Delaware EEAC

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RMI

ENERGY. TRANSFORMED.

RMI is catalyzing rapid, market-based change in the world's most critical geographies to be aligned to a 1.5°C future.

We identify the interventions and work to scale transformative change in the global energy system to cut greenhouse gas (GHG) emissions by at least 50% by 2030.

Building sector emissions fall under a few main categories:

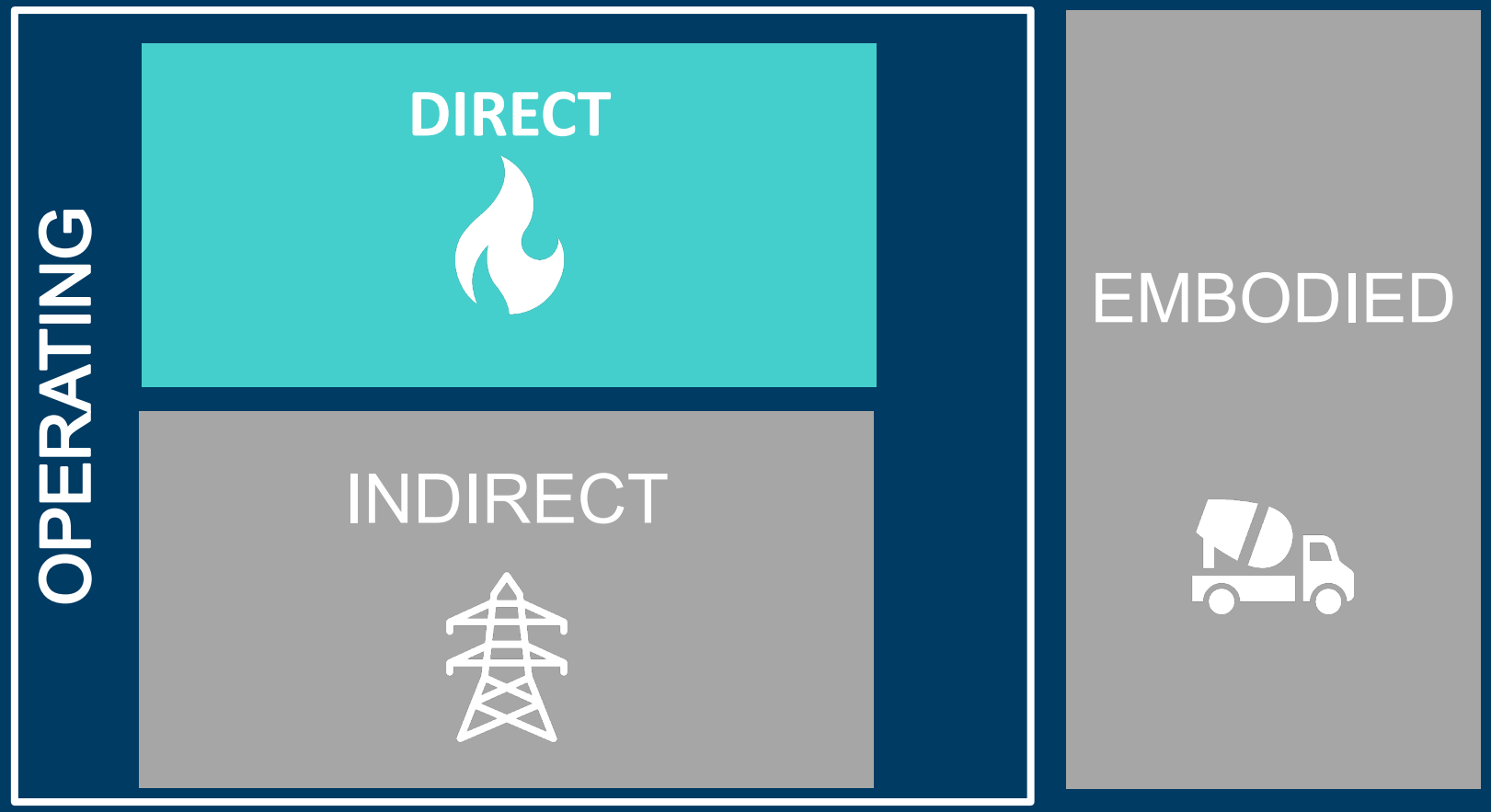
OPERATING

DIRECT

