoor coil release heat in winter and absorb it in summer; an air conditioner's indoor coil can only absorb heat.[17]

A typical heat pump system includes three main parts:

- An outdoor unit holding the compressor
- A refrigerant loop connecting the indoors to the outdoors
- An indoor air handler that distributes the heated or cooled air[18]

Importantly, heat pumps *move* heat from point to point rather than generating it like a furnace or electric resistance heater, making them much more efficient at heating than competing technologies.[19] While electric resistance uses one watt of electricity to deliver one watt of heat, heat pumps routinely deliver three or four watts of heat for every watt of electricity they use, which is commonly expressed as the coefficient of performance (COP).[20]

Heat pump efficiency decreases in colder temperatures because they must work harder to extract heat from the air. Despite this decrease, they remain well above electric resistance heating's 1:1 efficiency ceiling.[21] Heat pump performance in cold weather is still an important design consideration in colder parts of the country where heat pumps with more advanced compressors are often paired with backup heat for extreme weather.[22] Standard single-speed heat pumps, however, have been shown to meet a majority of a home's heating needs in regions with milder winters, including the South, requiring backup heat only during the coldest hours.[23]

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[17] Lowes, R., Gibb, D., Rosenow, J., Sunderland, L., Thomas, S., Graf, A., Verheyen, S., Kelpsaite, L., Malinowski, M., Ross, A., Graham, P., Kabare, R., & Njendu, M. (2024, November). *A policy toolkit for global mass heat pump deployment — Version 2.0.* Regulatory Assistance Project, Agora Energiewende, CLASP and Global Buildings Performance Network. https://www.raponline.org/wp-content/uploads/2023/08/RAP_Heat_Pump_Toolkit2.0-compressed.pdf

[18] Malinowski et al., 2022.

[19] Malinowski, M., Cox, V., Farnsworth, D., Dupuy, M., Shipley, J., Breit, R., & LeBel, M. (2023). *Accelerating heat pump adoption through the Inflation Reduction Act (IRA) and complementary policies.* CLASP and Regulatory Assistance Project. https://www.raponline.org/wp-content/uploads/2024/01/rap-clasp-accelerating-heat-pump-adoption-through-IRA-and-complementary-policies-2023-december.pdf

[20] Lowes et al., 2024.

[21] LeBel et al., 2026.

[22] Jessica Shipley, Jim Lazar, David Farnsworth, and Camille Kadoch, *Beneficial Electrification of Space Heating* (Montpelier, VT: Regulatory Assistance Project, November 2018), 17–21, 27, https://www.raponline.org/wp-content/uploads/2023/09/rap-shipley-lazar-farnsworth-kadoch-beneficial-electrification-space-heating-2018-november.pdf.

[23] See Malinowski et al., 2022, modeling a single-speed, 15 SEER/9 HSPF heat pump meeting the 2023 DOE minimum standard.

Analysis and Results

This study's methodology is based on ACEEE's *Transforming Texas: How Heat Pumps Can Replace Electric Resistance Heat, Reducing Costs and Winter Power Peaks*.[24] That report analyzed the benefits of replacing central air conditioners with heat pumps in homes using electric resistance heat in Texas. Our report expands that analysis to 14 U.S. southern states with a potential market of at least 100,000 candidate homes. Additional details on the study methodology can be found in Appendix A.

Our analysis shows that every watt of heat provided by a heat pump rather than electric resistance yields savings for households and reduces winter grid peaks. This model accounts for temperature impacts on a heat pump's COP and heating capacity. For the minimum standards compliant heat pump we used in our modeling, the COP at 15°F is 2.56 and the heating output capacity is 61%. This indicates that at low ambient temperatures, 39% of a building's heating load is supplied by backup electric resistance heat. Considering electric resistance heat has a COP of 1, the resulting combined system COP, which includes both the heat pump's output and supplementary resistance output, is 1.9. This drastic increase in heating system efficiency compared to resistance heat would lower energy consumption and winter heating bills for households that currently use electric resistance heat, as well as lowering peak electric grid loads.

[24] Nadel, S., Amann, J., & Chen, H. (2024, November). *Transforming Texas: How heat pumps can replace electric resistance heat, reducing costs and winter power peaks.* American Council for an Energy-Efficient Economy. https://www.aceee.org/white-paper/2024/11/transforming-texas-how-heat-pumps-can-replace-electric-resistance-heat

Table 1. Summary of results by state

State	Homes (resist. heat + central AC)	kWh / home / yr	kW / home @ 15°F	Winter peak MW	Equiv. 300-MW plants	Total program cost ($M)	Annual bill savings ($/home/yr)	Lifetime bill savings ($M)	Benefit-cost ratio
Alabama	262,800	1,553	3.55	932	3.1	$143M	$269	$1,060M	7.4
Arkansas	154,798	2,656	3.43	531	1.8	$90M	$366	$850M	9.4
Florida	2,012,759	1,011	4.16	8,371	27.9	$1,326M	$161	$4,870M	3.7
Georgia	409,217	1,518	3.98	1,629	5.4	$242M	$237	$1,450M	6.0
Kentucky	309,070	2,850	4.27	1,319	4.4	$211M	$387	$1,790M	8.5
Louisiana	378,677	1,325	3.97	1,503	5.0	$230M	$165	$940M	4.1
Maryland	285,792	2,228	4.07	1,162	3.9	$151M	$480	$2,060M	13.6
Mississippi	166,577	2,463	4.61	768	2.6	$127M	$342	$850M	6.7
North Carolina	574,488	1,572	3.34	1,917	6.4	$262M	$235	$2,020M	7.7
Oklahoma	250,538	3,326	3.92	982	3.3	$149M	$469	$1,760M	11.8
South Carolina	257,922	1,554	3.70	955	3.2	$146M	$228	$880M	6.1
Tennessee	392,053	2,082	3.93	1,540	5.1	$239M	$274	$1,610M	6.7
Texas	1,938,660	1,685	4.07	7,892	26.3	$1,221M	$258	$7,490M	6.1
Virginia	455,150	1,793	3.88	1,765	5.9	$245M	$292	$1,990M	8.1
14-state total	**7,848,502**	**—**	**—**	**31,265**	**104**	**$4,785M**	**$252 avg**	**$29,600M**	**6.3**

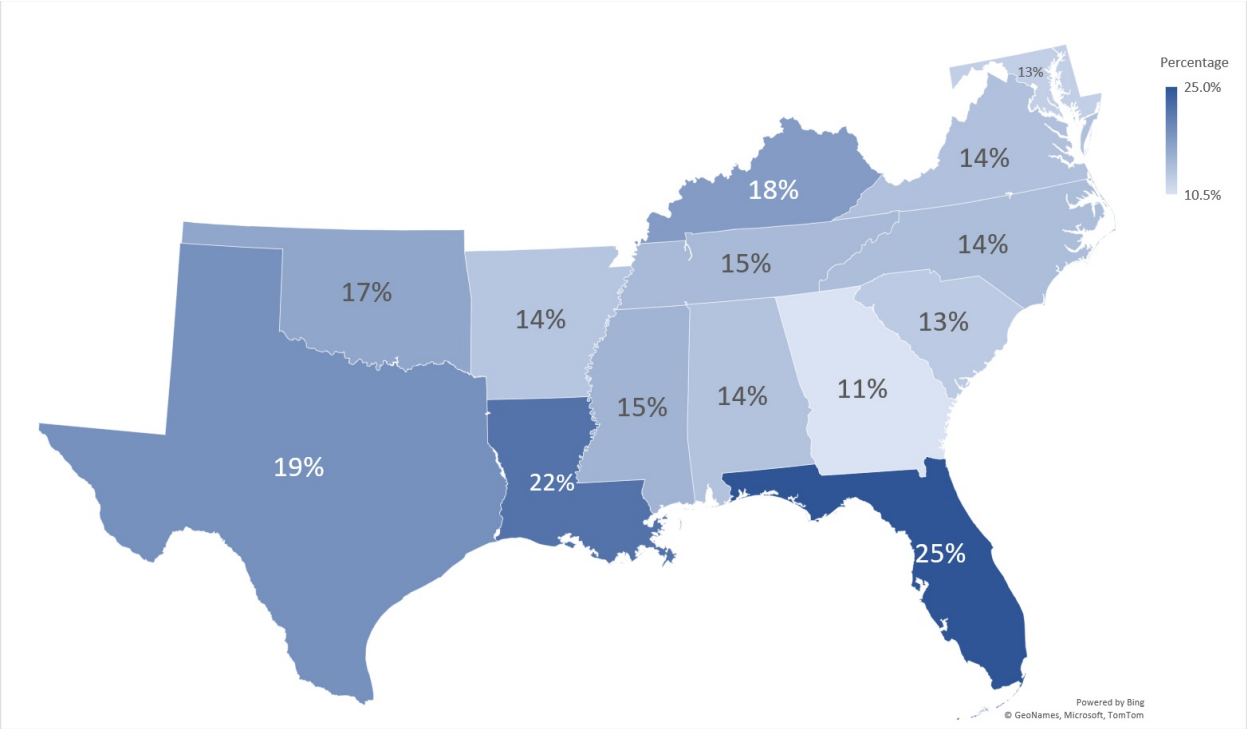
Key Outputs of Replacing AC Units with Heat Pumps in 14 Southern States

Every state across the 14-state footprint has 100,000 or more homes (single-family and multifamily combined) with electric resistance heat and central AC. Replacing the central AC with a standards-minimum heat pump at the time of burnout or using heat pumps from the outset in new construction delivers substantial electric bill, peak-demand and efficiency savings.[25]

[25] The 14 states analyzed are all in the U.S. Census South Region.

- The 14 states include approximately 7.85 million homes that heat with an electric resistance furnace and cool with central AC. The five largest individual markets are: Florida (2,012,759), Texas (1,938,660), North Carolina (574,488), Virginia (455,150) and Georgia (409,217).

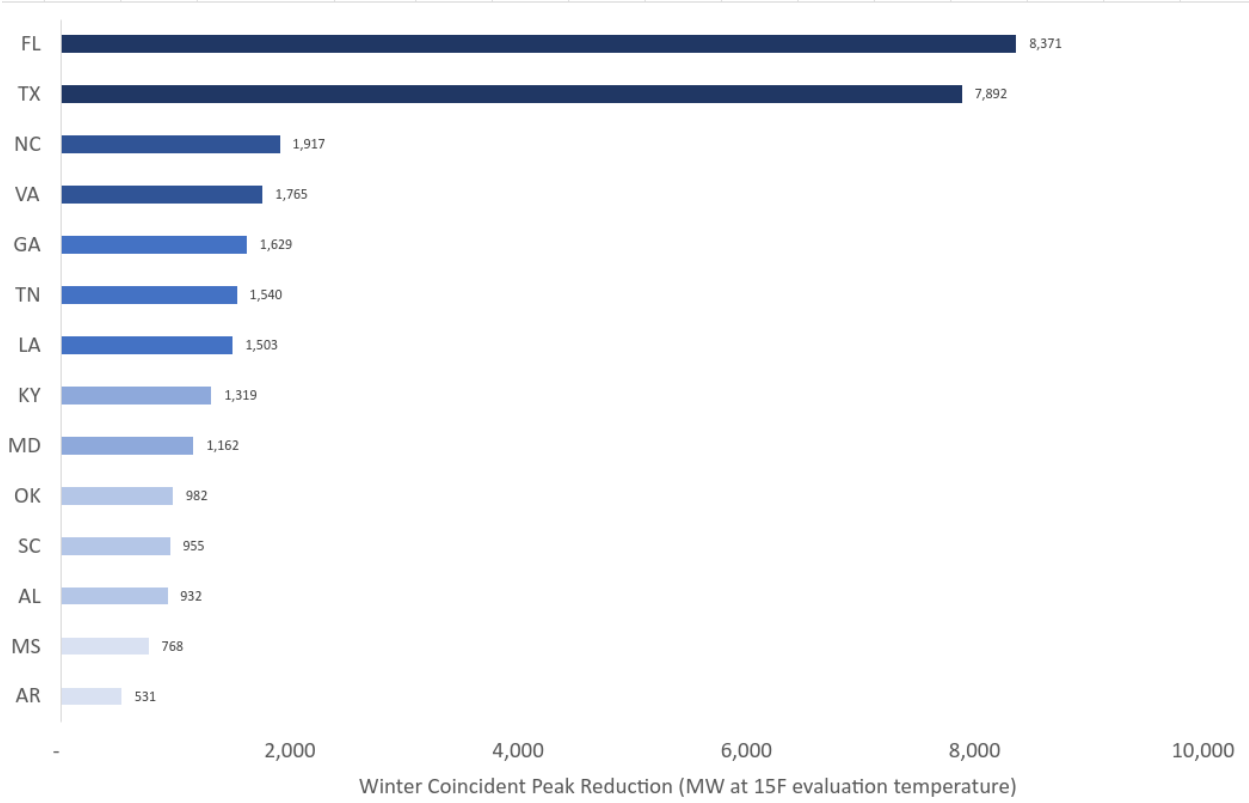
Figure 2. Percentage of Households with Central AC and Electric Resistance Heat



- At 15°F, these homes account for roughly 31.3 GW of coincident winter peak demand from heating alone. That reduction is equivalent to about 104 300-MW power plants' worth of capacity or removing the electrical heating demand of approximately 3.9 million homes from the grid each winter.[26]

[26] For scale there are 3.7 million housing units in the state of Virginia. See U.S. Census Bureau, 2026.

