

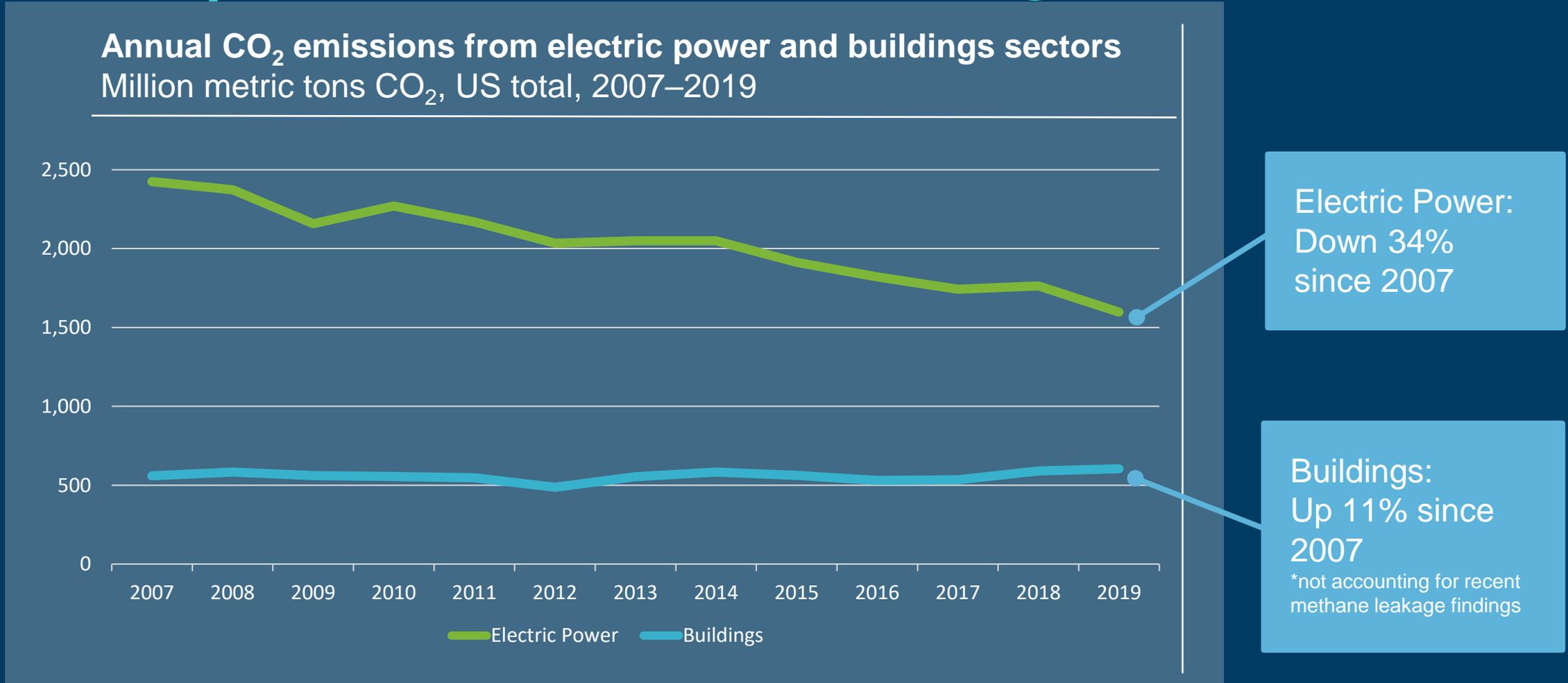


The Economics of Electrifying Buildings

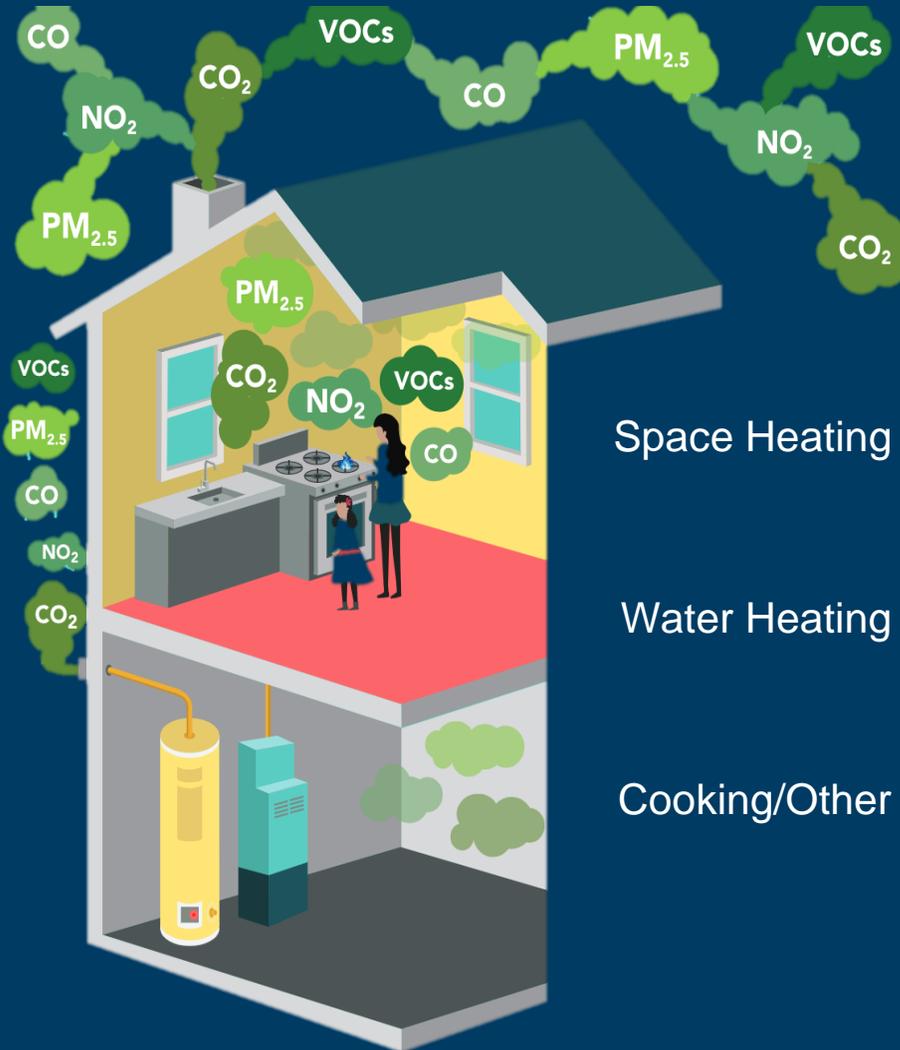
Maryland Briefing