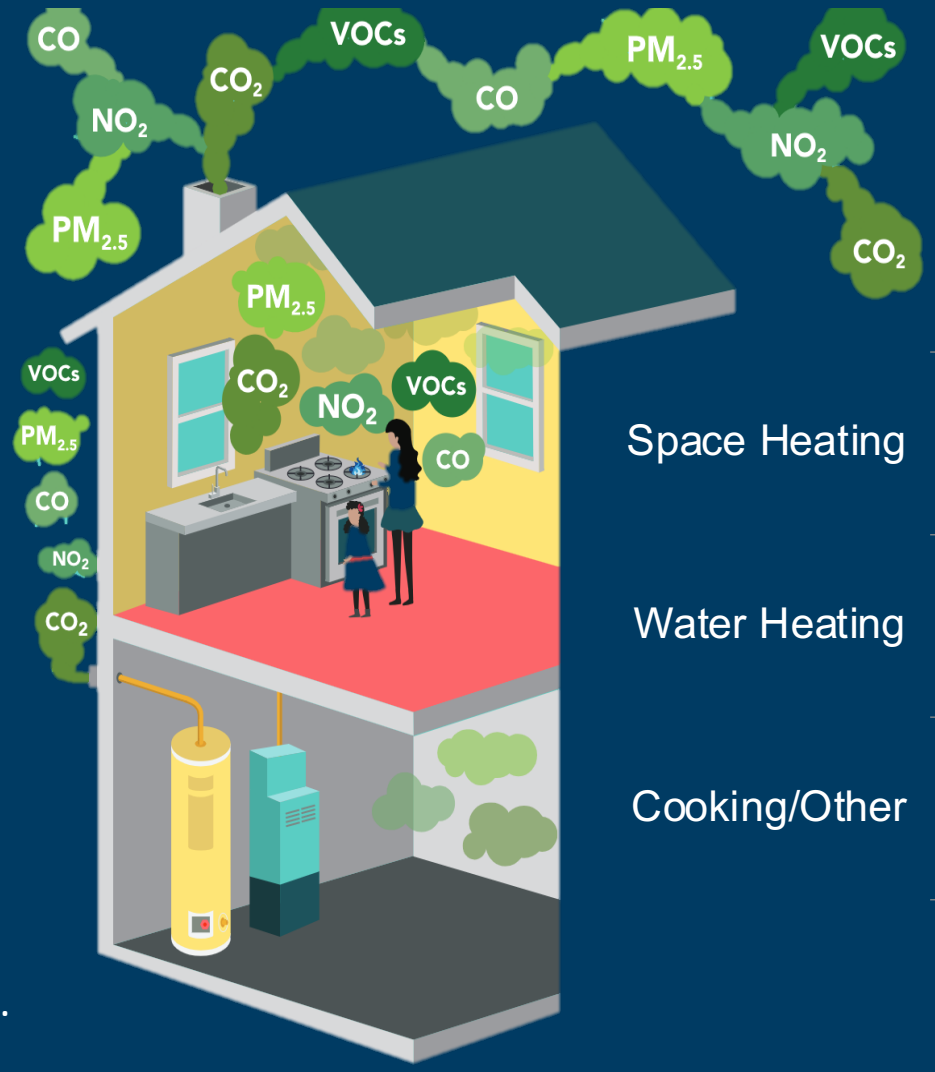
INDIRECT

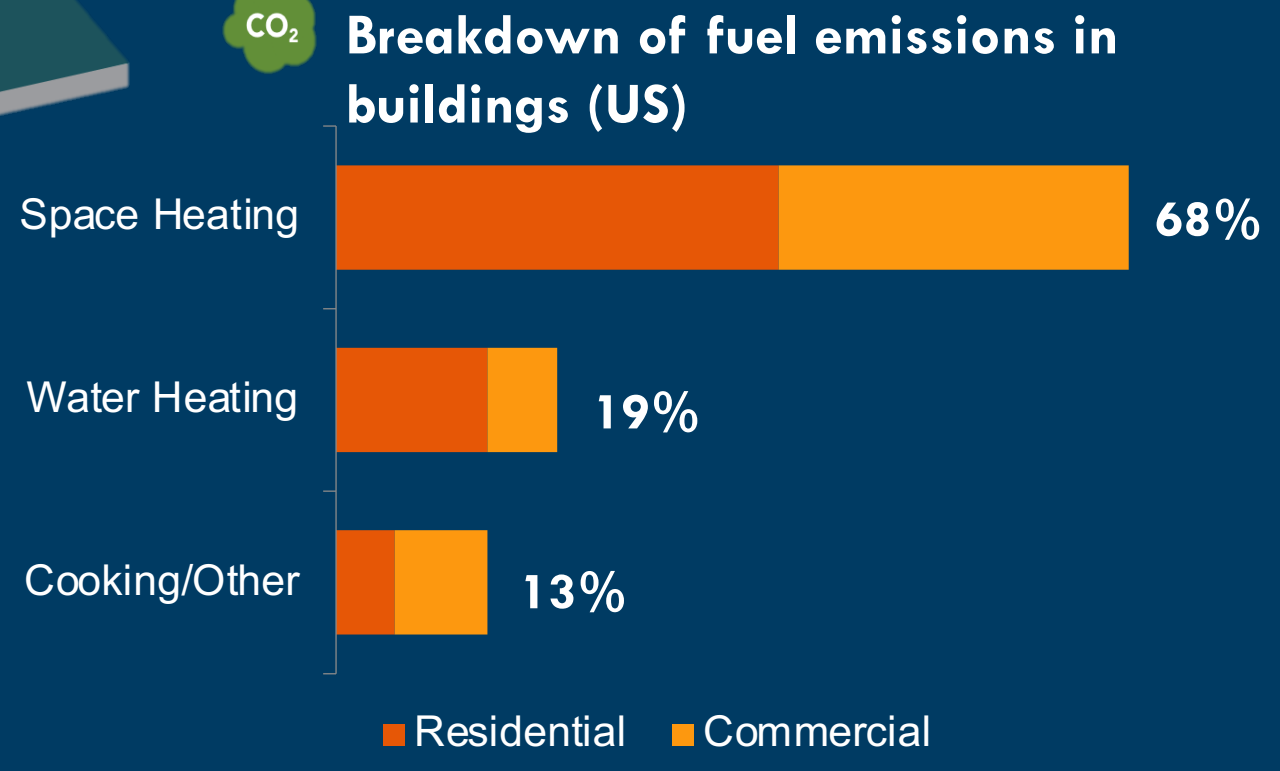
EMBODIED

Direct emissions are a critical component of building emissions

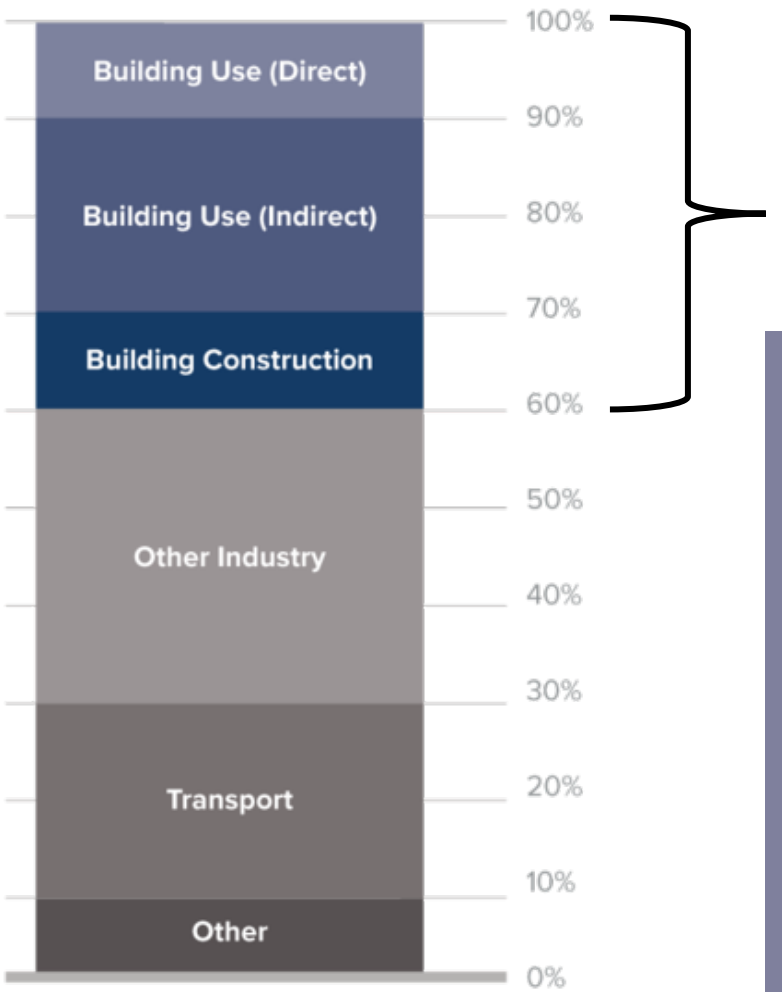


Direct emissions are from space heating, water heating, and cooking





Building sector GHG emissions in DE are too large to ignore.



Building construction and operations

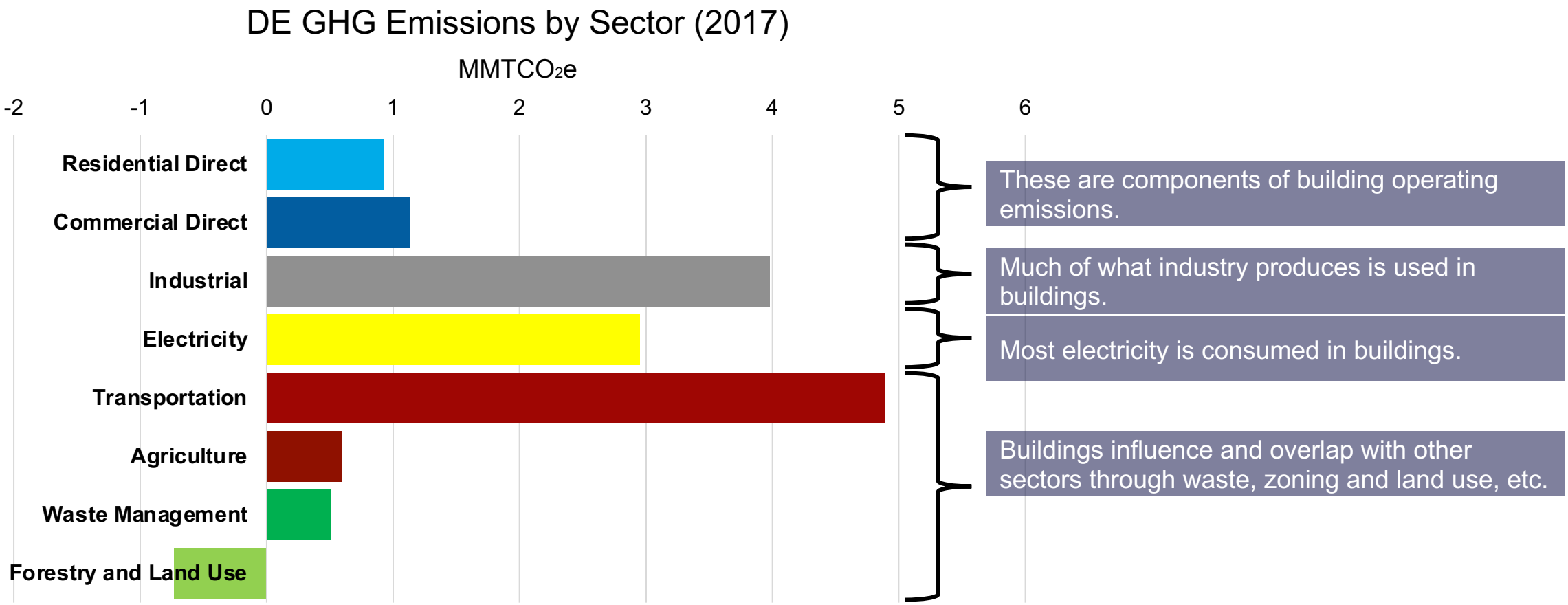
In DE:

~31%

of the state's net GHG emissions are from building use (excluding construction).