Figure 3. Winter Coincident Peak Demand Reduction by State



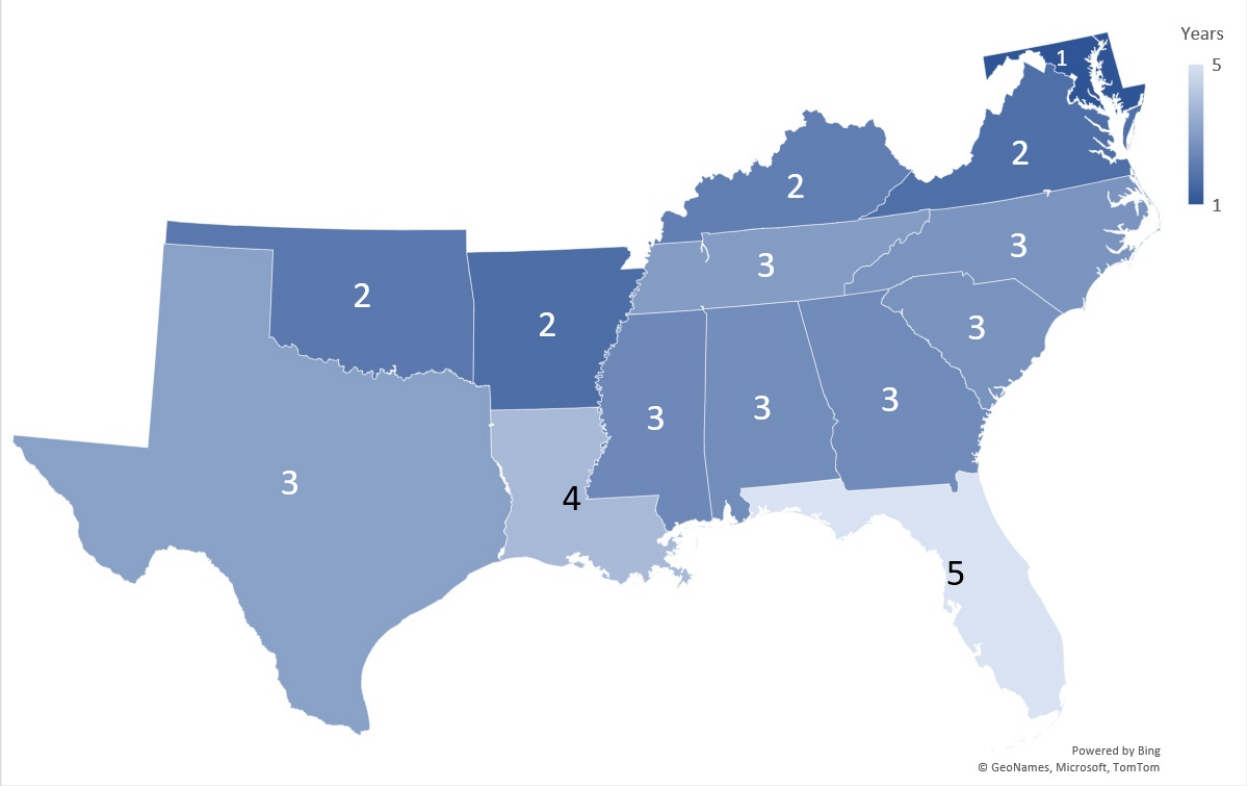
Estimated winter coincident peak demand reduction (GW at 15°F evaluation temperature) from replacing all central AC units with heat pumps in each state's addressable market. Texas and Florida together account for 52% of total 14-state potential (31.3 GW).

- Swapping the central AC with a minimum standards compliant heat pump cuts the average home's winter peak by roughly half (48.8%), from 8.2 kW to 4.2 kW across the 14 southern states. State averages range from 3.3 kW per home in North Carolina to 4.6 kW in Mississippi, depending on home size, housing mix and baseline load. Reductions average about 5.0 kW in detached single-family homes and about 2.5 kW in apartments.
- In the 15th year after a region-wide deployment, the annual energy savings reach roughly 12.9 TWh, equivalent to the annual electricity use of about 1.06 million U.S. households.[27]
- The weighted average incremental cost of a central heat pump over a standards-minimum central AC across the 14 states is $562 per home, ranging from $285 in North Carolina to $776 in Mississippi. This average reflects state-specific estimates of how many of these homes will be new construction over the next 15 years, which range from 9% in Kentucky, Louisiana, Maryland, Mississippi and Oklahoma to 36% in Texas.

[27] "On average, each home consumed 12,194 kWh of delivered electricity (EIA 2023a)." See U.S. Environmental Protection Agency. (2026, August 4). *Greenhouse gas equivalencies calculator — Calculations and references*, Home electricity use. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references#houseelec

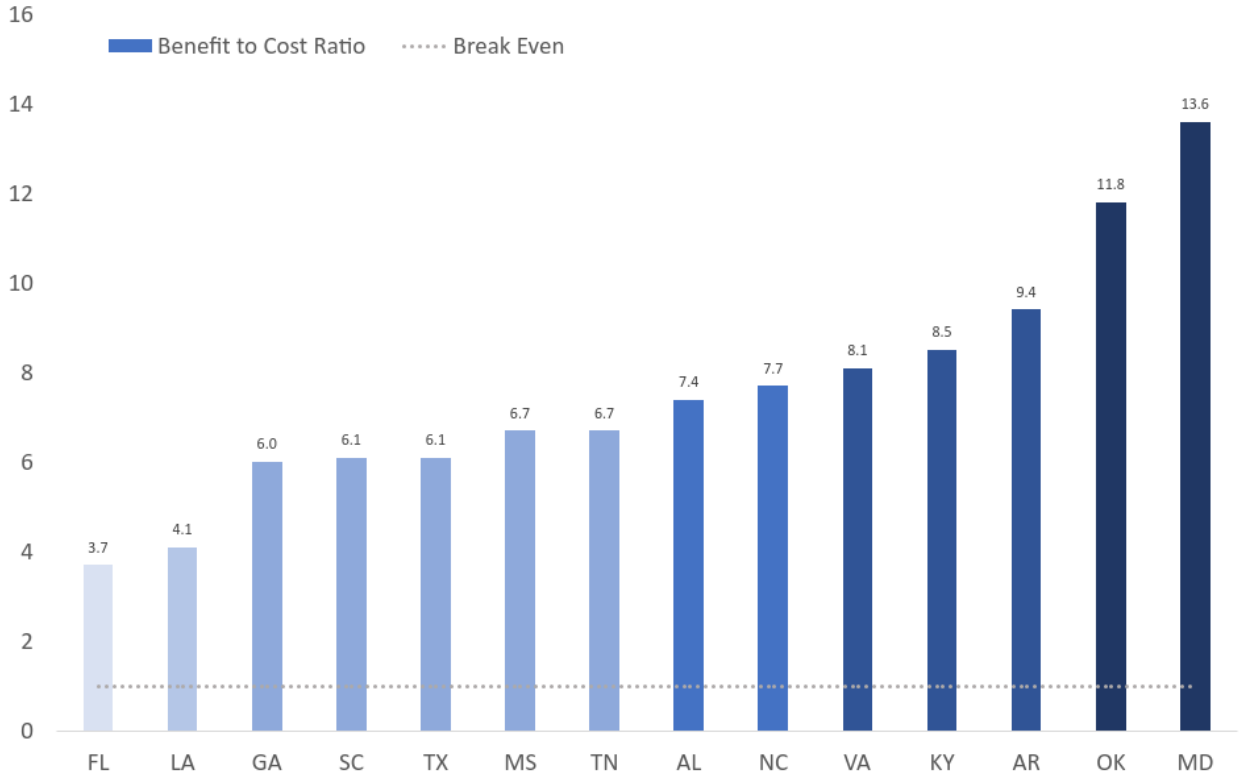
- The average household saves approximately $252 per year on its electric bill once the heat pump is installed. Results are based on bills, weather and household characteristics in the 2020 Residential Energy Consumption Survey (RECS). Per-state weighted median bill savings range from $94 per year in Florida to $449 per year in Oklahoma.
- The average simple payback period for customers living in the 14 states is approximately three years, and the median household payback is approximately two years in most states. Households in states with more expensive electricity and colder average winters can expect faster payback periods.

Figure 4. Simple Payback Period



- The total upfront investment to replace every central AC in the 14-state region with a heat pump is approximately $4.79 billion. Of that, the largest individual state investments are in Florida ($1.3 billion) and Texas ($1.2 billion).
- The total potential customer bill savings are $1.96 billion per year in the 15th year after deployment and $29.6 billion cumulatively over the 15-year service life of the installed heat pumps, assuming 2025 electricity rates, with no adjustment for future rate increases.
- Region-wide simple BCR ratio is 6.3:1, and state-level BCRs range from 3.7:1 in Florida to 13.6:1 in Maryland. These BCRs do not include avoided capacity or resilience value.

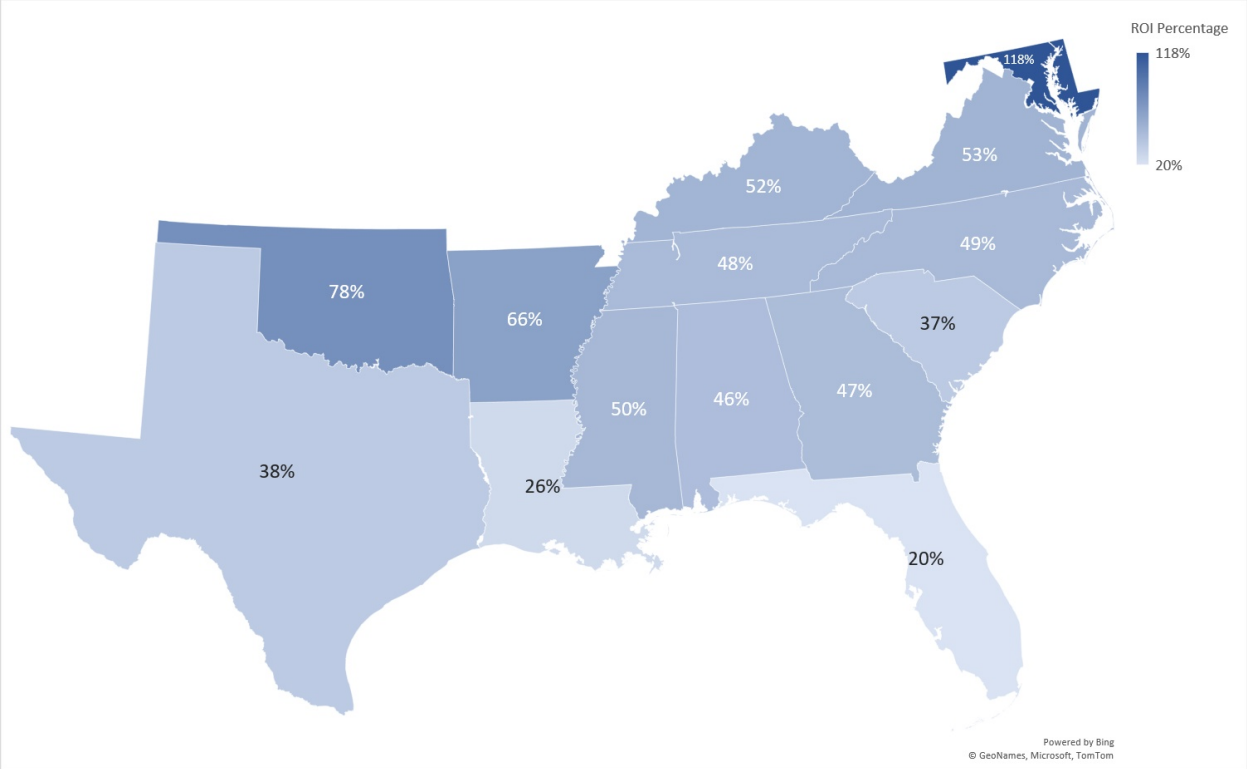
Figure 5. Benefit-to-Cost Ratio by State (15-Year Customer Bill Savings/Program Incentive Cost)



Simple benefit-to-cost ratio for each state. Twelve of 14 states exceed 5:1. Maryland (13.6:1) and Oklahoma (11.8:1) lead, reflecting high electricity rates and favorable equipment economics relative to incremental heat pump costs.

- The region-wide weighted median return on investment is 42%, with state-level returns ranging from 20% in Florida to 118% in Maryland. These returns do not include avoided capacity or resilience value.

Figure 6. Return on Investment by State



Why Winter Peak Demand Matters in the South

In the past, utilities and regulators in the South planned their systems around hot summer afternoons. Assuming summer afternoons will continue to represent peak conditions no longer holds. The North American Electric Reliability Corporation (NERC), which assesses the reliability of the bulk power system, now reports that much of the South either peaks in both summer and winter or is moving toward winter peaks. NERC also increasingly finds that the hours of greatest risk in the region are cold winter mornings. This shift has changed how utilities evaluate electricity system capacity needs. NERC's *2025 Long-Term Reliability Assessment* (LTRA) states that "dual-peaking or changing from summer to winter peaking is anticipated in several areas, including the U.S. Southeast" and that "SERC-Central and SERC-East became dual-peaking systems in recent years" (SERC Reliability Corporation). A dual-peaking system is one whose winter peak is about as large as its summer peak, so the winter peak can set capacity needs. Across North America, NERC now expects winter peak demand to grow by more than 245 gigawatts (GW) over the next 10 years, 65% more than it projected a year earlier, and peak demand growth rates are the highest since NERC began tracking them in 1995.[28]

[28] NERC. (2025a). *2025 Long-Term Reliability Assessment.* p. 25. https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf

The *2025-2026 Winter Reliability Assessment* (WRA) shows that in North and South Carolina (SERC-East), the winter peak demand forecast rose 700 megawatts (MW) in a year while winter firm capacity fell, which lowered reserves. As in the LTRA, NERC also found that the highest risk falls in early morning hours in winter.[29] In SERC-Central, which includes Tennessee and parts of five neighboring states, resource capacity fell by 1,120 MW. NERC warns that the demand that comes with extreme cold could leave reserves short, so operators would have to rely on non-firm imports and could face energy emergencies. NERC describes Georgia, Alabama and Mississippi (SERC-Southeast) as "trending towards becoming slightly winter-peaking."[30]

These findings do not mean the region expects shortfalls under normal winter weather. The concern is extreme cold, which has struck the region repeatedly. NERC notes that four severe arctic storms have covered much of North America since 2021, "exposing generation and fuel infrastructure in temperate areas to freezing conditions."[31] For SERC-Central and SERC-East, NERC warns that "a severe cold weather event that extends to the south could lead to energy emergencies."[32] Looking further ahead, the LTRA moves SERC-East from normal to elevated risk beginning in 2027. NERC's estimate of the electricity demand that would go unmet in a year, called expected unserved energy, more than triples between the 2026 and 2029 study years.[33] That risk is concentrated in January mornings.[34]

The same pattern appears in the regional grid operators (RTO) that serve the rest of the South: MISO, whose southern region covers Arkansas, Louisiana, Mississippi and east Texas; the SPP, which covers Oklahoma and parts of Arkansas, Louisiana and Texas; PJM, which covers Virginia and parts of Kentucky, North Carolina and Tennessee; and ERCOT, which covers most of Texas. NERC still classifies all four as summer peaking, but for three (ERCOT, MISO, PJM), it now places the greatest long-term risk in winter.

