Acadia Center

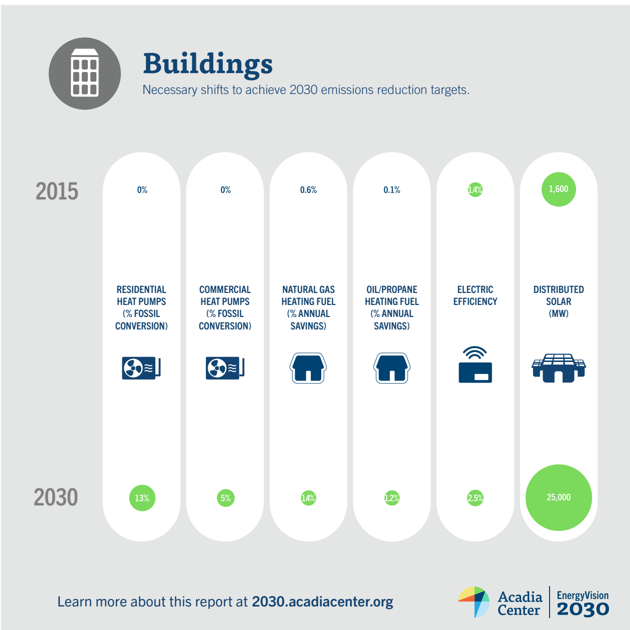
EnergyVision 2030

Buildings

Companion Brief

Buildings for the Future

To advance the clean energy future, buildings in the Northeast must be powered and heated by cleaner energy sources while at the same time becoming more efficient. Continued investment in energy efficiency will save money and avoid unnecessary energy waste. When efficiency is combined with clean heating technologies, a deep emissions reduction pathway emerges. The buildings of tomorrow will reflect a much more integrated and interactive energy system that produces and consumes electricity in ways that result in a cleaner and more efficient grid. The figure below shows some of the shifts necessary.

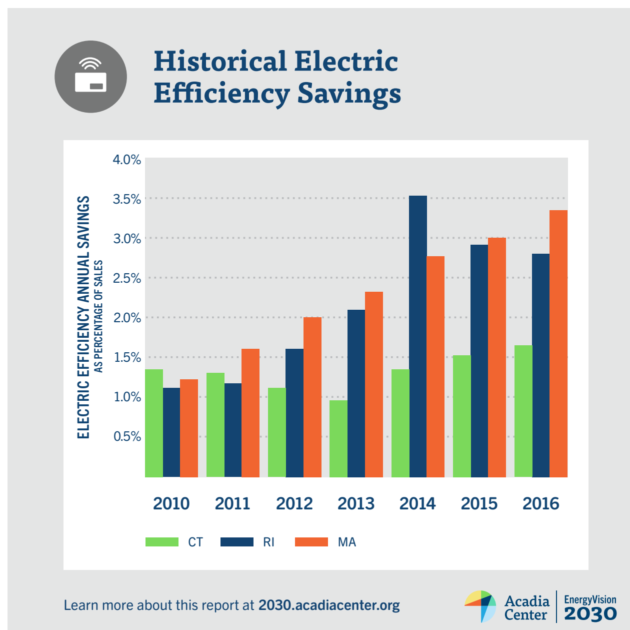


Energy Efficiency—Still the First Fuel

Energy efficiency is a core element of energy policy for many Northeast states. As one of the fundamental components of meeting 2030 emissions targets, efficiency efforts must be sustained in states that are already leading and improved in states that are falling behind. States at the forefront of efficiency have adopted a policy model known as Least Cost Procurement, which directs utilities to invest in all energy efficiency that is less expensive than traditional energy supply. Doing so reduces the cost that consumers pay for energy and results in an energy system that is cleaner and leaner. In addition, investing in local efficiency resources instead of fossil fuel imports also provides macroeconomic benefits that grow states' economies. Every dollar invested in electric energy efficiency in New England results in $5.90 in increased Gross State Product.[1] By lowering energy use now and in the future, energy efficiency also makes it easier and less costly to meet renewable energy and emissions targets. **Every state in the Northeast should adopt and sustain a Least Cost Procurement or similar policy for their distribution utilities in order to lower energy system costs and reduce emissions.**