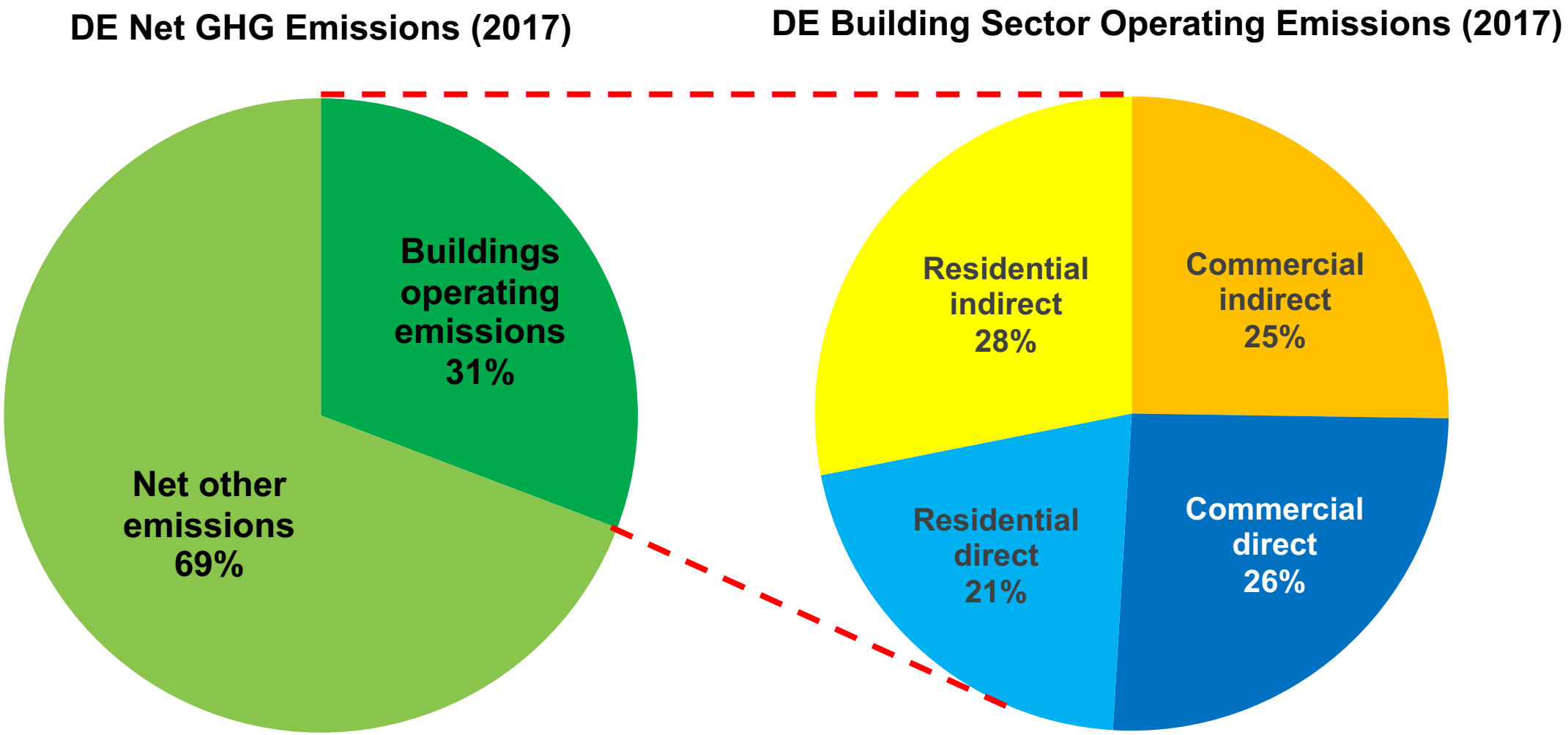
Source: EIA 2020, Delaware 2017 Greenhouse Gas Emissions Inventory

Building sector GHG emissions in DE are too large to ignore.



Source: Delaware 2017 Greenhouse Gas Emissions Inventory

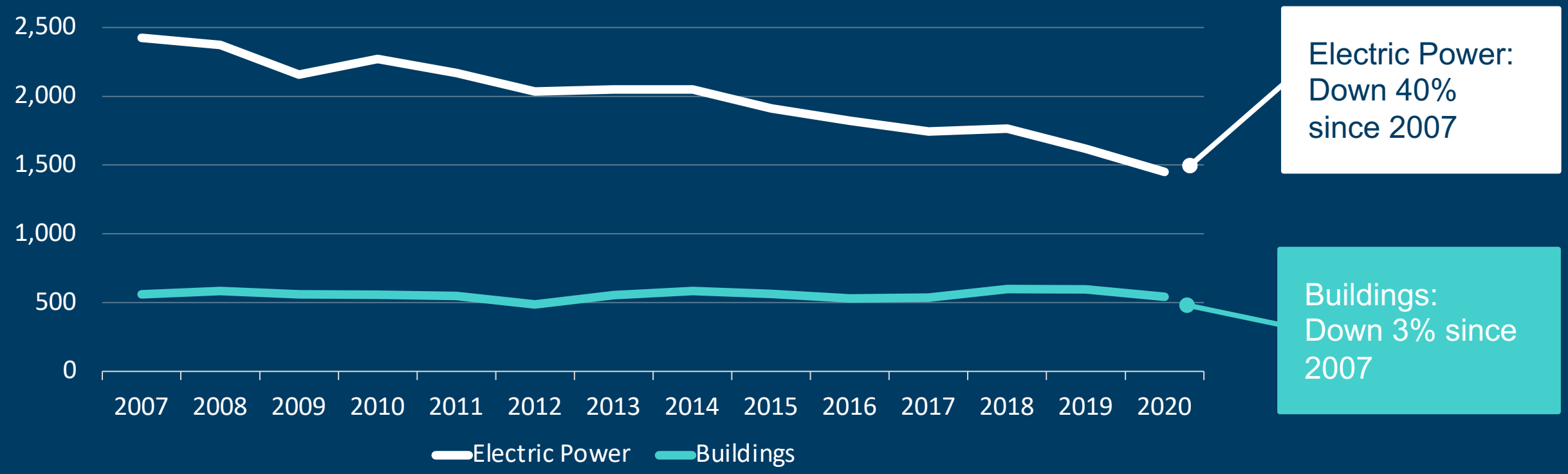
DE's building emissions are split (almost) evenly four ways.



Source: EIA 2020, Delaware 2017 Greenhouse Gas Emissions Inventory

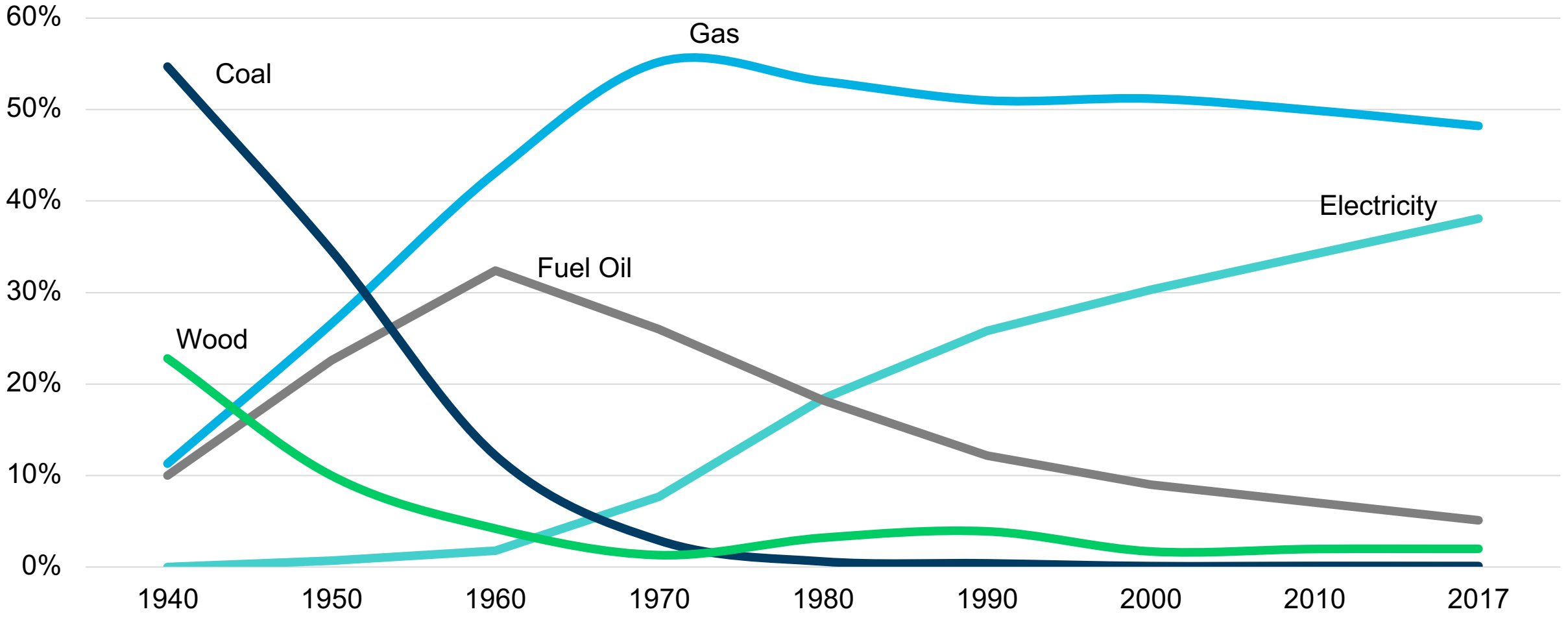
The United States has reduced carbon emissions from electricity, while the buildings sector is flat