NERC rates all four RTO areas as elevated or high risk over the next decade. In PJM, "the greatest risk of resource shortfalls leading to unserved energy or load loss […] occurs in the winter months during the early morning and evening hours," driven by equipment freezing and fuel supply problems in extreme cold. NERC concludes that "new resources will need to be capable of reliably serving winter load."[35] PJM's winter peak is forecast to grow by about 62 GW, to 198 GW, by the winter of 2034-2035, close to its projected 210 GW summer peak, and NERC notes that "additional electric heating

[29] NERC. (2025b, November). *2025-2026 Winter Reliability Assessment,* p. 5. https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf

[30] NERC, 2025b, p. 30.

[31] NERC, 2025b, p. 5.

[32] NERC, 2025b, pp. 27-28.

[33] NERC, 2025b, p. 22.

[34] NERC, 2025b, p. *28*.

[35] NERC, 2025a, p.17.

will narrow the gap between summer and winter peaks."[36] PJM set an all-time winter peak of 143 GW on January 22, 2025, and declared an energy emergency alert that day.[37] MISO is "projecting shortfalls in planned resources for winter peak periods" and reaches high risk beginning in the winter of 2028, with risk concentrated in early mornings and evenings.[38] In ERCOT, "most resource adequacy risk is in the winter," driven mainly by "the large demand variability associated with winter temperatures."[39] SPP, which "continues to set new winter season load records,"[40] is rated elevated risk from 2026.[41]

During Winter Storm Elliott in December 2022, more than 5,400 MW of firm customer load was shed across the Southeast.[42] This was what federal investigators called "the largest controlled firm load shed recorded in the history of the Eastern Interconnection."[43] The Tennessee Valley Authority (TVA) shed more than 3,000 MW. Duke Energy Carolinas and Duke Energy Progress shed about 1,000 MW each, and LG&E/KU, Dominion Energy South Carolina and Santee Cooper also cut firm load.[44] TVA has since set its all-time system peak in winter in two consecutive years: about 34.5 GW on the morning of January 17, 2024, which broke a summer record that had stood since 2007,[45] and then 35.3 GW at 8:00 a.m. on January 22, 2025.[46] Duke Energy reports that demand in the Carolinas reached a record winter peak on January 27, 2026. To keep homes warm through that period, the company bought "additional electricity from neighboring utilities at elevated market prices." Duke Energy Carolinas and Duke Energy Progress are seeking to recover about $809 million across both subsidiaries in fuel and purchased power costs from North Carolina customers.[47]

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[36] NERC, 2025a, pp. 16, 94.

[37] NERC, 2025b, p. 52.

[38] NERC, 2025a, p.15.

[39] NERC, 2025a, p. 18.

[40] NERC, 2025b, p. 20.

[41] NERC, 2025a, p. 20.

[42] Federal Energy Regulatory Commission, North American Electric Reliability Corporation, & Regional Entity Staff. (2023, October). *Inquiry into bulk-power system operations during December 2022 Winter Storm Elliott*. https://www.ferc.gov/sites/default/files/2024-02/24_Winter-Storm_Elliot_0207_UPDATE.pdf

[43] FERC et al., 2023.

[44] FERC et al., 2023.

[45] Ciampoli, P. (2024, January 17). *TVA sets new all-time record for peak power demand.* American Public Power Association. https://www.publicpower.org/periodical/article/tva-sets-new-all-time-record-peak-power-demand

[46] Crawford, K. (2025, January 23). *TVA sets new power demand record during winter freeze*. Blue Ridge Mountain EMC. https://www.brmemc.com/tva-sets-new-power-demand-record-during-winter-freeze/

[47] Duke Energy. (2026, April 15). *Duke Energy outlines steps to reliably serve record customer demand resulting from extreme winter weather* [Press release]. https://news.duke-energy.com/releases/duke-energy-outlines-steps-to-reliably-serve-record-customer-demand-resulting-from-extreme-winter-weather

Table 2. Winter is where NERC sees reliability risk growing across the South

Assessment Area	Peak Season (NERC)	Long-term resource adequacy risk, all seasons						Season of Greatest Long-Term Risk (NERC)
		Winter 25-26	2026	2027	2028	2029	2030	
SERC-East NC, SC	Dual-peaking	Elevated	Normal	Elevated	Elevated	Elevated	Elevated	Winter
SERC-Central TN; parts of GA, AL, MS, MO, and KY.	Dual-peaking	Elevated	Normal	Normal	Normal	Normal	Normal	—
SERC-Southeast GA, AL, and MS	Trending to Winter	Normal	Normal	Normal	Normal	Normal	Normal	—
SERC-Florida Peninsula FL	Summer	Normal	Normal	Normal	Normal	Normal	Normal	—
MISO AR, LA, MS, and east TX	Summer	Normal	Normal	Elevated	High	High	High	Winter
SPP OK; parts of AR, LA, and TX	Summer	Normal	Elevated	Elevated	Elevated	Elevated	Elevated	Not seasonally specific
PJM MD, VA and KY; parts of NC and TN	Summer; Gap Narrowing	Normal	Elevated	Elevated	Elevated	High	High	Winter
ERCOT TX	Summer	Elevated	Elevated	Elevated	Elevated	High	High	Winter

Winter 25-26: NERC rates areas elevated when extreme weather could cause supply shortfalls; all areas have enough winter resources for a normal winter peak.

Long-term ratings cover all four seasons: Each year shows NERC's risk classification for that year. "Season of Greatest Long-Term Risk" is where NERC names winter as the main risk season.

Peak season: NERC describes SERC-East and SERC-Central as dual-peaking and SERC-Southeast as trending toward winter-peaking; it describes all other areas as summer-peaking.

Sources: NERC. (2025, November). *2025-2026 Winter Reliability Assessment*, Figure 1. pp. 5, 17, 20, 26-31; and NERC. (2025). *2025 Long-Term Reliability Assessment*, Table 1, pp. 15-18, 22, 28, 61, 93, 105.

Utilities and planners have responded to these events by carrying more capacity for winter, and customers are paying for it. One SERC-Central entity raised its winter planning reserve margin target to 26% after Winter Storm Elliott.[48] A planning reserve margin is the extra capacity a utility holds above its forecast peak. In SERC-East, one entity raised its winter reserve margin from 12% to 18%, "reflect[ing] heightened concern over winter reliability risks," and another plans to adopt a 22% winter reserve margin by

[48] NERC, 2025b, p. 27.

2031.[49] Georgia Power plans a 26% winter target reserve margin and forecasts 8,205 MW of winter peak load growth between the winters of 2024/2025 and 2030/2031.[50] Each added point of winter reserve margin is capacity that customers pay for all year in order to serve a small number of cold hours.

A study prepared for Duke Energy found that its winter systems "have a steep morning peak, which is driven predominantly by residential and commercial space heating."[51] In homes heated by electric resistance furnaces, demand climbs steeply as the temperature falls because resistance heat delivers only one unit of heat for each unit of electricity at any outdoor temperature. A heat pump delivers the same comfort with far less electricity, even in the cold snaps that set the winter peak in the South.

That makes swapping electric resistance furnaces with heat pumps one of the most direct ways to reduce winter peak risk across the South. Each time an air conditioner fails and is replaced with a heat pump instead of another one-way AC, the system shaves part of the load that NERC identifies as a driver of the winter peak. Unlike most new supply-side resources, these reductions do not need new transmission or fuel contracts, and their impact is largest during the exact hours NERC flags as the riskiest. The sections that follow describe how commissions and utilities can capture this opportunity through incentive and financing programs, energy code adoption and adherence and resource planning to count winter peak reductions as the reliability resource they are.

[49] NERC, 2025a, p. 104.

[50] Georgia Public Service Commission, Docket Nos. 56002 and 56003 (Georgia Power 2025 Integrated Resource Plan), Post-hearing brief of Walmart Inc., July 3, 2025. https://services.psc.ga.gov/api/v1/External/Public/Get/Document/DownloadFile/223236/104472

[51] Dunsky Energy Consulting & Tierra Resource Consultants. (2020, December). *Duke Energy winter peak demand reduction potential assessment*. Duke Energy Corporation. https://cleanenergy.org/wp-content/uploads/Duke-Winter-Peak-Demand-Reduction-Potential-Assessment-Final-Report.pdf

The Additional Benefits of Variable-Speed Heat Pumps

This report's core analysis is built on standards-minimum, single-speed heat pump equipment. Variable speed or inverter-driven heat pumps are a distinct, more capable equipment class. They modulate compressor and fan speeds to match a home's real-time heating and cooling load, rather than cycling fully on and off.[52] In the empirical tests discussed below, variable-speed heat pumps were shown to deliver measurable winter and summer peak electricity demand reduction on top of the baseline savings from single-speed heat pumps this report already considers.

Additional Peak Electricity Reductions

Offsetting or even replacing electric resistance heating with variable speed heat pumps would further reduce wintertime peak electricity demand compared to this report's analysis. A Tennessee Valley Authority (TVA) pilot illustrates this. In East Tennessee, through TVA's Home Uplift Program, 24 homes received variable-speed heat pumps sized to meet all or nearly all the home's design heating load. Installed backup resistance capacity was more than 50% smaller than typical for single-speed installations, and nine of the 24 homes needed no resistance backup at all.[53]

In a separate Knoxville-based research project, also owned and operated by TVA, a single home was retrofitted with two high-efficiency variable-speed heat pumps to replace its older single-speed systems. During winter conditions, the new variable-speed systems reduced the average combined power demand of the home between 17% and 38%, depending on the temperature compared to the prior single-speed system.[54] This was primarily driven by the variable-speed system's ability to minimize the use of high-power backup electric resistance heating compared to the single-speed baseline. The same Knoxville field study that compared variable-speed to single-speed systems in outdoor temperatures of 90° to 95°F measured a 0.9 kW (38%) total power reduction during cooling conditions.

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[52] Less, B., & Walker, I. (2024). *HVAC heat pump upgrades and their impact on household maximum power demand.* ACEEE Summer Study 2024. Lawrence Berkeley National Laboratory/American Council for an Energy-Efficient Economy. https://eta-publications.lbl.gov/sites/default/files/2024-12/aceee_2024_heat_pumps_and_peak_power.pdf

[53] Shirey, D., Hargrove, H., Rapley, F., Harrell, S., & Wagner, G. (2024). *Variable-speed heat pumps to improve grid resilience*. Electrical Power Research Institute and Tennessee Valley Authority. ACEEE Summer Study on Energy Efficiency in Buildings. https://www.aceee.org/sites/default/files/proceedings/ssb24/pdfs/Variable-speed%20heat%20pumps%20improve%20grid%20resilience.pdf

[54] Electric Power Research Institute. (2016, October 28). *Variable-speed heat pumps for energy efficiency and demand response: Part 2 — field testing high-efficiency systems in a simulated-occupancy home in Knoxville, Tennessee*. https://www.epri.com/research/products/000000003002009220, https://www.bpa.gov/-/media/Aep/energy-efficiency/emerging-technologies/ET-Documents/000000003002003925-Variable-Speed-Heat-Pump.pdf

Why This Matters

Utility rebate programs and IRP filings that specifically tier incentives toward variable speed equipment, rather than treating all heat pumps the same, can capture additional avoided capacity value beyond what this report's base case quantifies.

Program and Policy Options to Increase Heat Pump Adoption

The benefits described above depend on the availability and correct installation of heat pumps when a central AC breaks down. The biggest barrier is that most homeowners replace ACs under emergency conditions, often during sweltering heat. The homeowner's priority is restoring cooling as fast as possible, not vetting every option. In that moment of urgency, the default option — another traditional AC, sourced and installed by the first contractor who answers the phone — almost always wins.

Another barrier is the HVAC contractors or companies themselves. HVAC contractors responding to emergency calls may not stock heat pumps, often lack the training to size and commission them correctly and have insufficient financial incentive to recommend a higher-cost unit when a like-for-like swap is faster and simpler.

Even if utility energy efficiency programs exist, they rarely reach customers in time to influence their decision, as a home energy assessment scheduled for next week cannot compete with a replacement unit installed today. Even when contractors and customers are receptive, the absence of on-bill financing in most states means the incremental cost of a heat pump must be paid upfront, a barrier that disproportionately excludes the customers for whom the long-term bill savings would matter most.

Policymakers in the Southeast have five complementary levers available to lower the barriers for heat pump adoption:

1. Layered rebates
2. Customer financing
3. Improve building energy use through energy codes and weatherization programs
4. Workforce education and development
5. Improved IRP capacity accounting

Each lever advances heat pump adoption on its own, and the levers complement each other when deployed together.

Layered Rebates

The incremental upfront cost of a heat pump relative to an air conditioner is the largest barrier to switching when equipment fails. Most HVAC replacements happen at or near the end of the equipment's life, often after the system has already failed. One utility market study found that 85% of residential replacements were made for end-of-life reasons.[55] In that moment, consumers are highly price sensitive, and their choices are constrained by whatever the contractor has in stock. At wholesale, a heat pump is typically $300 to $700 more expensive than an equivalent one-way air conditioner. During an emergency, the consumer is most likely to opt for the cheapest option absent intervention.