April 2021

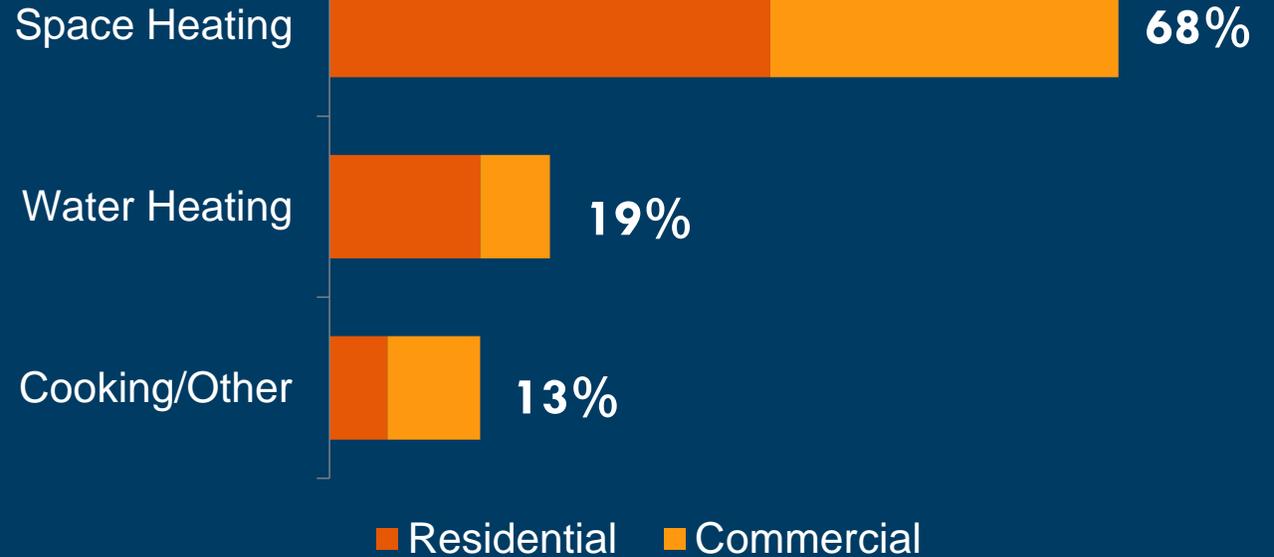
The United States has reduced carbon emissions in the electricity sector, but not