Annual CO_2 emissions from electric power and buildings sectors
Million metric tons CO_2, US total, 2007–2020



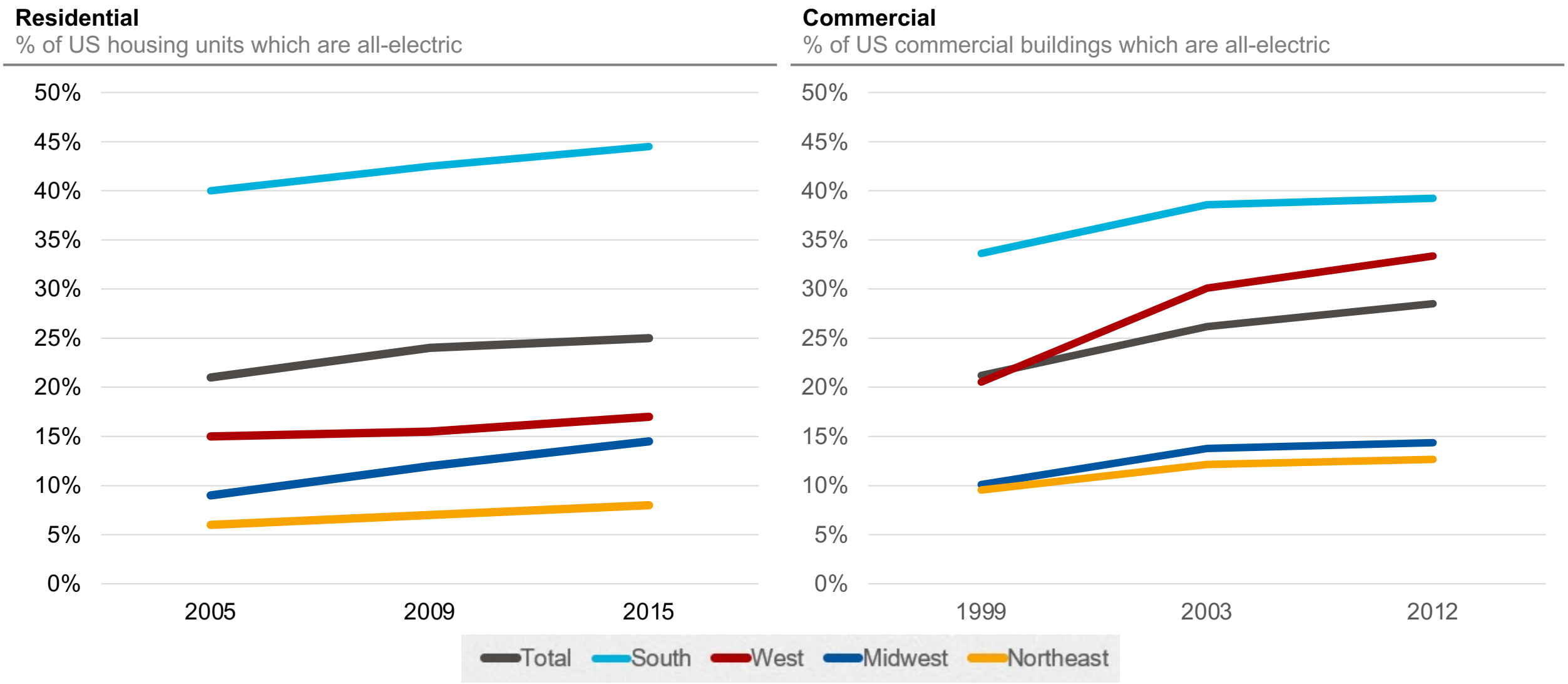
Electricity has been growing as a primary heating fuel for decades