Upstream and Midstream Rebates

Upstream and midstream incentives target this barrier by flowing directly to manufacturers, distributors and retailers, rather than to end customers. A manufacturer incentive of $300 to $700 per unit, for example, is approximately the cost premium between a one-way air conditioner and a comparable heat pump.[56] Such an incentive could shift the default option on the distributor's floor toward heat pumps for installation during emergency replacements.

Downstream Customer Rebates

Direct customer incentives bridge the remaining cost gap. To preserve access for low- and moderate-income (LMI) households, rebates should be applied at the point of sale because delayed rebates create a cash-flow barrier that limits uptake among the households with the most to gain. At least one consumer advocate supports phasing out incentives for one-way central air conditioners and redirecting those funds to heat pumps, eliminating the perverse subsidy that has historically pushed the market toward the less efficient option.[57]

About 2.4 million of the 7.85 million homes, or 31%, are apartments with their own central air conditioner and electric resistance furnace. They account for about 6 GW, or 19%, of the estimated winter peak reduction. For these units, the equipment swap is the same as in a house, but the decision is not. Nearly nine in 10 are rented, so the owner who pays for a replacement does not see the lower electric bill. Programs that reach

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[55] Lawrence, P. A., & Jenkins, J. C. (2000). *Critical differences between residential HVAC customers' and contractors' perceptions.* Pacific Gas and Electric Company and Opinion Dynamics Corporation. Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings, Panel 6. https://www.aceee.org/wp-content/uploads/proceedings-1980-2020/2000/SS00_Panel6_Paper21.pdf

[56] Heat pump prices came from a heating, ventilating and air-conditioning manufacturer. The comparison is against a central AC with an electric heating coil.

[57] Maryland Office of People's Counsel, "OPC report on EmPOWER programs: Most utilities achieved statutory goals, overestimated budgets, and generated low-cost savings," press release, April 17, 2026, https://content.govdelivery.com/accounts/MDOPC/bulletins/4136c29 (summarizing OPC Comments on Q3–Q4 Semi-Annual Reports, Md. PSC Case No. 9705).

property owners directly and coordinate with building-wide replacement cycles can address these barriers. CenterPoint Energy's program in Texas, described below, is one example.

Utility example: CenterPoint Energy's Multi-Family Market Transformation Program

CenterPoint Energy's electric territory in the Houston area offers one of the most instructive utility rebate programs in the South. Operating since 2015 and regulated by the Public Utility Commission of Texas (PUCT), the program targets low-income multifamily properties whose central HVAC systems pair aging air conditioners with electric resistance furnaces. The *Texas Technical Reference Manual* explicitly credits heat pumps replacing electric resistance heat for their winter peak savings potential, making these replacements highly cost effective under PUCT's cost-effectiveness screening.[58]

The program uses a competitive "name your own incentive" bid design where property owners and HVAC contractors jointly submit bids scored on the ratio of energy savings benefits to requested incentive dollars. For-profit and nonprofit properties are scored in separate pools. Participation caps prevent any single property owner from dominating the program's budget, directing funds toward underserved properties. Bids can also include complementary measures, like ceiling insulation and smart thermostats, which can be bundled with the heat pump replacement to deepen per-project savings. The program provides technical assistance to new applicants and maintains an outreach list of more than 300 contacts, spanning property owners, maintenance companies, HVAC contractors and nonprofit housing agencies.

Since 2015, the program has supported an average of 1,500 to 2,000 new heat pump installations per year, replacing central air conditioners and electric resistance furnaces, engaging more than 20 unique HVAC contractors and more than 40 owners and ownership groups.[59] Bids have improved over time, offering higher equipment efficiency ratings and greater owner co-investment, with no reported performance issues attributable to the heat pump technology itself. The CenterPoint example shows that a utility-funded, competitively bid rebate program can simultaneously advance market transformation, build contractor familiarity and concentrate benefits among low-income households, all while satisfying a regulator's cost-effectiveness requirement.

[58] Public Utility Commission of Texas, *Texas Technical Reference Manual, Version 13.0, Volume 2: Residential Measures* (Program Year 2026, rev. November 2025), §2.2.2, "Central and Mini-Split Air Conditioners and Heat Pumps," 44–50, https://texasefficiency.com/wp-content/uploads/2025/11/trm13v2.pdf.

[59] Pooley, A., & Wiese, S. (2023, March 7). *Achieving high impacts in low-income multifamily housing* [Presentation], slide 11. CenterPoint Energy and Frontier Energy. 2023 ACEEE Hot Air Forum.

Customer Financing

Rebates lower the price of a heat pump, but they do not solve the problem that decides most replacements: timing. A family with a dead air conditioner in August or a failed furnace in January needs working equipment within a day or two, not weeks. In that moment, the customer does not have time to navigate a whole-home efficiency program and often does not have the cash to pay the portion of the upfront cost that incentives would cover. Facing those constraints, the family takes the replacement with the lowest upfront cost and the quickest availability, which is usually another one-way air conditioner paired with the existing electric resistance furnace. That choice locks in the home's energy use, bills and winter peak demand for the next 15 or more years.

A financing tool can only change that outcome if it reaches the customer before the replacement decision is made. Recent results from Missouri show that it can, and that when it does, most customers say yes.

Inclusive Utility Investment

Three Terms, One Approach

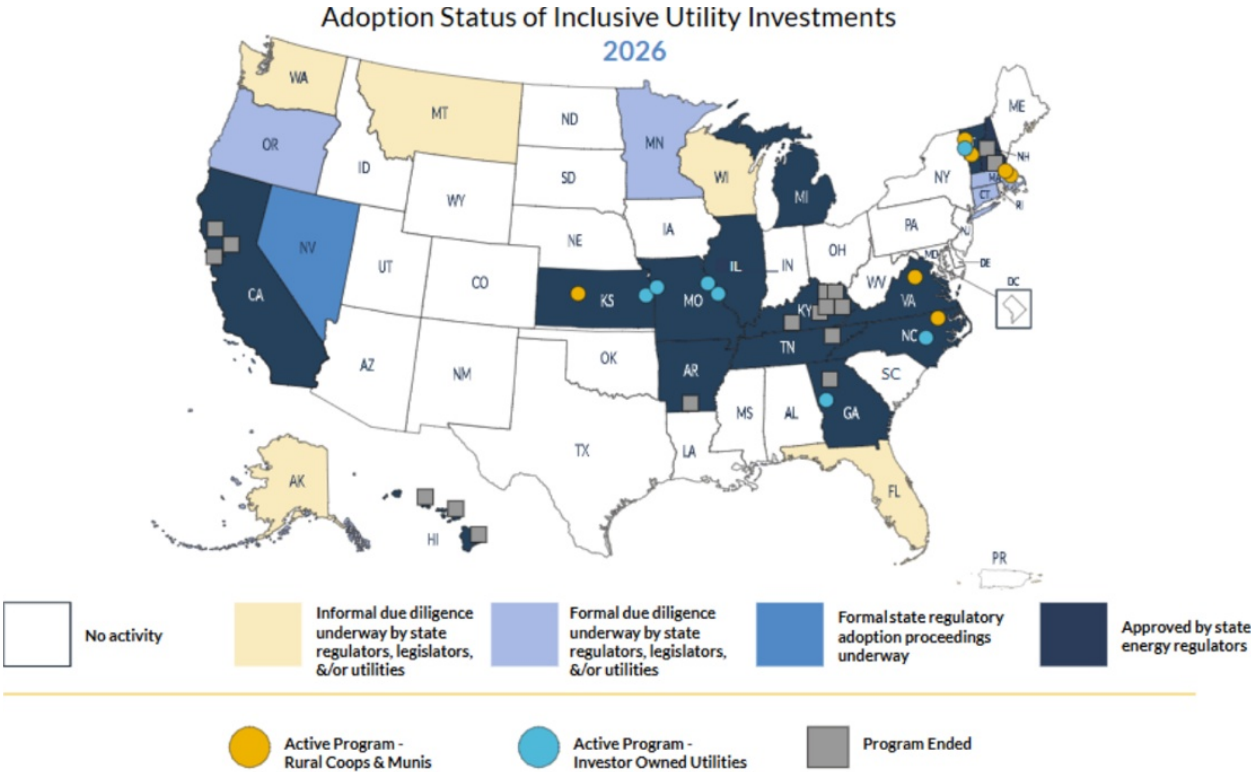
- **Inclusive utility investment (IUI)** is the general approach. A utility pays for a cost-effective upgrade at a customer's home and recovers its cost through a monthly charge tied to the meter, not to the customer's credit. There is no loan, credit check or personal debt.
- **Tariffed on-bill (TOB)** describes how the cost is recovered. A commission-approved tariff places the charge on the utility bill, where it stays with the meter until the cost is repaid.
- **Pay As You Save (PAYS)** is the original and most widely used system for delivering IUI, developed by the Energy Efficiency Institute in 1999. It adds specific consumer protections, including the requirement that the monthly charge be set below the estimated savings.

In short, PAYS is a specific system of IUI, and a tariff is how IUI recovers its cost. This report uses "IUI" for the approach and "PAYS" only for programs that follow the PAYS system, such as those in Missouri.

IUI, often marketed as PAYS, has the broadest customer reach of the available financing options. The utility pays for a cost-effective upgrade at the site and recovers its investment through a fixed monthly charge assigned to the metered location under a commission-approved tariff. It is not a loan: There is no credit check, no payment-history underwriting, no lien and no personal debt. Eligibility rests on two things, an estimate of energy savings from an upgrade on a commission-approved list and the condition of the building itself, which opens the offer to low- and moderate-income households and renters who are routinely screened out of conventional financing.

The IUI tariff builds consumer protection into the offer. The utility's investment is capped at a percentage lower than the estimated savings (typically 80%) over the cost-recovery term (up to 15 years), so the monthly charge is set below the customer's average monthly estimated savings. Where estimated savings are too low to recover the full cost, the customer is given the option of an upfront copayment for the difference. The charge stays with the meter through changes in owners or renters until cost recovery is complete, and the next occupant inherits both the lower bills and the same protections. If a customer believes the charge exceeds their savings, an IUI investigation protocol applies. If occupant behavior, extreme weather or poor contractor workmanship is not the cause, the charge and term must be reduced or removed. Because the charge sits on a level playing field with other energy services, the commission's existing nonpayment and disconnection protocols apply to it as they would to any other part of the bill.

Figure 7. Adoption of Inclusive Utility Investments, 2026



Note: Tennessee's IUI programs were offered by local power companies and cooperatives served by TVA, which the Tennessee Public Utility Commission does not regulate; the map's shading for Tennessee should not be read as state commission approval.

Source: Clean Energy Works. https://www.cleanenergyworks.org/.

For most of the past decade, however, IUI has been offered mainly as a "whole home" program: an energy audit, a bundle of measures, a bid process and an installation

schedule that typically spans four to eight weeks. That design works for households with the time and flexibility to plan a project. It cannot reach the household whose equipment just failed. Missouri's experience shows what happens when the same tariff and the same protections are rebuilt around the replace-on-failure moment.

Case study: Missouri's FastTrack HVAC PAYS

Ameren, Evergy and Spire have offered customers both rebates and PAYS investments for nearly five years through their shared program operator, EEtility.[60] In 2025-2026, Missouri added a FastTrack HVAC pathway (FastTrack). It uses the same commission-approved tariff, consumer protections and savings engine as whole-home PAYS but is designed for households whose heating or cooling system has failed or is failing.

Under FastTrack, an offer moves from service call to signature in five steps:

1. **The contractor assesses the site.** The contractor who answers the service call enters existing and proposed equipment specifications, price and basic structural data into the FastTrack app.
2. **The app calculates the offer.** It combines the contractor's inputs with the home's meter-level usage history from the utility to estimate savings, qualifying rebates, the utility investment cap, the cost-recovery term, the monthly tariff charge and any copayment.
3. **The app checks for errors.** Built-in guardrails, including geo-coded, time-stamped photo requirements and automated checks for missing or inconsistent data, catch errors before an offer is issued. Operator staff are available in real time if the contractor needs help.
4. **The app sends the offer.** In about 15 minutes, the customer receives a site-specific offer by email, with the participant agreement ready for e-signature.
5. **The customer decides.** The customer can compare offers from more than one contractor, and each offer is good for 60 days.

The scope of FastTrack is currently limited to HVAC equipment plus a smart thermostat, and participating contractors must provide a 15-year workmanship warranty at no extra charge.

EEtility's results from the first eight months of FastTrack implementation, based on more than 1,000 accepted offers, show a clear change in customer response. The acceptance rate is about four times higher than for whole home PAYS, the cost of producing an offer is roughly one-fifth as much and the time to installation is at least 10 times faster (see table below). The key to this success rests on changing the timing of the offer. When the efficient option is offered at the moment of failure and on terms that require little or no cash up front and lower the monthly bill, it becomes the least expensive and quickest choice and is chosen by most customers.

[60] Ameren Missouri, Pay As You Save (PAYS); Evergy and Spire, Pay As You Save program announcement (May 16, 2022); Spire and Ameren Missouri, Pay As You Save program announcement (May 31, 2022). These sources describe PAYS offerings involving all three utilities.

Table 3. Missouri PAYS results: Whole home versus FastTrack HVAC pathway

	Whole-Home PAYS	FastTrack HVAC PAYS
Customer moment	Proactive efficiency planning	HVAC failed or failing
Assessment	Full home energy audit	Responding contractor enters HVAC-specific site data
Share of customers offered an investment who accept it	10-15%	~60% average
Program operator cost per site to reach an offer	$825	$179
Time from enrollment to installation	28-56 days	1-2 days

Source: EEtility. (2026, August 24). *Briefing for NARUC on Experience in Missouri.* EEtility-reported results for the first eight months of FastTrack HVAC PAYS in Missouri, based on more than 1,000 accepted offers.