in the building sector



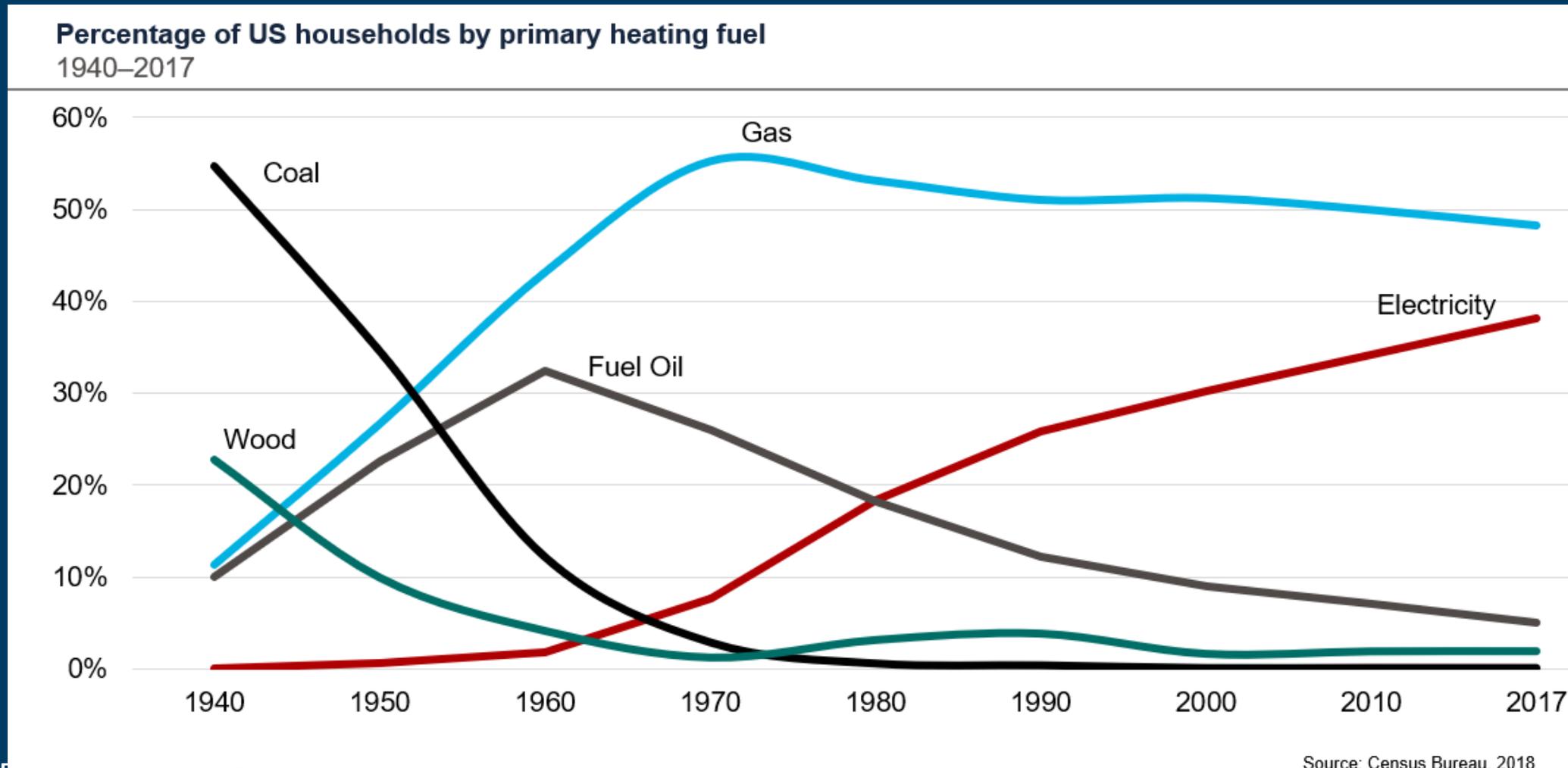
Direct Emissions are from space heating, water heating, and cooking