Percentage of US households by primary heating fuel
1940–2017



Source: Census Bureau, 2018

This growth is consistent across regions and building types

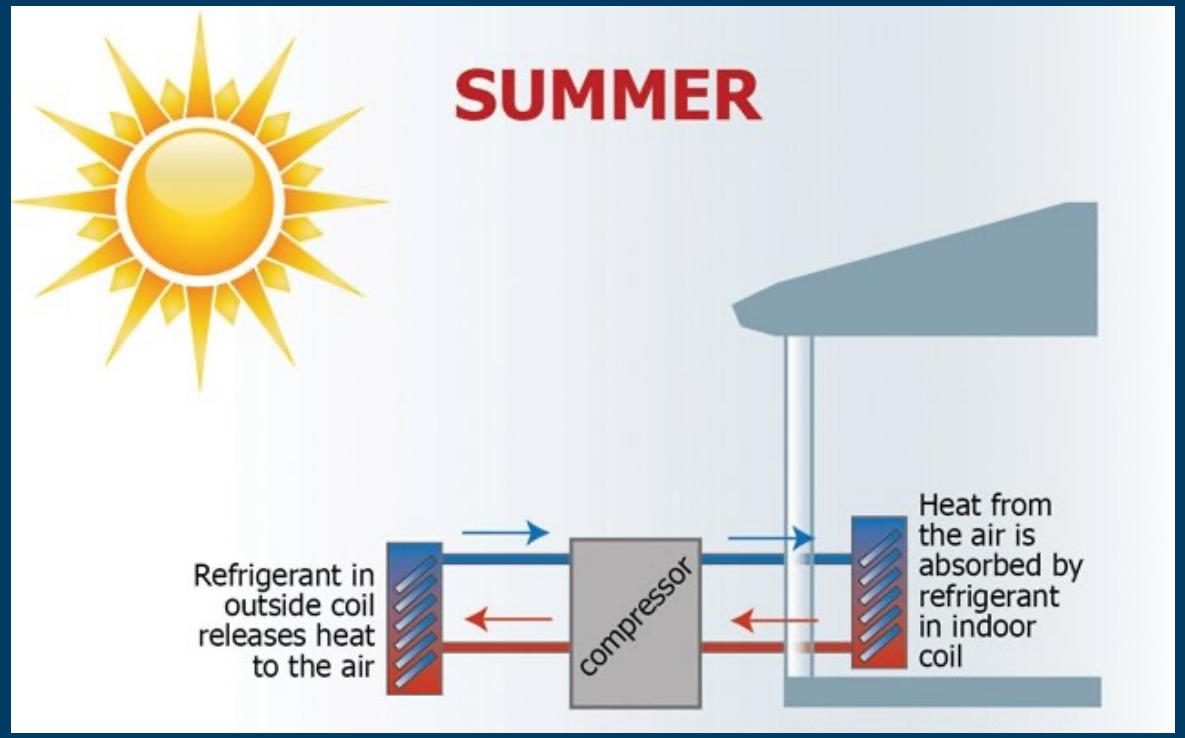


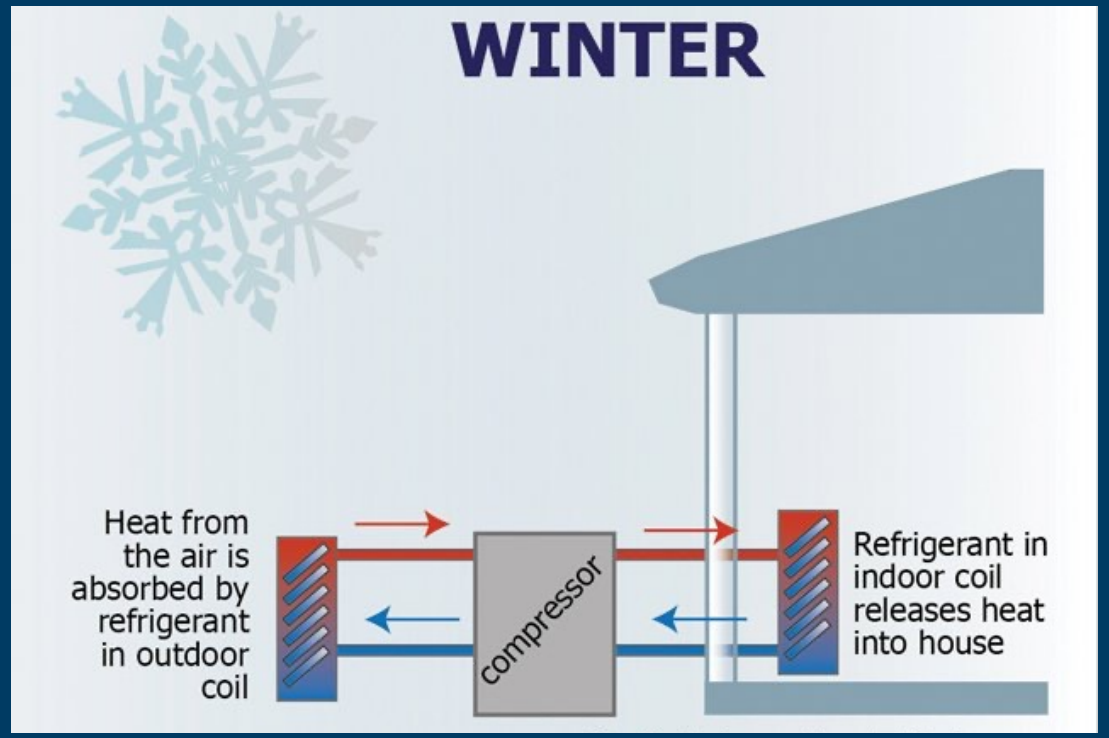
Source: EIA RECS and CBECS

A heat pump uses small amount of electricity to move heat rather than generate heat

- Is different and more efficient than resistance heating
- Provides heating AND cooling
- Heat pumps deliver two to four times more heating energy than the electricity it consumes
- Even burning gas in a power plant to run a heat pump is more efficient than a gas furnace or boiler

Heat Pump Technology





Heat pumps work in cold climates.

Diminished peaks.

Winter peaks on electric grid can be mitigated with weatherization and demand response programs.

High efficiency.

Ground and water source heat pumps function well without much reduction in efficiency in extreme temperatures.

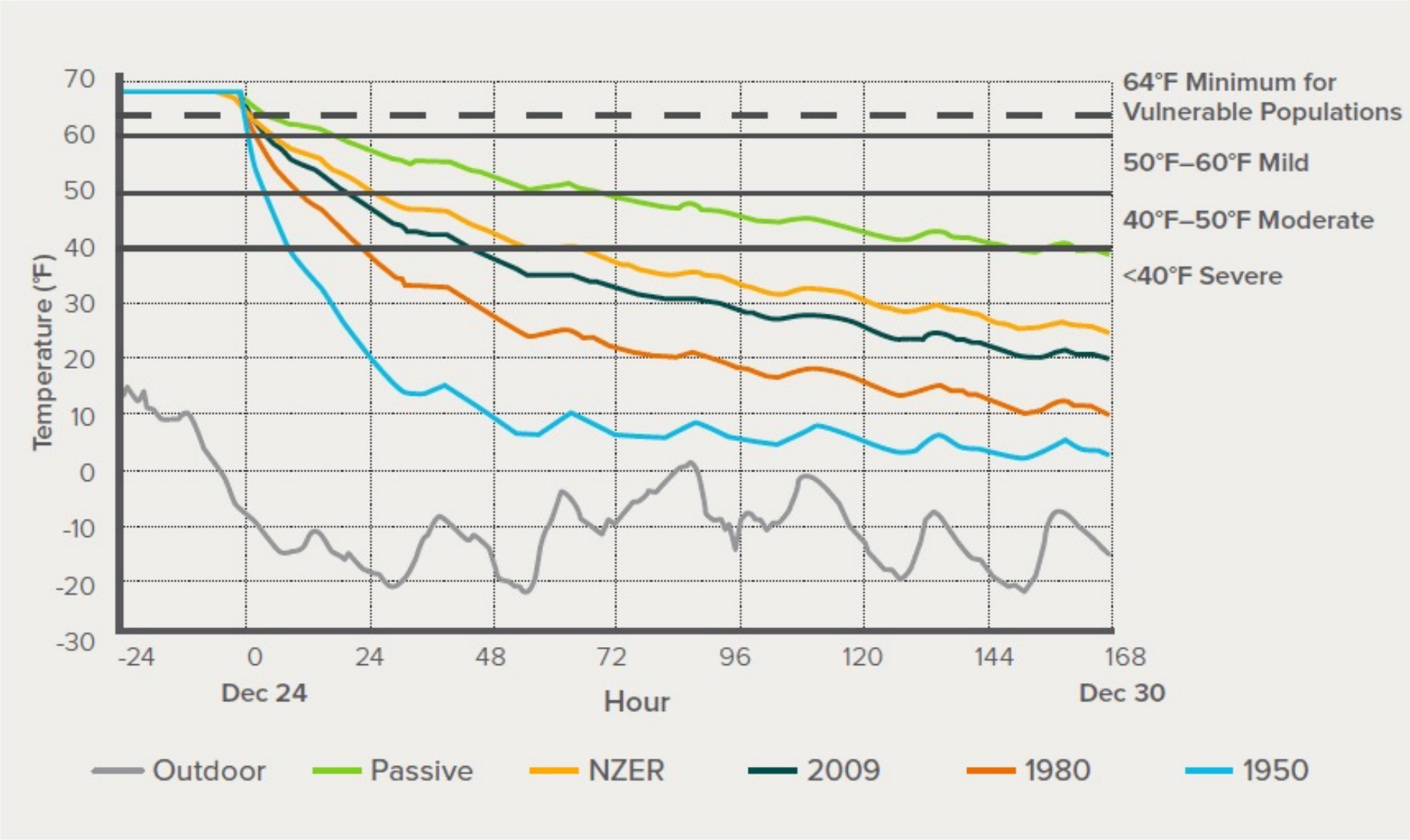
Backup often unnecessary.

Today's air-source heat pumps work without back-up down to -15°F with cutting edge products heating at -30°F.

Where necessary, backup options vary.

Electric resistance or existing fossil fuel infrastructure can be used for backup heating – some heat pump programs leave existing fossil fuel infrastructure as back up source of heating, but electric resistance heating is also effective.