For the South, the Missouri FastTrack PAYS program illustrates that customers will participate in utility-administered efficiency financing programs when presented with a timely financing option during an HVAC service call. The 7.85 million households that heat with electric resistance furnaces and cool with central air conditioners have the largest savings potential of any HVAC configuration, so under PAYS' 80% estimated savings cap, they support the largest utility investment and the smallest copayment. The ductwork, electrical service and air handler location that a heat pump needs are already in place. Every AC failure in one of these homes is a chance to cut winter peak demand for the next 15 years, and today that chance is almost always lost to a like-for-like replacement.

Inclusive utility investment is already at work in the South:

- State energy regulators approved Ouachita Electric Cooperative's HELP PAYS tariff in Arkansas in 2016 and a Georgia Power pilot in 2020.[61]
- In North Carolina, Duke Energy Carolinas' Improve and Save program was adopted in 2020, and Roanoke Electric Cooperative offers its Upgrade to $ave program.[62]
- Rural cooperatives also run programs in Kentucky; How$mart KY has operated since 2013, and in Virginia, state regulators adopted a code in 2020 supported by Rappahannock Electric Cooperative.[63]
- Virginia has since gone further: a 2026 law directs a feasibility study of inclusive utility investment for Dominion and Appalachian Power, and to set program requirements by May 2027 if it finds the program feasible.[64]

[61] SEEA staff. (2020, March 16). *A tale of two tariffs.* Southeast Energy Efficiency Alliance. https://www.seealliance.org/a-tale-of-two-tariffs-ouachita-electric-cooperative-and-roanoke-electric-cooperative/; and National Association of Regulatory Utility Commissioners. (2022, March 7). *State approaches to Pay As You Save programs.* Georgia. https://pubs.naruc.org/pub/D9C246C0-1866-DAAC-99FB-0973A12547C0

[62] Energy Star. (2022). *Inclusive Utility Investment Current Program Information*. U.S. EPA. https://www.energystar.gov/products/inclusive_utility_investment/current-program-information.

[63] Energy Star, 2022.

[64] An act to amend the Code of Virginia by adding a section numbered 56-585.1:17, relating to electric utilities; pilot program for electric energy

Missouri gives these commissions evidence that the approach works at the moment of equipment failure: Roughly 60% of customers who receive an offer accept it, installation takes one to two days, and the cost to produce each offer is a fraction of whole home offerings. For utilities facing winter peak growth, a replace-on-failure IUI pathway may be the fastest way to turn electric-resistance-plus-AC homes into heat pump homes, one service call at a time.

Improving Building Energy Use

Building Energy Codes

Building energy codes establish the regulatory floor for building envelopes and other building systems and are set at the state level based on the International Energy Conservation Code (IECC). State and local codes can phase out electric resistance space heating and set heat pumps as the default for new construction and at equipment replacement, preventing decades of locked-in high bills and continued winter peak growth.

Nine of the fourteen states in our analysis either have not updated beyond the 2009 IECC, have amended newer editions to the point that they are equivalent to the 2009 IECC or weaker or have no statewide residential energy code. The 2024 IECC limits electric resistance space heating to 2.0 kW unless a heat pump serves the largest non-bedroom space, in climate zones 4 through 8 (Kentucky, Maryland, parts of Arkansas, North Carolina, Oklahoma, Tennessee, Texas and Virginia).[65] All jurisdictions in the 14-state region should adopt this requirement, and it should extend to additional climate zones, building types, new construction, renovations and equipment replacement. Florida (mostly climate zone 2)[66] provides justification for this expanded application. The current *2023 Florida Building Code*, eighth edition, which is based on the 2021 IECC, already prohibits electric resistance space heating from being the primary heating system in climate zone 2, and this prohibition extends to complete central equipment replacements, not just new construction.[67] Florida's existing electric resistance prohibition in climate zone 2 is precisely the kind of policy that other states should adopt across climate zones.

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conservation, generation, and storage, Virginia Acts of Assembly, 2026 Sess., (Va. 2026). https://lis.blob.core.windows.net/files/1222362.PDF

[65] International Code Council, 2024 International Energy Conservation Code, Chapter 4 [RE] Residential Energy Efficiency, Section R403.7.1 Electric-resistance space heating: "Detached one- and two-family dwellings and townhouses in Climate Zones 4 through 8 using electric-resistance space heating shall limit the total installed heating capacity of all electric-resistance space heating serving the *dwelling unit* to not more than 2.0 kW or shall install a heat pump in the largest space that is not used as a bedroom." https://codes.iccsafe.org/content/IECC2024P1/chapter-4-re-residential-energy-efficiency#IECC2024P1_RE_Ch04_SecR403.7.1

[66] International Code Council, 2024 International Energy Conservation Code, Chapter 4 [RE] Residential Energy Efficiency, Section R403.7.2 Electric Space Heating (Prescriptive): "Electric resistance space heating shall not be the primary heating system used in Climate Zone 2." https://up.codes/viewer/florida/fl-energy-conservation-code-2023/chapter/RE_4/re-residential energy-efficiency#RE_4; and International Code Council. (2023). *Florida Building Code: Energy Conservation*, 8th ed. https://codes.iccsafe.org/content/FLEC2023P1

[67] International Code Council, 2023.

Municipalities that can adopt their own codes can fill this gap ahead of statewide code adoption.[68] For example, Austin, in addition to adopting a more stringent code than the state of Texas, has also adopted an amendment restricting electric resistance heating.[69] More cities should follow Austin's example and adopt similar amendments restricting the use of electric resistance heating as a primary source of space heating.

Table 4. State residential energy code adoption by IECC edition

State	Adopted code	Equivalent IECC edition	Effective date
Alabama	2015 IECC with amendments	2009 IECC	2016-10-01
Arkansas	2009 IECC with amendments	<2009 IECC	2015-01-01
Florida	2021 IECC with amendments	2021 IECC	2023-12-31
Georgia	2015 IECC with amendments	2009 IECC	2020-01-01
Kentucky	2009 IECC	2009 IECC	2014-10-01
Louisiana	2021 IECC with amendments	2018 IECC	2023-07-01
Maryland	2021 IECC with amendments	2018 IECC	2023-05-29
Mississippi*	Home rule	2009 IECC	NA
North Carolina	2015 IECC with amendments	2009 IECC	2019-01-01
Oklahoma	2018 IECC with amendments	2009 IECC	2022-09-14
South Carolina	2009 IECC	2009 IECC	2013-01-01
Tennessee	2018 IECC with amendments	2009 IECC	2020-07-16
Texas	2015 IECC	2015 IECC	2016-09-01
Virginia	2021 IECC with amendments	2018 IECC	2024-01-18

*For states designated as home rule, code level was determined using a weighted EUI based on the applicable code for jurisdictions representing either (1) 80% of state population or (2) 80% of recent building permit activity.

Source: U.S. Department of Energy. (2026, September 15). *Residential State-Level Results* [Table]. https://www.energycodes.gov/sites/default/files/2026-09/StateLevelResidentialCodesEnergyUseIndex.xlsx

Prohibiting electric resistance heating in new builds

New construction is the lowest-cost opportunity to install efficient heating because there is no equipment to remove, and the building envelope, electrical service and air distribution system can all be designed around the heat pump. Statewide actions are critical. For example, Georgia amended the 2015 IECC and enacted a statewide prohibition on primary electric resistance space heating in new dwelling units.[70] Virginia's

[68] Applies in Texas, Oklahoma, Mississippi, Alabama, Georgia, South Carolina and Maryland.

[69] City of Austin, Ordinance No. 20071018-088, 2007. https://services.austintexas.gov/edims/document.cfm?id=109740#page=11

[70] Ga. Comp. R. & Regs. r. 110-11-1-.34, *International Energy Conservation Code, 2015 Edition, with Georgia State Supplements and Amendments*, § R403.1.2.3 ("Primary heat source") (effective Jan. 1, 2020) (providing that, for new dwelling-unit central HVAC systems, electric-resistance heat "shall not be used as the primary heat source"). Text of the Georgia regulation.

amendments to the 2021 IECC include a similar provision.[71] Thus, there are now examples of this provision across southern states in climate zones 2 through 4.

More comprehensive state codes and accompanying enforcement can extend these requirements across single-family, multifamily and commercial buildings through prescriptive compliance paths. Alternatively, they could use energy efficiency credit systems to favor high-efficiency heat pumps over electric resistance.

Regulating equipment replacement in existing buildings

Most near-term opportunities lie in existing buildings. In 2024, there were approximately 800,000 new housing permits issued in the South census region,[72] but there were 51 million primary occupied housing units in the region.[73] Codes and ordinances can extend to equipment replacement. Stretch codes and ordinances let local governments specify that new HVAC installations use two-way heat pumps rather than one-way air conditioners. Georgia's prohibition on primary electric resistance space heating, for example, applies not only to new construction but also to replacement HVAC systems installed in dwelling units originally permitted after 1996.

Strict controls on auxiliary (backup) heat

Even heat pumps can produce unintended demand spikes if their backup electric resistance coils run when they are not needed. A technician working from outdated assumptions about heat pump performance may set the backup heat to turn on at outdoor temperatures 10, 20 or more degrees warmer than a modern, minimum-efficiency heat pump needs, raising the homeowner's bills and the demand on the grid. As noted, the model energy code already addresses this. IECC Section R403.1.2 requires heat pumps with supplementary electric resistance heat to have controls that keep the backup off, except during defrost, whenever the compressor can meet the heating load. North Carolina added an outdoor lockout thermostat requirement to its residential energy code in 2012.[74]

These HVAC control requirements have limits, though. They set no lockout temperature, so whether they work depends on how the installer configures the system. One field study found a working lockout in only 14% to 25% of systems where no program

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[71] Virginia Administrative Code. 13VAC5-63-210, Section 310.8, item 73 (Virginia Residential Code Section N1103.1.3), and 13VAC5-63-264, Section 1301.1.1.1, item 21 (Virginia Energy Conservation Code Section R403.1.3), "Heat pump as primary space heat source." Virginia Uniform Statewide Building Code, as amended effective January 18, 2024. https://law.lis.virginia.gov/admincode/title13/agency5/chapter63/

[72] U.S. Census Bureau. (2025). *New privately owned housing units authorized by building permits in permit-issuing places* [Table]. https://www.census.gov/construction/bps/permitsbyusreg_cust.xls

[73] U.S. Energy Information Administration. (2024). Table HC2.1: Structural and geographic characteristics of U.S. homes, by housing unit type, 2024 [Table]. https://www.eia.gov/consumption/residential/data/2024/hc/xls/HC2.1_2024.xlsx

[74] North Carolina Department of Insurance, Office of the State Fire Marshal, Engineering Division, Heat Pump Auxiliary Controls for Single-Family Dwellings, Code 2012 Energy Conservation Code, Section 403.1.2, July 3, 2012. https://www.ncosfm.gov/energy-conservation/40312-heat-pump-auxiliary-controls-single-family-dwellings/open

requires one, and in 65% where one does.[75] The requirements also govern *when* backup heat runs, not *how much* is installed. A home with a 10-kW backup strip still draws that full load during defrost, in emergency heat mode and in the coldest hours, which are the hours that set the winter peak. And because a single-speed heat pump loses capacity as the temperature drops, even a correctly controlled system leans on its backup heat at peak.

Codes that limit how much electric resistance heat is installed in the first place are one way to address these limits. Section R403.7.1 of the 2024 IECC caps electric-resistance space heating at 2.0 kW in detached homes and townhouses in climate zones 4 through 8, unless a heat pump serves the whole home or its largest room that isn't a bedroom.[76] That would steer new homes in the region's colder areas away from resistance-only heating, including Kentucky, most of Virginia and Maryland and parts of Tennessee, North Carolina, Arkansas, Oklahoma and Texas. But it exempts the backup heat in heat pump systems, and it doesn't reach climate zones 2 and 3, where most of this report's candidate homes are. Southern states adopting the 2024 IECC can extend R403.7.1 to all climate zones and pair R403.1.2 with a lockout set from the equipment's published performance data. Because design-temperature conditions are rare in the South, these requirements would cost homeowners little while reducing the backup load that drives winter peaks.

Weatherization and Pre-weatherization Support for Existing Housing Stock

Weatherization can increase the savings heat pumps deliver in this region's older housing stock to deliver the full savings this report calculates. Replacements in existing homes account for 85% of the heat pump conversions that this analysis models.[77] Existing homes built under weak building codes, or no code at all, typically have minimal attic insulation, no meaningful air sealing and ductwork that runs through an attic. Those factors inflate a home's design heating load, which negatively impacts how much a heat pump's compressor can heat a home on its own. That raises the balance point on auxiliary heat controls: the outdoor temperature below which backup resistance heat must run.

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[75] SBW Consulting, Opinion Dynamics Corporation, Ecotope, and Cadeo Group. 2019. Air Source Heat Pump Commissioning, Controls & Sizing Baseline Field Study Report. Prepared for Bonneville Power Administration. December. Table ES 2, p. 5. https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2019-bpa-heat-pump-field-study-final-report.pdf; Cited in Douglass, Christian, and Josh Rushton. 2024. "Getting Heat Pumps Under Control: The Success of the Heat Pump Revolution Requires Getting Heat Pump Controls and Sizing Right." *ACEEE Summer Study on Energy Efficiency in Buildings*, p. 3.

[76] International Code Council, 2024 International Energy Conservation Code, Section R403.7.1 (Electric-resistance space heating); see code change proposal RE2D-18-23.

[77] Henderson, T. (2024, May 16). *Housing boom in most of the US could ease shortage, but cost is still a problem*. Washington State Standard. https://washingtonstatestandard.com/2024/05/16/housing-boom-in-most-of-the-us-could-ease-shortage-but-cost-is-still-a-problem/

A leaky and uninsulated home needs either a larger compressor to hold the same balance point or more reliance on backup electric resistance heat to hold the same comfort level, thus eroding the winter peak reduction and bill savings this report models.