Breakdown of fuel emissions in buildings



Electricity has been slowly growing as a primary heating fuel, even before “electrify everything” was a climate solution



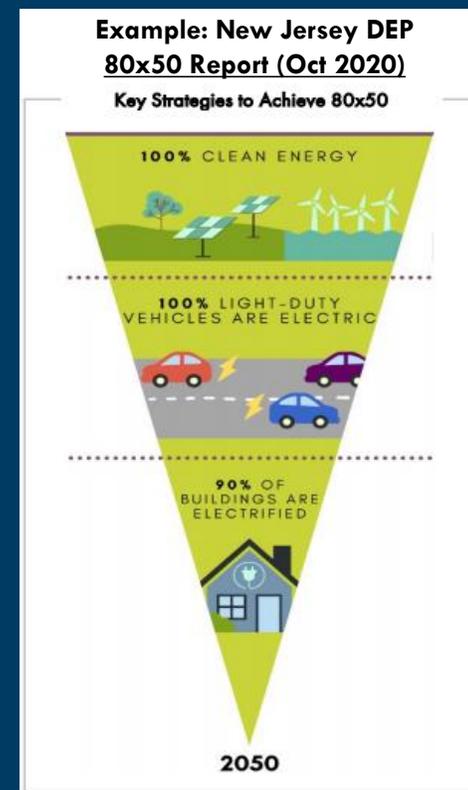
A heat pump uses small amount of electricity to move heat rather than generate heat