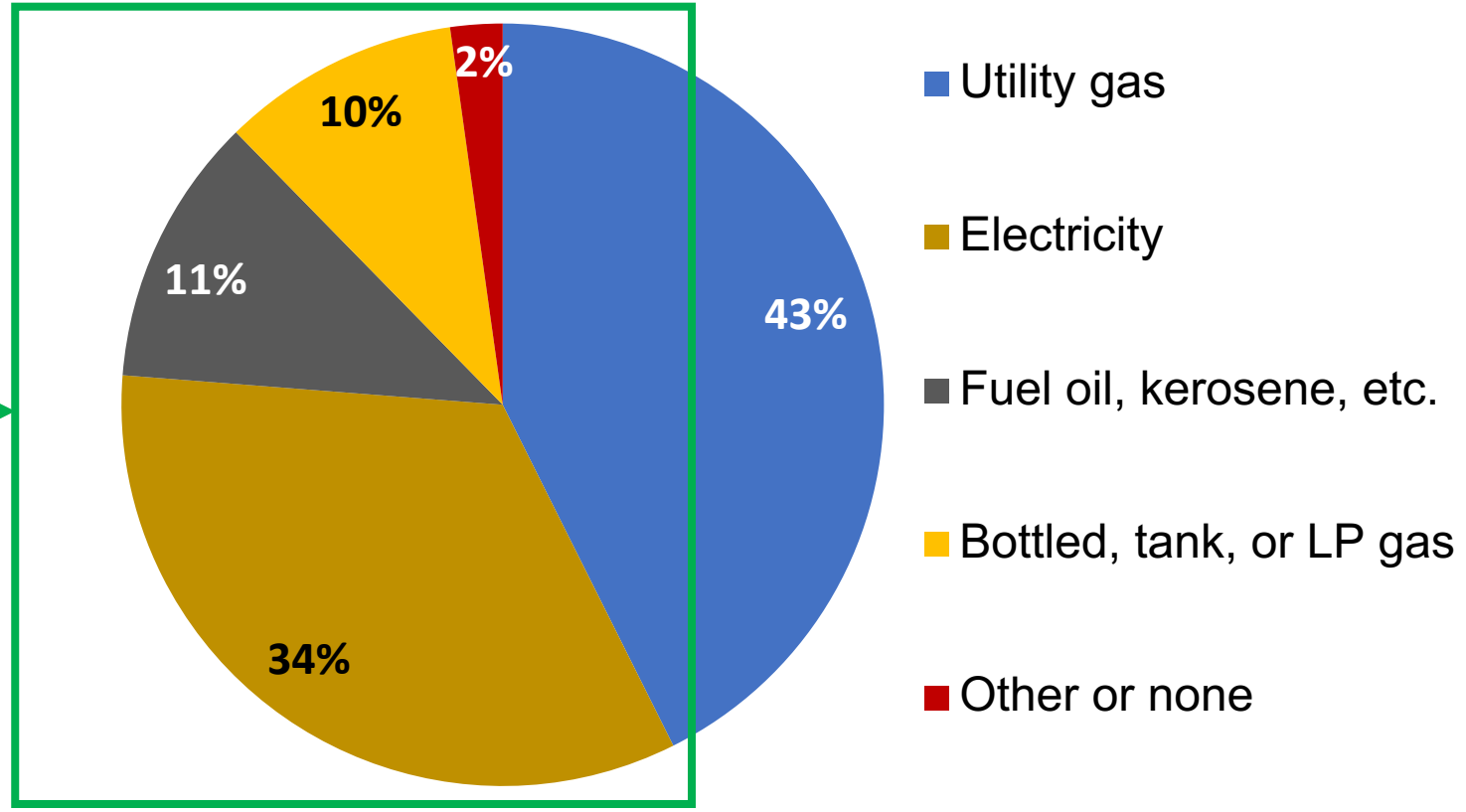
Resilience and Electrification



Source: Hours of Safety in Cold Weather - RMI

Electrification may have big potential in DE's non-gas homes.

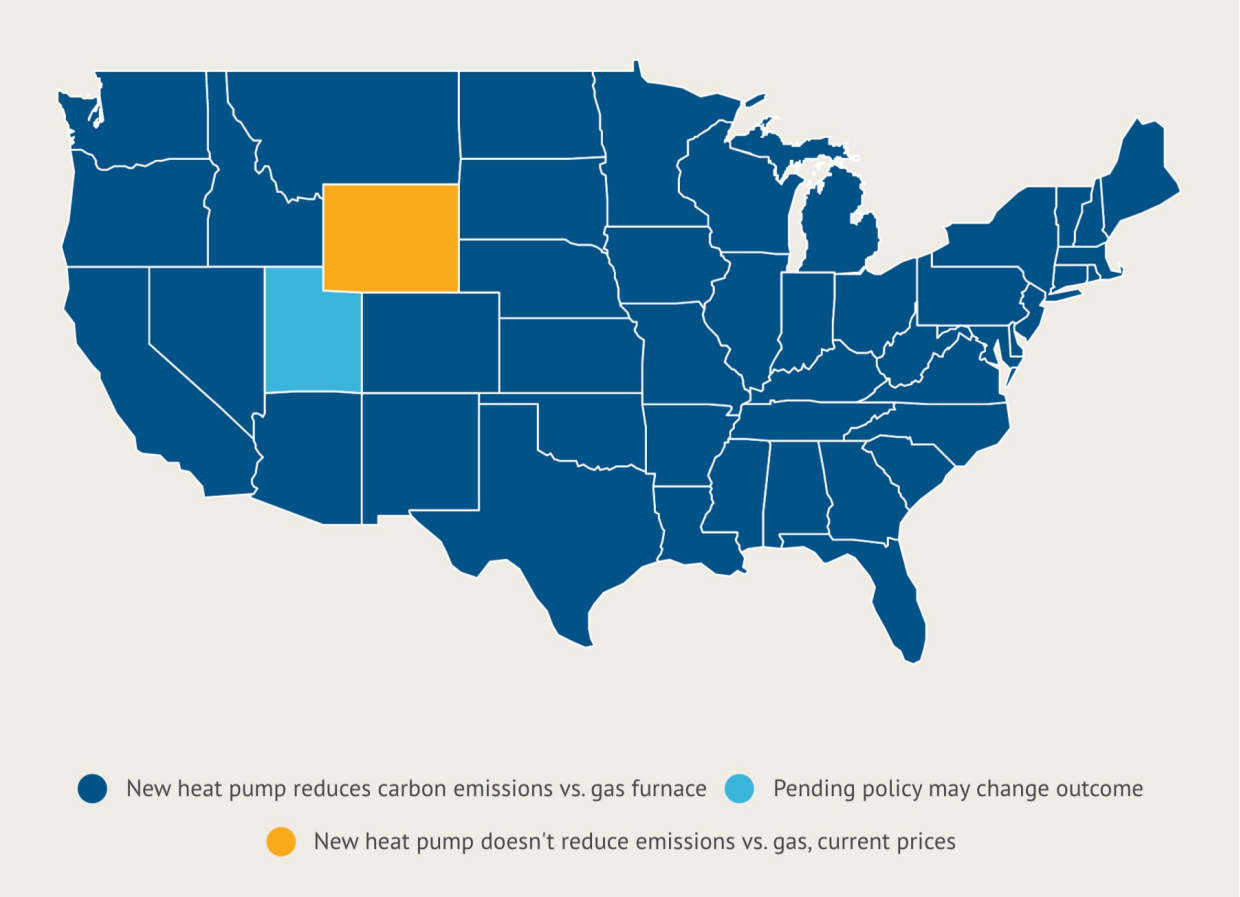
Likely most potential for scaling the adoption of cost-saving and emissions-reducing technology



Source: United States Census 2020

Electrification can reduce emissions in DE's natural gas-heated homes.

Emissions Impact by State: Heat Pump vs. Gas Furnace

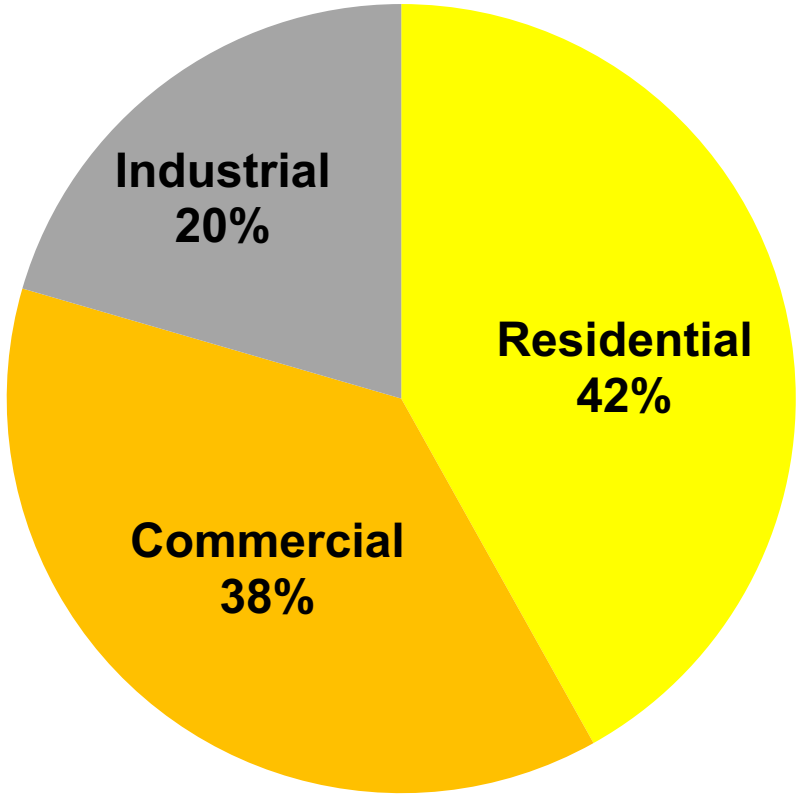


Source: RMI 2020

- **Heat pumps are carbon-reducing in 99% of U.S. households.**
- **Heat pumps are multiple times more energy efficient than an Energy Star gas furnace.**
- **The costs of electric homes and technologies are falling steeply.**

Home energy prices may support building electrification in DE.