Utilities and commissions across the region should treat weatherization and pre-weatherization support as a supplement to the heat pump programs and code reforms recommended elsewhere in this report, not a separate agenda competing for the same funding. Three actions to integrate heat pump and weatherization programs follow:

First, utility energy efficiency portfolios should fund basic envelope work like air sealing and attic insulation, given how directly they affect the balance point calculation as a paired or sequenced measure alongside heat pump rebates (so equipment is sized against the home's actual post weatherization load). Xcel Energy's Whole Home Efficiency program in Colorado shows what this looks like as an incentive design:

- It pays a $600 bonus to customers who install qualifying insulation and air sealing before a qualifying space-heating heat pump.
- It allows attic insulation rebates, including the bonus, to cover up to 75% of project cost, compared with the standard 60% cap.
- It adds a bonus of 25% of the standard rebate for each measure when a customer completes three or more qualifying measures within two years of an energy audit.[78]

Second, commissions should recognize and fund pre-weatherization repair costs as an eligible program expense. In a survey of weatherization agencies in 28 states, roughly one in five income-eligible households seeking weatherization assistance services are initially deferred because of conditions like roof failure, unsafe electrical panels and structural or moisture damage that must be fixed before insulation or air-sealing work can proceed. About 40% of those deferred homes are never weatherized at all without separate repair funding, at a weighted median repair cost of $15,000 per home.[79] State and utility weatherization programs should budget for repair costs accordingly.

Third, on-bill investment can extend to the building envelope. Under an IUI tariff, the utility's investment is capped at a share of estimated savings, so envelope work whose savings don't cover its cost raises the customer's copayment. Program designers should therefore keep the heat pump offer self-contained and treat envelope measures as separate options. Duct sealing, which the responding HVAC contractor can do on the same visit, belongs in the replacement offer when it passes the savings test. Air sealing and attic insulation fit better as follow-up offers under the same tariff and meter-based savings estimate, made within a few months of installation, so the customer doesn't have to qualify for and coordinate between two separate programs. Each envelope

[78] Xcel Energy. (2025). *2025 Whole Home Efficiency* [Colorado application, Form 17-9232 (02-25)]. https://justheatpumpsllc.com/wp-content/uploads/2025/03/2025-Xcel-Energy-WHE-Whole-Home-Efficiency-Rebate-Info-Sheet-Just-Heat-Pumps.pdf

[79] Farrell, D., Mah, J., Sussman, R. & Specian, M. (2025). *Estimating the impacts of weatherization readiness programs* [Report B2504]. American Council for an Energy-Efficient Economy. https://www.aceee.org/research-report/b2504.

measure should be screened on the savings it produces with the heat pump in place, not against the old resistance furnace. Where a measure falls short on bill savings alone but lowers the winter peak, utility rebates that reflect its capacity value, or weatherization assistance funds for eligible households, can cover the gap instead of a larger copayment. For planned replacements, where there is time to sequence the work, envelope improvements should come first so the heat pump and its backup heat can be sized to the smaller load.

Workforce Training and Education

Heat pump adoption depends on contractor capacity and quality. The HVAC trades face a shortage of installers trained on heat pump sizing, controls and integration; contractors facing complex jobs and the risk of job callbacks tend to default to like-for-like AC replacements.

Standardized technical curricula address the skills gap, and the U.S. Department of Energy's Energy Skilled Recognition[80] program offers an instructive model. It sets guidelines that ensure training programs cover building science fundamentals, proper sizing, electric panel capacity and retrofit principles and recognizes credentials that are stackable and employer recognized, so workers have clear career pathways. Alabama Power hosts an HVAC training center, which is an Energy Skilled recognized program offering both heat pump installation and comfort advising training.[81]

Program Example: Goodwill Industries of Upstate/Midlands South Carolina — Clean Tech Accelerator

Another organization working to fill the demand for trained heat pump installers while also helping people facing barriers to conventional workforce participation is Goodwill Industries of Upstate/Midlands South Carolina (GIUMSC). GIUMSC addressed both goals simultaneously when it launched the state's first Clean Tech Accelerator in 2025. The program offers five-weeks of full-time heat pump technician training designed to serve participants by providing additional nonacademic resources to support qualified candidates completing training and entering the field.

A grant from Goodwill Industries International funds the program and pays participants $15 per hour for a full 40-hour week throughout the five-week course, converting what would otherwise be an income gap into compensated training. The curriculum covers HVAC fundamentals, building science, heat pump installation and maintenance, troubleshooting, Manual J load calculations and customer service. It awards four

[80] U.S. Department of Energy. (n.d.). *Energy Skilled HVAC programs.* https://bsesc.energy.gov/recognition/hvac-programs; see also, https://www.pnnl.gov/projects/energy-skilled-recognition/hvac

[81] Alabama Power. (n.d.). *HVAC training.* https://www.alabamapower.com/business/business-customers-and-services/hvac/hvac-training.html

nationally recognized credentials upon completion: the EPA Section 608 refrigerant handling certification, the Climate & Community Lab HVAC/Heat Pump Installation Certificate, OSHA-10 construction safety certification and CPR and first aid.

HVAC and heat pump technician wages reaching $50 per hour in high-demand markets provide a compelling earnings proposition, and the field's projected 13% national job growth over the next five years means that graduates enter a supply-constrained market where employer demand for heat-pump-competent technicians is increasing faster than traditional technical college pipelines can fill.[82] Goodwill's employer-services function connects graduates directly with HVAC contractors through job placement support, creating a closed loop between training and placement that reduces the recruiting burden on small contractors who lack dedicated HR capacity.

Southern utilities and state energy offices can accelerate regional installer pipeline growth by partnering with successful training and support programs, providing employer commitments that give training programs a guaranteed placement market and integrating wraparound service funding into utility workforce development budgets. Public utility commissions can encourage this by requiring that the workforce development components of utility efficiency programs specifically address trade ally pipeline gaps, particularly in rural service territories where heat pump installation capacity is most constrained. Running an accelerator cohort twice a year in each state's major metropolitan areas is one way to build the installer base that heat pump programs at the scale documented in this report will need.

Contractor Business Model Development

Workforce development also extends beyond technical installation to business and sales training. Equipping contractors with a profitable business model for selling high-performance heat pumps built around comfort, efficiency and total cost of ownership rather than lowest upfront price gives the trade an intrinsic incentive to recommend heat pumps over the cheapest available emergency replacement. This requires both curriculum and sustained program support to shift longstanding industry norms.

Case Study: Closing the Energy Code Compliance Gap in Maryland

Adopting a strong building energy code is the first step, but its savings arrive only if builders and contractors follow it. A U.S. Department of Energy (DOE) field study in Maryland, carried out from 2015 to 2018 and led by the Maryland Energy Administration,

[82] Goodwill Industries of Upstate/Midlands South Carolina. 2025. "Goodwill Launches South Carolina's First Clean Tech Accelerator to Train HVAC & Heat Pump Technicians." News release, March 26. https://www.goodwillsc.org/news-events/news/clean-tech/; see also, U.S. Bureau of Labor Statistics. 2026. "Heating, Air Conditioning, and Refrigeration Mechanics and Installers." Occupational Outlook Handbook. Last modified October 29, 2026. https://www.bls.gov/ooh/installation-maintenance-and-repair/heating-air-conditioning-and-refrigeration-mechanics-and-installers.htm

measured the gap and showed that it can be narrowed. At baseline, new homes met the code an average of 54.2% of the time across four key measures: duct tightness, ceiling insulation, envelope air tightness and exterior wall insulation. The state then delivered two years of education and training: 46 classroom and field trainings that reached 905 participants, 18 events led by a circuit rider (an in-field technical expert who gave code officials and builders customized training and technical assistance) and a hotline that answered 150 requests for help. When researchers returned to the field, average compliance across the same five measures had risen to 73.8%. The study estimates that this increased compliance among new homes built within one year cut energy loss from 93,341 MMBtu to 20,593 MMBtu; a reduction of 72,748 MMBtu is worth about $1.2 million a year in energy costs.[83]

DOE paid for Maryland's study, but its training and circuit rider work is exactly what utility codes programs deliver. Fourteen states and the District of Columbia credit utilities with energy savings from their codes work.[84] A third-party evaluator typically estimates the savings, and utilities can count them toward portfolio savings targets where the state's energy efficiency resource standard allows it. None of those 14 states is in the Southeast.

The Maryland model can be adapted across the South. Of the 14 states in this analysis, nine have residential codes equivalent to the 2009 IECC or older, and only Florida's equals the 2021 IECC.[85] If compliance in those states resembles Maryland's baseline, a large share of the savings that even these older codes promise is never delivered.

Counting Capacity Value in Resource Planning

Integrated resource plans (IRPs) guide billions of dollars of long-term utility investment. Many IRPs continue to discount energy efficiency as a mechanism for reducing coincident peak demand. The switch from electric resistance to a heat pump changes the load shape by substantially reducing demand during winter peak hours. Yet many IRPs count that reduction only as an adjustment to the load forecast, calculated outside the planning model, so it never competes directly with supply-side generation resources, like the 300MW gas-powered generation plants we use as an illustrative example of the peak demand reduction potential. Letting heat pump programs compete as capacity

[83] Bartlett, R., Hathaway, R., Halverson, M., Xie, Y., Mendon, V., Zhao, M., & Williams, J. (2022, September). *Maryland Residential Energy Code Field Study: Final Report*, PNNL-30210. Pacific Northwest National Laboratory for the U.S. Department of Energy, iii, 1.1, 2.8, 3.24 (Tables 3.24-3.25). Average compliance rates are the authors' calculation, the unweighted mean of the five measure-level rates in Table 3.24. Savings are PNNL's modeled estimates of annual statewide savings potential, not measured savings.

[84] Garfunkel, E., & Waite, M. (2024, July). *Utility energy codes programs and their potential extension to building performance standards*, iv, 3-5, 25-27. American Council for an Energy-Efficient Economy. The 14 states are Arizona, California, Colorado, Hawaii, Idaho, Massachusetts, Minnesota, Montana, Nevada, New Jersey, New York, Oregon, Rhode Island and Washington.

[85] Authors' compilation from U.S. DOE Building Energy Codes Program state status pages and ICC IECC savings-map data, checked October 2026. Mississippi has no statewide residential energy code.

resources would show regulators that they are the lower-cost way to meet the winter peak.

Winter Reliability as a Binding Planning Constraint

Many utilities across the 14-state region experience system coincident peak demand during summer cooling months rather than during winter heating periods. On these summer-peaking systems, generating capacity has historically been sized to meet summer's peak demand, thus yielding a buffer of available capacity over wintertime's expected peak coincident demand. From this perspective, programs that reduce winter peak demand have traditionally not been considered to avoid real capacity investment.

However, as discussed previously, Winter Storm Uri (February 2021) and Winter Storm Elliott (December 2022) challenged that assumption by exposing a structural vulnerability: Cold weather increases electric heating load and simultaneously reduces available generation capacity through cold-weather unit deratings and natural gas supply interruptions. The two risks compound, producing higher-stress periods when electric resistance heating draws peak power when generating capacity is least able to respond. The headline events, like rolling outages in Texas during Uri and more than 5,400 MW of firm load shed in the Southeast during Elliott, mostly resulted from these conditions.[86]

NERC cold weather standards (EOP-011-2, TOP-003-5, IRO-010-4), which SERC enforces in the region, took effect April 1, 2023, requiring generator cold weather preparedness plans. The revised standards require balancing authorities and transmission operators to maintain operating plans, generator owners to maintain cold weather preparedness plans and entities in the SERC region to maintain and execute an Extreme Weather Operating Plan calibrated to cold-weather operating conditions. These are standards mandatory and enforceable.[87]

Utility integrated resource plans filed since Elliott reflect this shift. Georgia Power's 2025 IRP, approved by the Georgia Public Service Commission in July 2025, has plans for a winter target reserve margin of 26%, compared with a 20% summer target.[88] Georgia Power attributes its continued need for a higher winter target to "the significant presence of winter reliability risks," driven by "the narrowing of the difference between summer and winter weather-normal peak loads," "cold-weather-related unit outages," "the penetration of solar resources," "increased reliance on natural gas" and "market

[86] NERC and SERC jointly investigated both storms. See: NERC. (2021). *FERC, NERC, and Regional Entity Report: The February 2021 cold weather outages in Texas and the South Central United States*. https://www.nerc.com/pa/rrm/Documents/2021_URI_Report.pdf; and SERC Reliability. (2023). *2022-2023 winter reliability assessment*. https://www.serc.org

[87] The revised standards (EOP-011-2, TOP-003-5, IRO-010-4) became effective April 1, 2023. See SERC Reliability. (2024). *Extreme cold weather*. https://www.serc.org/risk/extreme-weather-impacts/cold-weather-preparedness/

[88] Georgia Power. (2025a). 2025 *Integrated Resource Plan*, pp. 40, 72; and Georgia Power. (2025b, July 15). *Georgia Public Service Commission approves plan to reliably, economically meet the energy needs of a growing Georgia* [Press release]. https://www.georgiapower.com/news-hub/press-releases/georgia-public-service-commission-approves-plan-to-meet-the-energy-needs-of-a-growing-georgia.html Georgia Power, *2025 Integrated Resource Plan* (approved July 15, 2025), available through the Georgia Power IRP filings page and the Georgia PSC's 2025 IRP docket, No. 56002.

purchase availability," among other factors.[89] To meet that winter capacity obligation, Georgia Power's approved 2025 IRP includes battery energy storage and combustion turbine additions scheduled through the winter of 2030-2031.