- 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

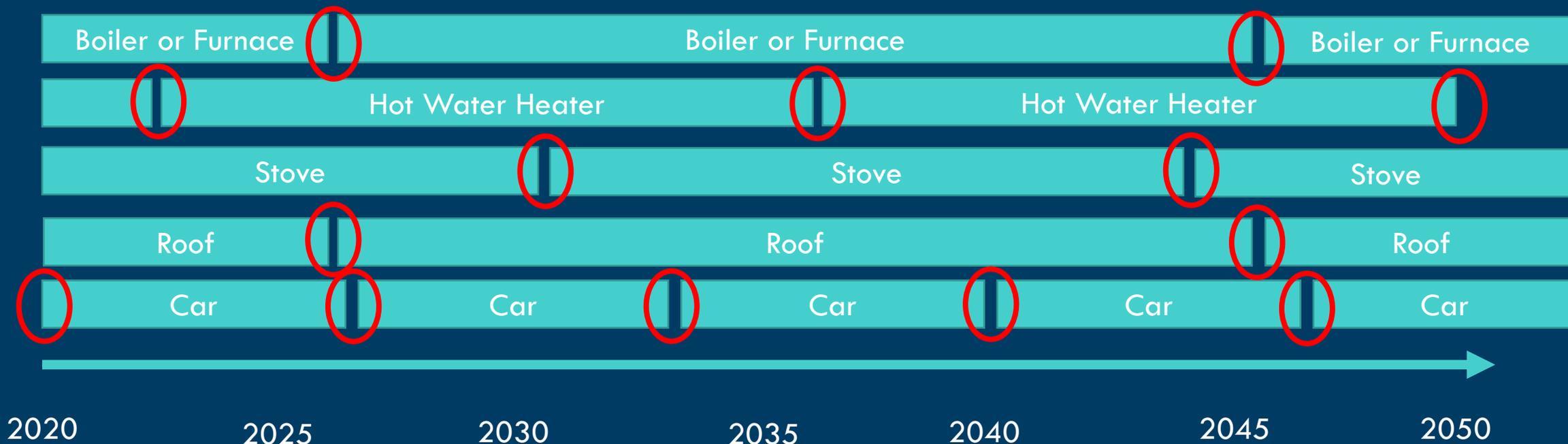


Electrification as a Least Cost Solution

- **Building electrification has emerged as key ingredient to least cost, economywide decarbonization**
 - Least cost path to emission reductions across states: CA, NJ, CO, etc.
 - ‘Optimistic’ scenarios around low carbon gas supply and price still point to use of limited supply in harder-to decarbonize sectors (while relying on electrification for buildings)
- **Absent electrification, customer bills rise significantly as projected prices of biogas or synthetic gas are much higher than current gas prices**
- **Planned transition of the gas system can provide additional system savings and ensure equitable outcomes for low-income communities and workers**