Electric Efficiency

For many years, most utilities and states in the region have been implementing some degree of electric efficiency. However, in the last five years, several New England states have dramatically increased their efficiency procurements. **All states in the region need to achieve at least 2.5% annual electric efficiency savings to help meet the 2030 emissions target.** As demonstrated in the figure below, Rhode Island and Massachusetts are already exceeding these levels on a consistent basis.

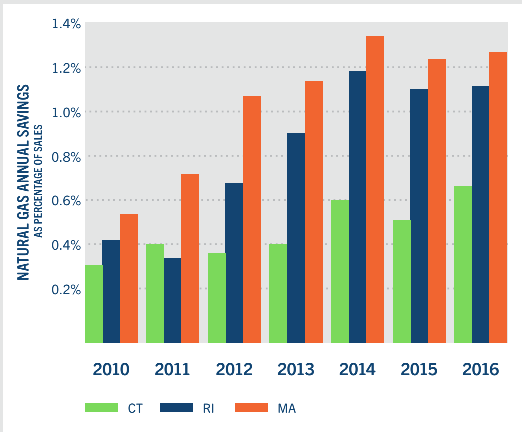


Source: see note 2

Natural Gas & Delivered Fuel Efficiency

The Northeast states also have opportunities to reduce energy costs and emissions by investing in energy efficiency measures that reduce the use of heating fuels like natural gas, propane, and fuel oil. Weatherizing buildings, replacing outdated equipment, and improving industrial processes can all reduce the amount of

Historical Natural Gas Efficiency Savings



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Source: see note 2

fossil fuels consumed in buildings. **Natural gas and delivered fuel (fuel oil and propane) efficiency savings must increase to 1.4% and 1.2% per year, respectively,** to help achieve the region's emissions goals. Lagging states need to capture all cost-effective efficiency and leading states need to sustain and even improve their current efforts. **States need to find sustainable funding for fuel oil and propane efficiency through economy-wide carbon pricing** or other mechanisms.

While it is the most mature resource contributing to the EnergyVision 2030 emissions reductions, energy efficiency is also undergoing dramatic changes as a result of technological advances. LED lighting is achieving market penetration at levels unthinkable just a few years ago. More advances are on the way, particularly around intelligent controls and automation, that will unlock additional savings potential in the years to come. From streetlights that turn off or dim when no cars are present to bedroom lights that shut off when the room is empty to conference rooms that change lighting, temperature, and ventilation in response to occupancy, advanced controls will extract new cost-effective savings that were unanticipated in the past.

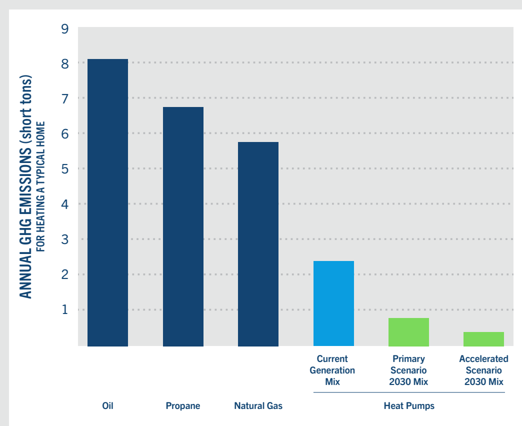
Electrification—An Emerging Clean Energy Pathway

Thanks to advances in technology and significant cost reductions, heat pumps have become a new tool for heating buildings more efficiently and reducing emissions. Heat pumps are far more efficient than traditional electric resistance heating and, with today's electric generation mix, provide immediate emissions reductions. As generation grows cleaner, emissions from heat pumps will continue to decline. Installing heat pumps today creates a "renewable-ready" infrastructure that will take advantage of a cleaner grid as renewables continue to come on line at a dramatic rate.