DE Electricity Sales by Volume



Electricity prices are **similar to the national average.**

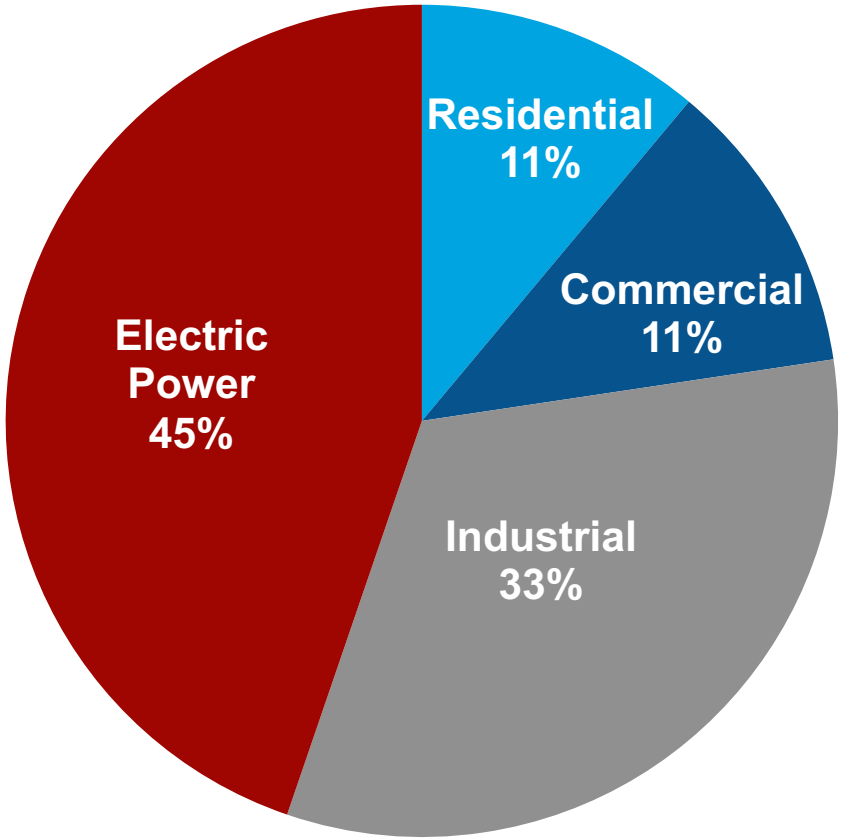
13
c/kWh
avg residential electricity price

10
c/kWh
avg commercial electricity price

Source: EIA 2020, EIA 2021

Home energy prices may support building electrification in DE.

Gas Consumption in DE (2020)



Gas prices are **slightly above the national average.**

$1.25
/therm
avg residential gas price

$1.04
/therm
avg commercial gas price

Source: EIA 2020, EIA 2021

Rewiring America found that electrification would reduce energy bills in 99% of DE households.

If they upgrade, **99% of households in Delaware** would save more than **$150 million** a year on energy bills and reduce emissions by **600,000 metric tons of CO2e** annually.

	# of Furnaces	**Avg. savings if electrified**	# of Water Heaters	**Avg. savings if electrified**
Electric Resistance	63.9K	**$295 / yr**	0.27M	**$269 / yr**
Fuel Oil	41.6K	**$434 / yr**	1.2K	**$228 / yr**
Propane	36.8K	**$526 / yr**	7.1K	**$437 / yr**

100% of households using natural gas would also save on annual energy bills. The savings will continue to increase given the trajectory of heat pump technology improvements.

On average, each household could save $425 on their energy bills each year.

Source: Rewiring America

Electrification incentives help and are widespread in the Northeast.

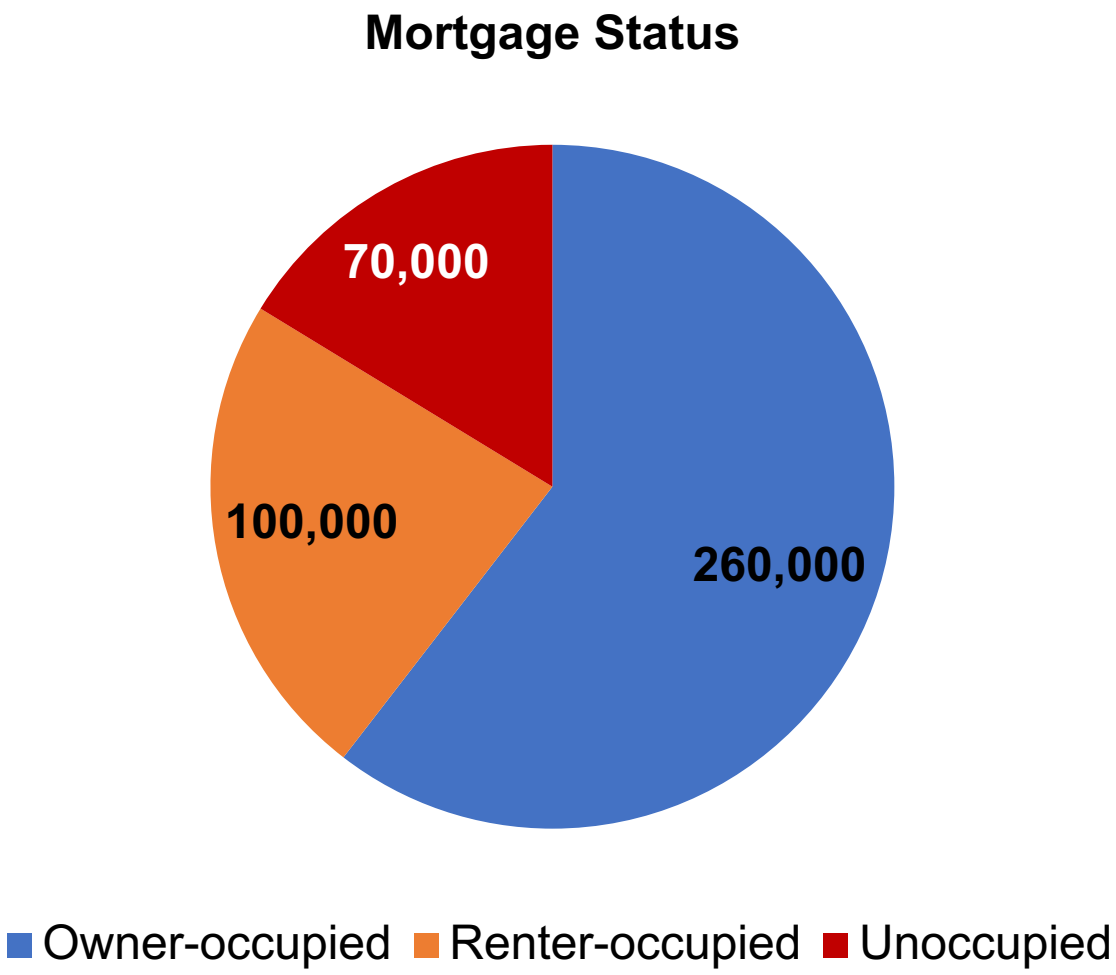
Program	Incentive
Ductless heat pumps (often cold climate)	
NYSERDA 2019	$500/outdoor unit
NY utilities 2020	$500–800/outdoor unit
Energize CT	$500/unit
Mass Save	$1,250/ton
Vermont Tier III	$500–800/system
Efficiency Vermont	$350–450/system
Burlington Electric Dept.	$1,200–1,650/system
National Grid Rhode Island	$1,000/ton
Ducted heat pumps (sometimes cold climate)	
NYSERDA 2019	$1,000/ton
NY utilities 2020	$1,000–2,000/ton
Energize CT	$500/system
Mass Save	$1,250/ton
MassCEC	$2,500 (convert from NG)
Massachusetts MVP	$2,000–12,000/system
Vermont Tier III	$500–800/system
Efficiency Vermont	$800/ton
Vermont ZEN	$15,000/home
National Grid Rhode Island	$1,000/ton