Duke Energy Carolinas and Duke Energy Progress are dual-peaking utilities[90] and reached analogous conclusions in their 2025 Carolinas Resource Plan. The Resource Adequacy study underlying the plan explicitly modeled cold-weather capacity risks based on actual operating experience during Winter Storm Elliott. It incorporates day-ahead uncertainty in load and solar forecasts under cold-weather conditions as a specific planning scenario.[91]

What a utility is building matters for avoided cost purposes, and across the Southeast, utilities are building new gas-fired power plants to meet winter peak demand. Commissions reviewing IRP filings should require utilities to account for heat pump demand savings against the winter avoided capacity cost. When a utility adds combustion turbines specifically to meet a winter planning reserve requirement, the cost of those turbines, ($123-$156/kW-year) is the avoided cost against which winter demand reduction programs should be measured. A home that switches from electric resistance to a heat pump reduces coincident winter peak demand by approximately 50% at a significantly lower cost ($16.80-$25.26/kW-year).

Regulators in the region are already treating demand-side programs as winter capacity. In its 2025 report to the general assembly on energy efficiency and demand-side management, the North Carolina Utilities Commission describes Duke Energy Progress proposing a demand-side program "due to a need for winter capacity resources," designed to "cost effectively address reducing system peaks in the winter." Duke Energy Progress described the program to "build an important and needed demand-side winter resource."[92] That program pays customers to curtail load. A heat pump program would deliver the same winter-peak reduction through a permanent equipment change rather than a dispatch event.

Time-Varying Value of Demand-side Measures

Time-varying value (TVV) analysis calculates the avoided capacity costs of demand-side measures on an hourly basis. With TVV, planners can explicitly quantify the winter-peak reduction from replacing an electric resistance system with a heat pump and reflect it in avoided supply-side investment, including new peaker plants.

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[89] Georgia Power, 2025a, p. 39 *2025 Integrated Resource Plan.*

[90] National Renewable Energy Laboratory. (2022). *Duke Energy carbon-free resource integration study.* https://docs.nlr.gov/docs/fy22osti/82431.pdf

[91] Duke Energy. (2025). *2025 Carolinas resource plan complete document and related information*. https://www.duke-energy.com/our-company/about-us/irp-carolinas/2025-crp

[92] North Carolina Utilities Commission. (2025, August 29). *Biennial report of the North Carolina Utilities Commission to the governor and legislative committees regarding proceedings for electric power suppliers involving energy efficiency and demand-side management programs, cost recovery and incentives*, p. 14. https://www.ncuc.gov/reports/CostAllocationReport25.pdf

Some states already require the inputs needed for TVV analysis. Washington's IRP rule requires each electric utility's portfolio to "include all cost-effective, reliable, and feasible conservation and efficiency resources" to assess the programs needed to obtain "all cost-effective demand response" and to include an "analysis and summary of the avoided cost estimate for energy, capacity, transmission, distribution" in every plan.[93] Requiring a published avoided capacity cost and full inclusion of cost-effective efficiency in the portfolio gives regulators a basis to check whether a heat pump's winter-peak reduction has been valued against the capacity it would displace.

Capacity Accreditation and Competitive Resource Modeling

Demand-side heat pump programs should be modeled as competitive capacity resources within the IRP optimization rather than as predetermined load modifiers calculated outside it. Applying a consistent capacity accreditation standard to heat pump programs and supply-side alternatives allows the IRP to select heat pumps whenever they are the least-cost option, which the analysis in this report indicates they routinely will be.

Both statutes and markets already put demand-side resources in direct competition with generation. Michigan's IRP statute requires utility modeling to include "any supply-side and demand-side resources that reasonably could address any need for additional generation capacity," including projected energy waste reduction and demand response savings. Before approving a plan, the Michigan Public Service Commission must consider "whether the proposed levels of peak load reduction and energy waste reduction are reasonable and cost-effective."[94] In New England's wholesale capacity market, energy efficiency competes in the same auction as power plants. In ISO New England's auction for the 2027-2028 commitment period, 2,614 MW (including 105 MW new) of demand resources, including energy efficiency, were approved, about 8% of the 31,556 MW procured.[95] These examples show that demand reductions can be accredited and paid for as capacity.

Conclusion

This report's analysis documents an opportunity that is large, well defined and time sensitive. Across 14 states, 7.85 million families heat their homes with electric resistance technology, which costs an average of $252 more per year than a heat pump would cost. Each family will replace their central air conditioner within the next 15 to 20

[93] Washington State Legislature, Washington Administrative Code § 480-100-620(3)(b)(ii), (11)(c), (13), December 2020. https://app.leg.wa.gov/wac/default.aspx?cite=480-100-620

[94] Michigan Public Service Commission, Michigan Compiled Laws, Act 3 of 1939, chap. 460, § 460.6t(1)(f)(iii), (8)(a)(vii). https://www.legislature.mi.gov/Laws/MCL?objectName=mcl-460-6t

[95] ISO New England. (2024, February 9). *New England's forward capacity auction closes with adequate power system resources for 2027/2028* [Press release]. https://www.iso-ne.com/static-assets/documents/100008/20240209_pr_fca18_initial_results.pdf

years. Whether that replacement is a heat pump depends on whether effective programs are in place at the moment a family panics and calls the nearest HVAC company. That opportunity does not recur for another equipment lifecycle.

The cost case for action is decisive. At approximately $16.80/kW-year, heat pump incentives deliver winter capacity at about 11% to 16% of the cost of building new peaking generation. The 6:1 BCR from customer bill savings alone does not count the capacity value. Together, they represent one of the most cost-effective investments available to the South's grid. Heat pump programs that reduce winter coincident peak are a grid reliability and capital deferral strategy that belongs in every utility's resource plan.

For public utility commissioners and their staff, the most important actions are:

- Require integrated resource plans to treat heat pump deployment as a capacity resource, using the cost of the capacity the utility would otherwise build, typically a new combustion turbine, as the avoided cost benchmark.
- Require utilities to implement demand-side heat pump, weatherization and pre-weatherization programs as a condition of approving new capacity investments.
- Authorize inclusive utility investment (IUI) programs that eliminate the credit barrier and allow cost recovery through meter-attached charges.
- Direct utilities to fund building energy code compliance support programs, like those already in place in 14 other states and Washington, D.C., and count the verified savings toward their efficiency targets.

For electric utilities, the most important actions are:

- Design upstream and midstream rebate programs that reach the HVAC trade at scale rather than relying entirely on customer-initiated claims that skew toward higher-income households.
- Invest in contractor workforce development to ensure installation capacity can absorb program demand.
- Account for heat pump programs in IRP filings using time-varying value analysis and ELCC-equivalent capacity accreditation so that the full winter peak value is visible to decisionmakers.

Utilities already have the metering data to identify which accounts carry the consumption signature of electric resistance heating. When an AC unit fails, the customer needs a replacement within days. That decision point occurs hundreds of thousands of times each year across the 14-state region, and roughly 85% of those replacements happen on an emergency timeline with no opportunity to shop deliberately.

Most utilities lack the policy direction and program structure to make a heat pump the default outcome at that moment. This report has outlined what is necessary to build a successful program: layered rebates, inclusive financing for customers, building codes that capture the opportunity at new construction, weatherization programs to make the most of the investment in existing homes, workforce development and code compliance programs to ensure installers are properly trained and following current energy codes and proper accounting of program demand savings in resource planning proceedings. This report is intended to give regulators, utilities, and policymakers in the region the specific direction and program models needed to close that gap.

Appendix A: AC to Heat Pump Methodology

This study's methodology is based on ACEEE's *Transforming Texas: How Heat Pumps Can Replace Electric Resistance Heat, Reducing Costs and Winter Power Peaks*.[96] The ACEEE report analyzed the benefits of replacing central air conditioners with heat pumps in electrically heated homes in Texas. Our report expands to 14 U.S. states with a potential market of at least 100,000 candidate homes.

This report employs data from the Energy Information Administration's Residential Energy Consumption Survey (RECS) 2020 Microdata file,[97] which provides information on the characteristics of homes around the country, along with their actual energy consumption from utility bills. We analyzed homes in the 14 states that (a) use an electric furnace as the main heating source and (b) have central air conditioning.

The next step is estimating the effect of switching the home's heating and cooling to current-generation heat pumps, roughly halving the electricity consumption for heating.[98] The incremental cost of the heat pump compared to a replacement air conditioner is based on 2024 manufacturer-provided data for a variety of sizes and new construction versus replacement scenarios; these costs were then inflated to account for distributor and installer markups as well as 2.4% inflation between 2024 and 2025.[99] The average incremental cost blends new-construction and replacement costs for each state using an estimate of the share of these homes that will be new construction within 15 years, based on each state's housing growth rate between April 2020 and July 2023. Those shares range from 9% to 36%.[100] The total program cost, benefit-cost ratios and payback periods are calculated conservatively, treating every home as a replacement. For additional information on the above methodology and assumptions, see ACEEE's report.[101]

To replicate the original Texas analysis for the additional 13 southern states, we used RECS homes from each state, with their own unique building characteristics. To calculate the peak demand impacts, we estimated the performance of the heat pumps with electric resistance backup heat compared to electric resistance furnaces at 15°F,

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[96] Steven Nadel et al., Transforming Texas: How Heat Pumps Can Replace Electric Resistance Heat, Reducing Costs and Winter Power Peaks (2024), https://www.aceee.org/white-paper/2024/11/transforming-texas-how-heat-pumps-can-replace-electric-resistance-heat.

[97] EIA, "Microdata," January 2024, https://www.eia.gov/consumption/residential/data/2020/index.php?view=microdata.

[98] The current HSPF2 is 7.5 Btu/Wh and the SEER2 is 14.3 Btu/Wh for heat pumps. See Energy and Water Conservation Standards and Their Compliance Dates: Air Conditioners and Heat Pumps, 10 CFR 430.32(c)(5), accessed October 30, 2025, https://www.ecfr.gov/current/title-10/part-430/section-430.32#p-430.32(c)(5). [National Archives, Code of Federal Regulations, 430.32 Energy and water conservation standards and their compliance dates, Table 7]

[99] Federal Reserve Bank of St. Louis, "Gross Domestic Product: Implicit Price Deflator," September 25, 2025, https://fred.stlouisfed.org/series/GDPDEF/.

[100] Henderson, T. (2024, May 16). *Housing boom in most of the US could ease shortage, but cost is still a problem.* Washington State Standard. https://washingtonstatestandard.com/2024/05/16/housing-boom-in-most-of-the-us-could-ease-shortage-but-cost-is-still-a-problem/

[101] Nadel et al., Transforming Texas: How Heat Pumps Can Replace Electric Resistance Heat, Reducing Costs and Winter Power Peaks, 5–6.

which is below the ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 99.6% heating design temperature for most of the region.

In the case of noncold climate heat pumps we used in our modeling, the COP at 15°F is 2.56 and capacity is 61%, meaning that 39% of the heating load must be supplied with electric resistance backup heat. Nonetheless, the resulting system COP of 1.9, is still almost twice as high as using an electric resistance furnace by itself (assumed 100% efficient or COP of 1). This contributes to lower peak loads on the electric grid as well as lower winter heating bills for electrically heated households.

Levelized Cost of Capacity Analysis

The central cost-effectiveness comparison in this report expresses both the heat pump incentive cost and the supply-side benchmark in a common unit — the levelized cost of capacity, measured in dollars per kilowatt-year ($/kW-year). This unit is appropriate because the policy question is not the cost of energy but the cost of acquiring and reliably serving winter peak demand. Every dollar of winter peak reduction achieved through heat pump incentives displaces a dollar of investment that would otherwise be required to build, permit and operate new peaking generation capacity. Expressing both sides of that comparison in $/kW-year — a standard metric in integrated resource planning — allows a direct, like-for-like assessment.

Heat Pump Incentive Cost

The total program cost is drawn directly from the ACEEE-RAP 14-state heat pump replacement analysis. The model applies state-specific equipment cost differentials — the incremental cost of a heat pump relative to a same-vintage air conditioner — to a sample representing the 7,848,502 households in the 14-state addressable market. The weighted-average incremental incentive cost, which equals the incremental cost of a heat pump over a comparable central air conditioner, is $610 per household when every home is treated as a replacement (the blended average reported in the Key Outputs, which reflects state-specific new-construction shares, is $562); the aggregate program cost, summed across all households and states, is $4.784 billion. This figure represents the total incentive outlay required to convert the full addressable market from electric resistance heating to heat pump operation.

The gross levelized cost of capacity is calculated by applying a capital recovery factor (CRF) to the total program cost and dividing by the aggregate winter peak reduction:

$$\text{Gross LCOC} = (\text{total incentive cost} \times \text{CRF}) \div \text{winter peak reduction (kW)}$$

The CRF converts a one-time expenditure into an equivalent annual payment stream over the measure life, incorporating the time value of money:

$$CRF(r, n) = r(1+r)^n / [(1+r)^n - 1]$$

This analysis uses a 7% social discount rate and a 15-year measure life, consistent with established residential HVAC equipment lifetimes and midrange public policy discount rate guidance. At these parameters, CRF = 0.1098. Applied to the $4.784 billion total and the 31,265 MW of coincident winter peak reduction at 15°F design temperature, also from the model, yields a gross levelized cost of $16.80/kW-year.

A sensitivity analysis across discount rates shows that this figure is not sensitive to the choice of rate within any defensible range: At a 3% public-policy discount rate (CEA 2017),[102] the gross cost falls to $12.82/kW-year; at the 7.7% weighted-average cost of capital (WACC) used by Lazard in their supply-side analysis, it rises modestly to $17.56/kW-year. In every case, the result remains well below the supply-side benchmarks described below.

Standard Demand-side Management Adjustments

Three standard DSM cost-effectiveness adjustments are applied to the gross figure to produce a fully adjusted estimate.

Net-to-gross ratio. The net-to-gross (NTG) ratio adjusts for free ridership — the share of program participants who would have installed a heat pump without the incentive. In most efficiency programs, NTG ratios of 0.70-0.80 are common, reflecting meaningful natural adoption. This market is structurally different: Approximately 85% of central HVAC replacements occur on an end-of-life basis following equipment failure,[103] at which point market data show that the overwhelming default outcome — absent direct point-of-sale intervention — is a like-for-like air conditioner replacement. Heat pump market share for end-of-life central system replacements in the Southeast without program intervention are approximately 10%.[104] This implies natural adoption near or below the free-ridership rate and supports an NTG ratio of 0.90 for a well-designed upstream or midstream program. A conservative NTG of 0.70 is used as a lower-bound sensitivity.