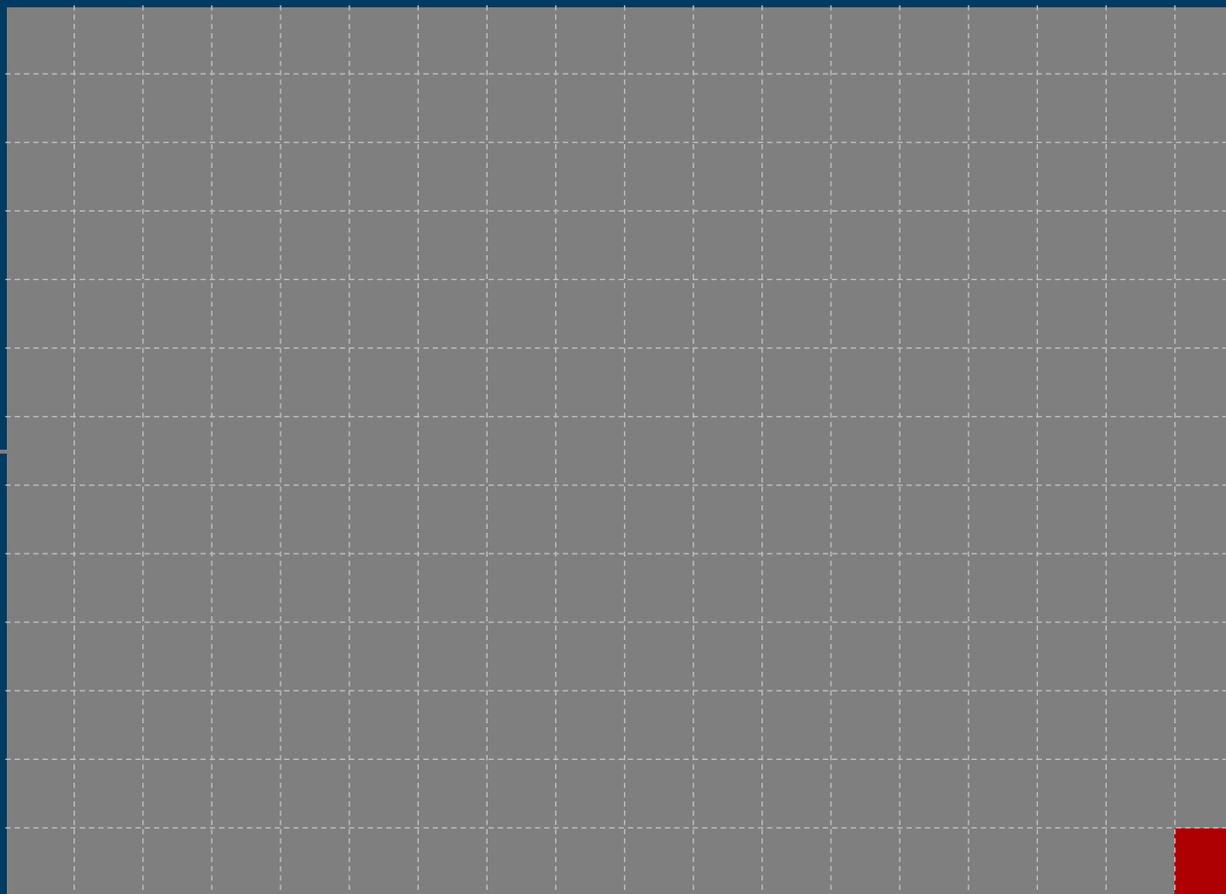


We have a limited number of opportunities to replace equipment economically, given equipment lifetimes



Continued buildout of gas infrastructure presents economic risks for ratepayers, particularly given past underinvestment

US gas distribution system
1.3 million miles of gas mains



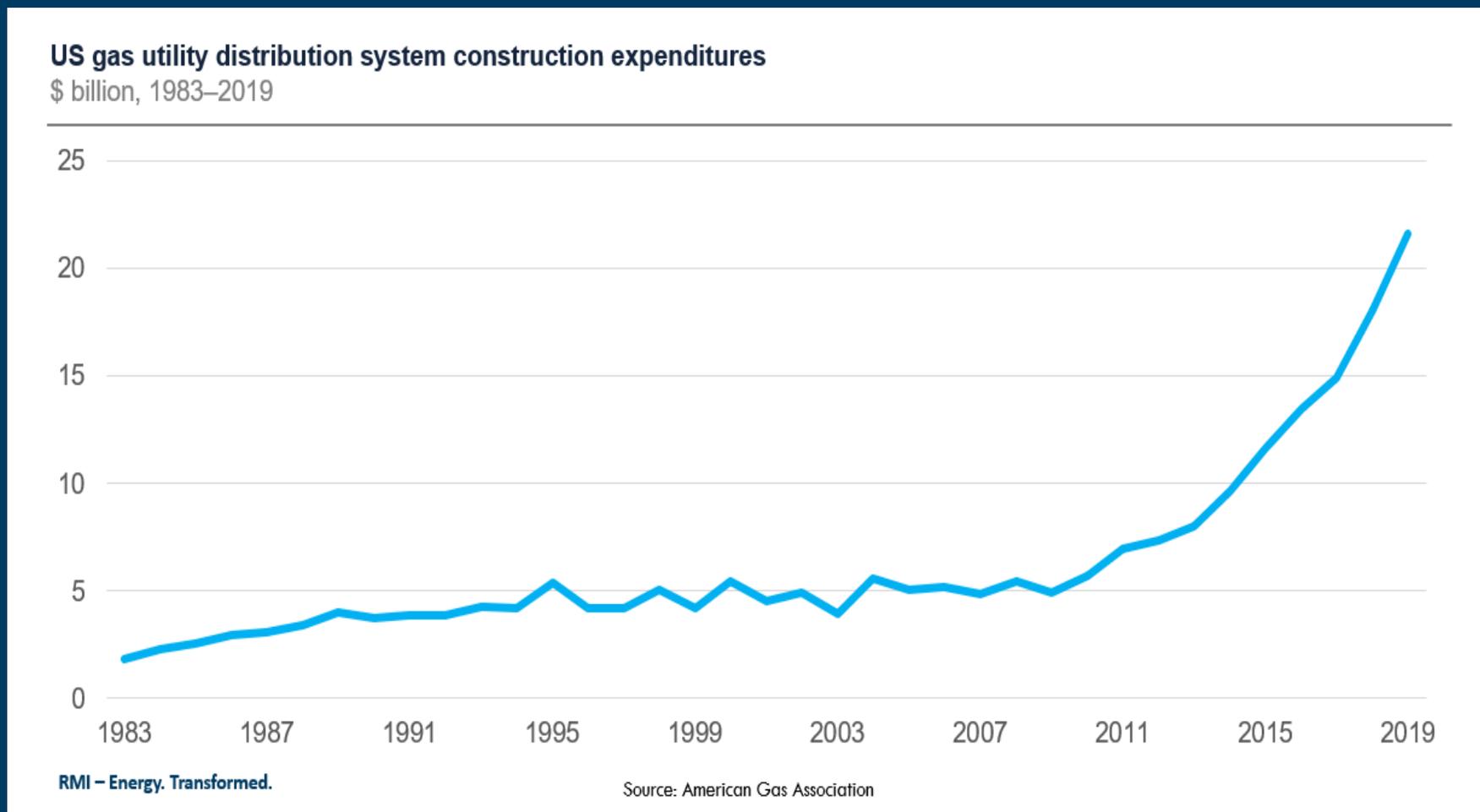
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On average, the system gets 0.8% larger each year, growing by 9,800 miles.