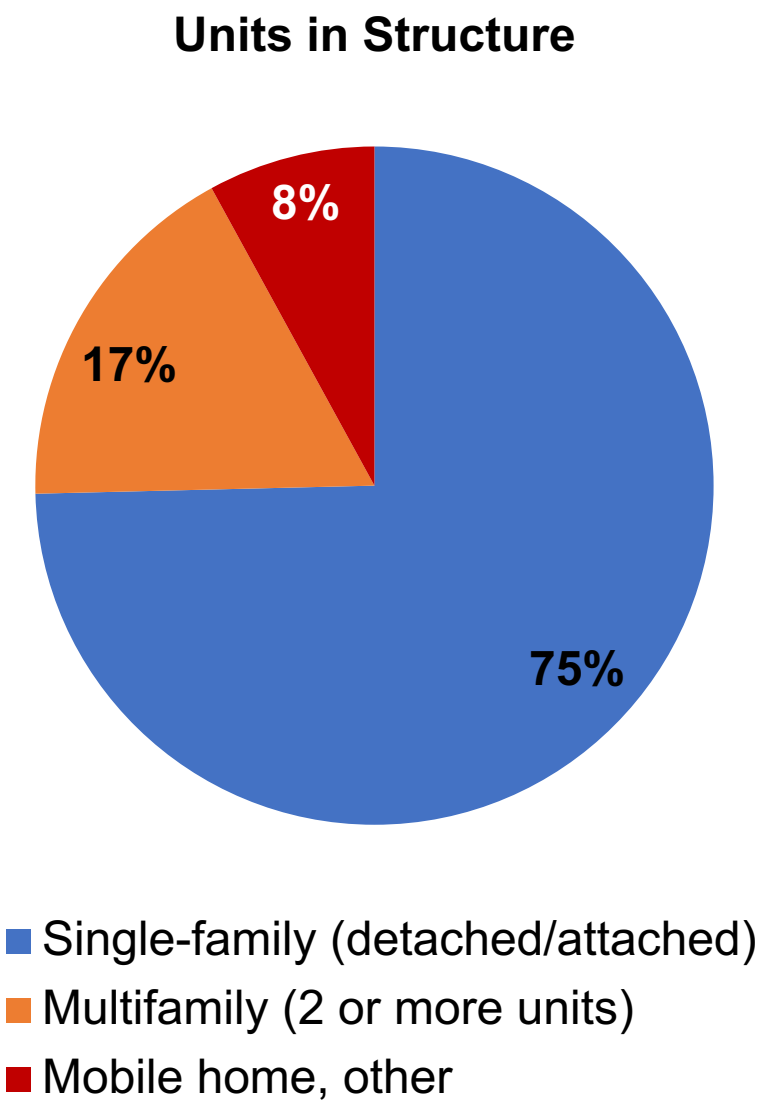
Program	Incentive
Ground-source heat pumps	
NYSERDA 2019	$1,500/ton
NY utilities 2020	$1,500–2,850/ton
Massachusetts MVP	$6,000–20,000/home
Heat pump water heaters	
Energize CT	$750
Efficiency Vermont	$600
Residential new construction	
Energize CT	$1,000/apt., $2,500/home
Weatherization	
Massachusetts MVP	$1,000–9,000
Vermont ZEN	$10,000
DC Sustainable Energy Utility	$5,000–6,500

Programs differ by implementor, target audience, target technology, existing technology, and funding.

Source: Programs to Electrify Space Heating in Homes and Buildings - ACEEE

DE's diverse building stock necessitates targeted decarbonization policy.





Source: United States Census 2019

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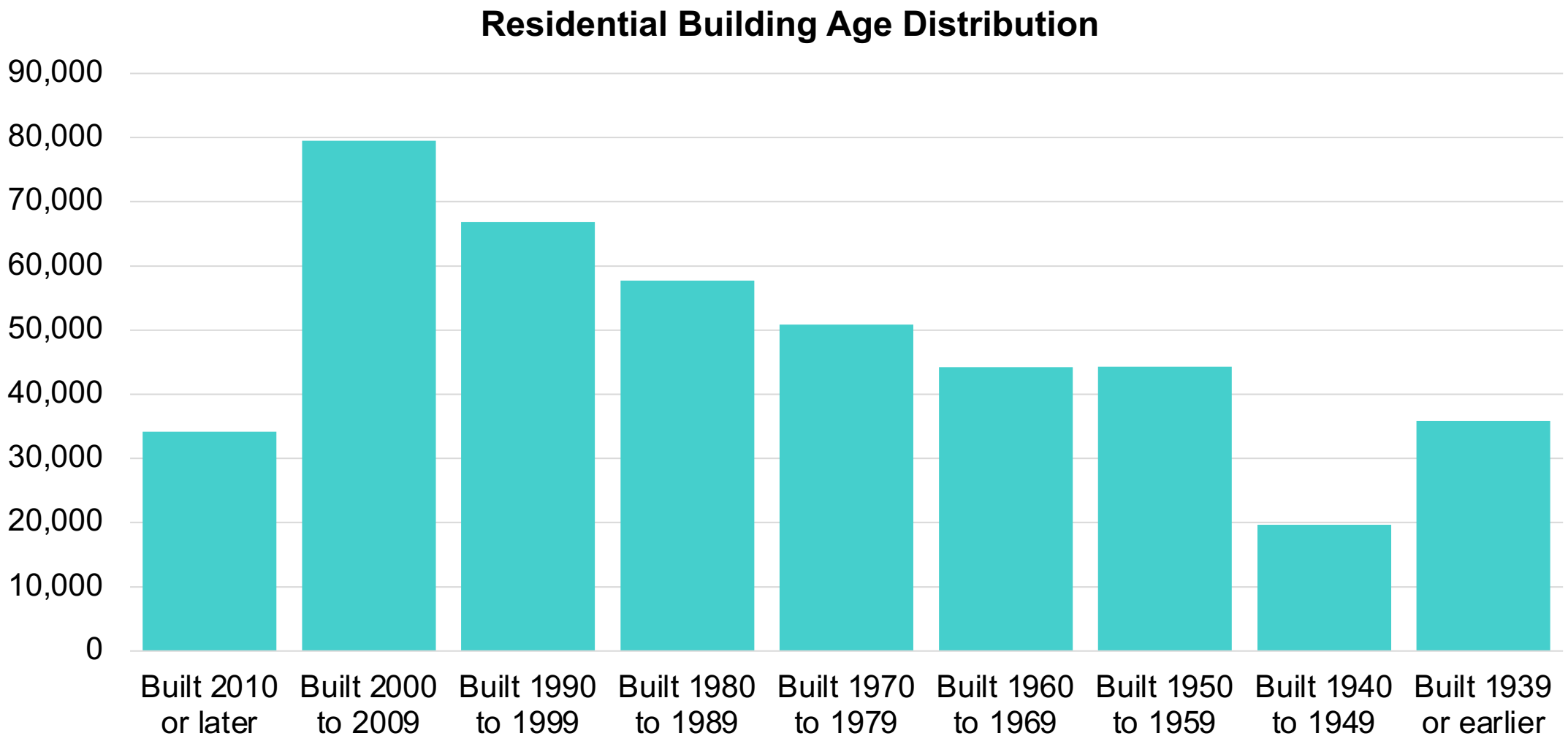

Source: United States Census 2019

Addressing equity will be key to achieving DE's climate goals.

11%

of Delaware's residents live below the poverty level.

8%

of income for low-income families is spent on energy.

10%

of Delaware's residents live with asthma.

Source: United States Census 2019

Building decarbonization directly drives diverse benefits.

Economy	Energy cost savings, avoided operations and maintenance costs, increased revenues through taxes or fees, job creation, real estate property value increases, business attraction, employee productivity gains, and other economic benefits, etc.
Health and Environment	Improved air quality, greater opportunities for physical activity, and other health and environmental benefits, etc.
Safety and Resilience	Improved disaster preparedness, removal of combustion hazards, emergency backup power sources, and other public safety and community resilience benefits, etc.
Aesthetics & Quality of Life	Area beautification and greenscapes, improved comfort, and other benefits that strengthen the region's pride and bolster resident happiness, etc.
Equity	Broader access to regional services (especially for low-income residents), expanded options that empower residents with choices, and other benefits that serve the general public en masse, etc.

Source: RMI 2017

Thank you!