Program administration. Program measurement, verification and administration costs are not included in the report's incentive cost. A 15% overhead adder is applied, consistent with observed cost ratios for similar HVAC programs.

Effective load carrying capability. The report's model calculates peak reduction at the 15°F design temperature. Because not every program household will be heating

[102] Council of Economic Advisers. (2017, January). *Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate* [Issue brief]. Executive Office of the President; Office of Management and Budget. (2003, September 17). *Circular A-4: Regulatory Analysis*. https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf

[103] See footnote 55.

[104] No published data isolate the rate at which southern households replacing a central AC with electric resistance heat choose a heat pump without program support. We assume natural conversion is low, given that most replacements are emergency like-for-like swaps, and adopt an NTG ratio of 0.90 for a well-designed upstream or midstream program. Because this assumption is uncertain, we test a conservative NTG of 0.70 as a lower-bound sensitivity.

simultaneously at the moment of the system-wide coincident peak, an effective load carrying capability (ELCC) factor of 85% is applied — an assumption for demand-side programs in winter-peaking systems — to convert the technical peak reduction to a firm capacity equivalent.

Applying all three adjustments yields a fully adjusted levelized cost of $25.26/kW-year at the preferred NTG of 0.90 and approximately $32/kW-year at the conservative NTG of 0.70. Figure 1 presents the complete adjustment stack.

Supply-side Capacity Cost Benchmark — Lazard

Lazard's Levelized Cost of Energy+ (LCOE+) analysis is widely used as an authoritative reference for generation technology costs, but its primary output — the levelized cost of energy in $/MWh — is not directly comparable to a demand-side capacity cost in $/kW-year. A common conversion approach multiplies the LCOE by an assumed capacity factor and 8,760 hours per year to express it as $/kW-year. This approach is methodologically incorrect for this comparison because Lazard's LCOE includes fuel and variable operating costs — components that have no analog in the heat pump incentive cost, which is purely a capital incentive with no energy cost component. Carrying fuel costs through the conversion inflates the apparent supply-side cost and produces a misleading comparison.

The correct approach separates the capacity cost components — annualized capital and fixed operations and maintenance — from the energy cost components. Using Lazard LCOE+ v19.0 key assumptions for new-build gas peakers[105]:

Capital cost: $1,100-$1,650/kW

Fixed O&M: $10-$17/kW-year

WACC: 7.7% (60% debt at 8%, 40% equity at 12%)

Facility life: 30 years → CRF = 0.0863

The annualized capital cost is $1,100-$1,650 × 0.0863 = $95-$142/kW-year. Adding fixed O&M yields a proper capacity cost equivalent of $105-$159/kW-year. This figure excludes fuel ($3.45/MMBtu × 10,275-11,175 Btu/kWh heat rate ≈ $35-$39/MWh) and variable O&M ($3.50-$5.00/MWh), which are energy costs that do not belong in a capacity cost comparison.

Grid operators' cost of new entry (CONE) benchmarks for MISO, PJM, SPP and ERCOT for the 2025-2026 planning year provide a second reference between $123 and $156 per kilowatt-year.

[105] Lazard, 2026, pp. 8, 28.

Summary

Across every combination of discount rate (3-7.7%), NTG assumption (0.70-0.90), and supply-side benchmark (Lazard capacity cost $105-$159, grid operator CONE $123-$156), heat pump incentive programs deliver winter peak capacity at a materially lower cost than any supply-side alternative. The conclusion is robust to the full range of defensible methodological choices.

Appendix B: Winter Peak Reduction at 15°F vs. State Capital 99.6% Design Temperatures

The main analysis estimates winter peak demand savings at a single outdoor temperature of 15°F in all 14 states. This appendix explains that choice and shows how the results change when each state is evaluated at the temperature HVAC designers and many utility planners already use to describe a cold winter hour in that state: the ASHRAE 99.6% heating design temperature for each state capital. The two approaches lead to the same conclusion. Replacing central air conditioners with heat pumps in homes heated by electric resistance furnaces would cut winter peak demand across the region by more than 30 GW under either assumption.

Key Terms

Term	Definition
99.6% heating dry-bulb design temperature (DBT)	The outdoor air temperature that a location is colder than for only 0.4% of the hours in a typical year, or about 35 hours. HVAC contractors use it to size heating equipment. The values here come from the *2005 ASHRAE Handbook: Fundamentals*, as compiled by the Fenestration and Glazing Industry Alliance (FGIA).
Coincident peak demand	The demand from all homes at the same time, which is what matters to the grid on a cold morning. This analysis assumes every home's heating system runs at its full design output in that hour.
Coefficient of performance (COP)	Units of heat delivered per unit of electricity used. An electric resistance furnace has a COP of 1. A heat pump's COP falls as the outdoor temperature drops.
Capacity fraction	The share of a heat pump's rated heating output (rated at 47°F) that it can still deliver at a lower temperature.
Backup (auxiliary) heat	The electric resistance strips inside a heat pump's air handler. They supply whatever heat the heat pump can't, at a COP of 1.
System COP	The combined efficiency of the heat pump and its backup heat at a given temperature.

Why the Main Analysis Uses 15°F

A single temperature lets readers compare states directly and follows the method of the ACEEE Texas study on which this report is based. Fifteen degrees is also cold for most of the region. It is colder than the 99.6% design temperature in 10 of the 14 state capitals, and it is within 1°F of the design temperature for Richmond and for the Washington, D.C., area, which represents Maryland. In the 10 states where it is warmer, the uniform assumption gives the heat pump less credit than a state-specific design temperature would. For the region as a whole, 15°F is the conservative choice.

How the Model Calculates Peak Savings at Any Temperature

For each home in the U.S. Energy Information Administration's Residential Energy Consumption Survey (RECS) sample, the model estimates the size of the central air conditioner from the home's floor area, at one ton of cooling capacity (12,000 Btu per hour) per 550 square feet. That rule of thumb follows the ACEEE Texas study, which took it from an Austin-area HVAC contractor and Austin Energy's sizing guidance. The model assumes the electric resistance furnace has the same capacity, then multiplies its demand by 0.8 to allow for an average 20% oversizing of heating equipment. ACEEE calls 20% conservative, since a SPEER review found typical oversizing of about 40% in new Texas homes. For Texas, the method gives an average peak electric resistance load of about 9 kW, close to the 9.27 kW that ERCOT estimated from meter data on Texas homes:

$$\text{Electric resistance kW} = (\text{floor area} \div 550\ \text{ft}^2\ \text{per ton}) \times 12{,}000\ \text{Btu/h} \times 0.8 \div 3{,}412\ \text{Btu/kWh}$$

That heating load is held constant. A replacement heat pump with backup heat meets the same load at a higher system COP, so the peak reduction for each home is:

$$\text{kW saved} = \text{electric resistance kW} \times [1 - (1 \div \text{system COP})]$$

$$\text{System COP} = \text{heat pump COP} \times \text{capacity fraction} + (1 - \text{capacity fraction})$$

For the standards-minimum heat pump modeled, the heat pump COP is 2.56 at 15°F, and its capacity fraction is 61% (20.74 of 34 kBtu/h), giving a system COP of 1.95 and cutting each home's heating demand by 48.8%. To evaluate other temperatures, the model draws a straight line through the 15°F rating point and the 5°F rating point (COP 2.14, capacity fraction 49%) and reads COP and capacity fraction off that line at each capital's design temperature. Table B-1 shows the resulting values for each state.

Because the heating load is fixed, the only effect of temperature in this calculation is on heat pump performance. Where each state capital's design temperature is warmer than

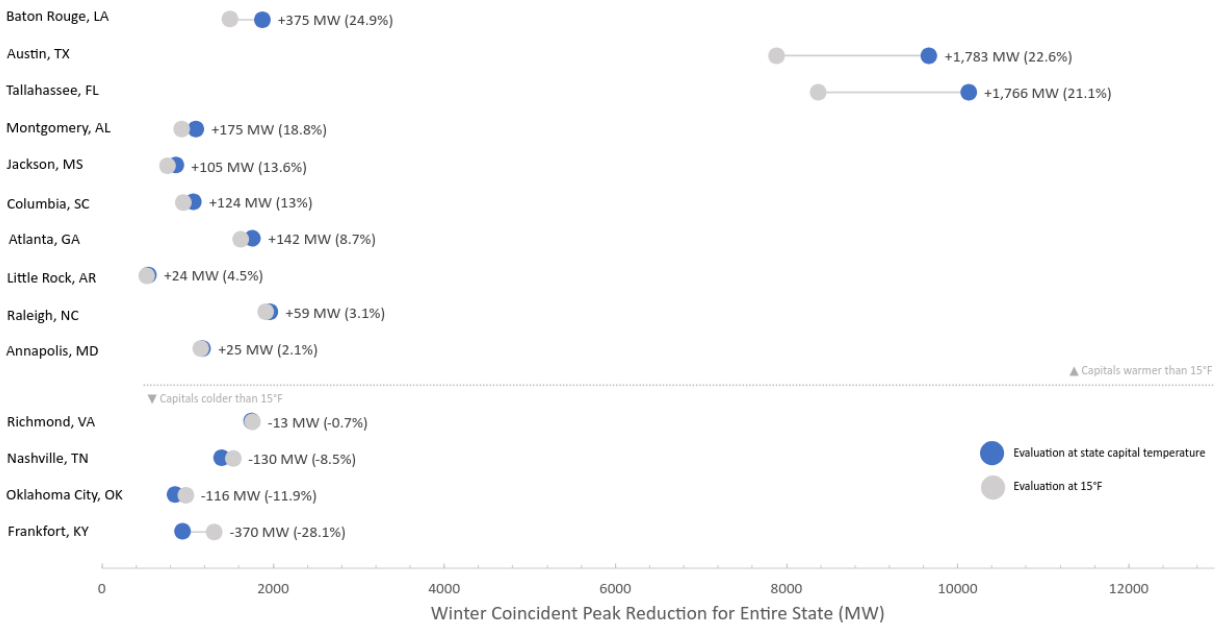
15°F, the heat pump runs more efficiently and supplies more of the heat itself, so savings per home rise. Where it is colder, savings fall.

Results

Evaluated at each state capital's 99.6% design temperature, the estimated winter coincident peak reduction for the 14 states rises from 31,265 MW to 35,212 MW, an increase of 3,947 MW or 12.6% (Table B-1 and Figure B-1). In 300-MW power plant equivalents, the reduction rises from about 104 to about 117. The average reduction per home rises from 3.98 kW to 4.49 kW.

The four states whose capitals are colder than 15°F (Kentucky, Oklahoma, Tennessee and Virginia) lose a combined 630 MW of savings. Kentucky changes most, falling 28% at Frankfort's design temperature of 4.5°F. The 10 states with warmer capitals gain a combined 4,577 MW, with the largest percentage gains in Louisiana (25%), Texas (23%) and Florida (21%). Because Florida and Texas hold more than half of the region's candidate homes, they account for about 90% of the net increase.

Figure B-1. Winter Peak Reduction at 15°F vs. State Capital 99.6% Design Temperatures



Evaluated at each capital's design temperature, the 14-state peak reduction rises 12.6% to 35,212 MW. Savings fall in the four states with capitals colder than 15°F and rise in the other 10.

Sources: Authors' analysis using the ACEEE heat pump model; and *ASHRAE 2005 Handbook: Fundamentals*, as compiled by FGIA.

Table B-1. Winter peak reduction at 15°F and at each state capital's 99.6% design temperature

State	Capital	99.6% DBT (°F)	Δ vs. 15°F	kW/home @15°F	kW/ home @DBT	MW @15°F	MW @DBT	Δ MW	Δ %
KY	Frankfort[1]	4.5	−10.5	4.27	3.07	1,319	949	−370	−28.1
OK	Oklahoma City	10.3	−4.7	3.92	3.45	982	865	−116	−11.9
TN	Nashville	11.6	−3.4	3.93	3.60	1,540	1,409	−130	−8.5
VA	Richmond	14.7	−0.3	3.88	3.85	1,765	1,752	−13	−0.7
MD	Annapolis[2]	15.9	+0.9	4.07	4.15	1,162	1,187	+25	+2.1
NC	Raleigh	16.3	+1.3	3.34	3.44	1,917	1,975	+59	+3.1
AR	Little Rock	16.9	+1.9	3.43	3.59	531	555	+24	+4.5
GA	Atlanta	18.8	+3.8	3.98	4.33	1,629	1,771	+142	+8.7
SC	Columbia	20.8	+5.8	3.70	4.18	955	1,079	+124	+13.0
MS	Jackson	21.1	+6.1	4.61	5.24	768	872	+105	+13.6
AL	Montgomery	23.7	+8.7	3.55	4.21	932	1,107	+175	+18.8
FL	Tallahassee	24.9	+9.9	4.16	5.04	8,371	10,138	+1,766	+21.1
TX	Austin	25.7	+10.7	4.07	4.99	7,892	9,674	+1,783	+22.6
LA	Baton Rouge	27.0	+12	3.97	4.96	1,503	1,878	+375	+24.9
14-state total				**3.98**	**4.49**	**31,265**	**35,212**	**+3,947**	**+12.6**

[1]FGIA lists Frankfort as "see Lexington, KY"; the Lexington value is used. [2]FGIA lists Annapolis as "see Washington, DC"; the Washington, DC, value is used. Per-home values are weighted averages across about 7.85 million candidate homes.

Sources: Authors' analysis using the ACEEE heat pump model, Weighted Summary rows 10 and 30; and *ASHRAE 2005 Handbook: Fundamentals*, 99.6% heating dry-bulb temperatures, as compiled by FGIA.



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