Building Heating

Heat pumps are a form of efficient electric heating for residential and commercial buildings. They extract heat from either outside air or the ground and move it into a building. An air conditioner is a type of heat pump that moves heat from inside a building to the outside to cool it; heat pumps simply reverse this process during the heating season and can now efficiently function even in cold Northeastern winters.

Comparison of Emissions from Heating Technologies



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Source: see note 3

To meet the region's 2030 emissions targets, 13% of the residential heating and 5% of the commercial heating currently provided by fossil fuels must be converted to heat pumps.[4] Because heat pumps are relatively new to the market in this region, states must take several steps to help develop this emerging market through program design and promotion of public awareness. **Utility or other program administrators need to improve customer incentive programs so that they fully account for the carbon reduction benefits that heat pumps provide.**

The new construction market offers particular promise for heat pumps because they can avoid the cost of installing a traditional fossil system. **States should put immediate effort into transforming the market for heat pumps in new homes.** Moreover, states need to lead by example and use their purchasing power to rapidly deploy heat pumps in government buildings.

Utility regulators need to acknowledge and correct the misalignment of incentives that is created when electric utilities are owned by parent companies that also have a stake in natural gas transmission or distribution. These companies are motivated to expand their natural gas infrastructure instead of using the existing electric system to heat homes with heat pumps. In addition, **utility regulators can help the already good economics of operating heat pumps through improved rate design that offers lower rates during non-peak times when heat pumps often operate.**

Finally, states need to end any policies that favor natural gas expansion over heat pumps. While natural gas will continue to serve as a bridge fuel while more renewables are built, the time for investing in new natural gas infrastructure has passed.

Water Heating

Making hot water is the second greatest use of energy in homes after space heating.[5] Heat pumps can increase water heating efficiency as much or even more than space heating efficiency. Fossil-fueled water heaters can also be replaced by solar thermal systems that use energy from the sun to heat water, which is then stored until needed. **New York and New England need to replace 11% of fossil-fueled water heaters with heat pumps and 1% with solar thermal systems by 2030.** Both of these technologies are fairly well developed at this point, but they have been viewed primarily as replacements for electric resistance hot water heaters. Additional focus is needed to increase conversions of fossil fuel systems. **States should adopt policies that assign an appropriate value to the emissions savings gained from replacing fossil fuel hot water systems with cleaner alternatives.**

Program Coordination and Design

Programs for efficiency and electrification in buildings have many similarities and in many cases can be combined. These programs also share a set of best practices that will help them achieve policy goals and serve customers well: they both require integrated program design, coordinated delivery systems, stakeholder engagement, and transparent accountability; they must also reach vulnerable customer segments and correct market failures. More details can be found in Acadia Center's "Lessons from New England: Energy Efficiency Best Practices"[6] and "Best Practices for Advancing State Energy Efficiency Programs."[7]

References

1 "Energy Efficiency: Engine of Economic Growth," Howland, et al, 2009, http://acadiacenter.org/document/energy-efficiency-engine-of-economic-growth/
2 Acadia Center Analysis of Efficiency and Sales Data for MA, RI and CT from Energy Efficiency Program Administrator Annual Reports/Plans and State Efficiency Databases.
3 Acadia Center Analysis of EnergyVision 2030 Modeling results, U.S. EPA and EIA data.
4 These forecasts were constructed using a detailed bottom-up methodology that examined the breakdown of fuel and system type and determined how much impact conversion would have for each combination. Heat pumps that are replacing electric resistance heat are included in the electric efficiency potential discussed in the previous section.
5 U.S. Energy Information Agency, https://www.eia.gov/energyexplained/index.cfm/data/index.cfm?page=us_energy_homes
6 http://acadiacenter.org/document/best-practices-table-for-ny-clean-energy-advisory-council/
7 http://acadiacenter.org/document/best-practices-for-advancing-state-energy-efficiency-programs-policy-options-suggestions/

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