About 5,600 miles of existing gas mains are replaced each year (0.43% of the system).

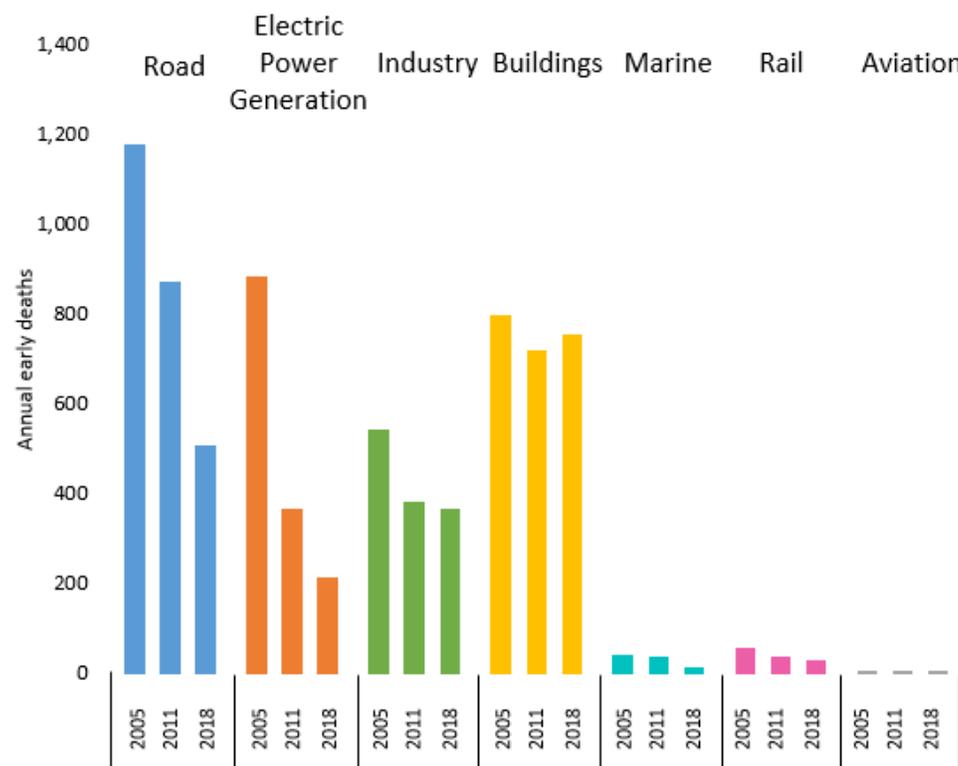
Gas distribution infrastructure spending tripled from 2011 to 2019



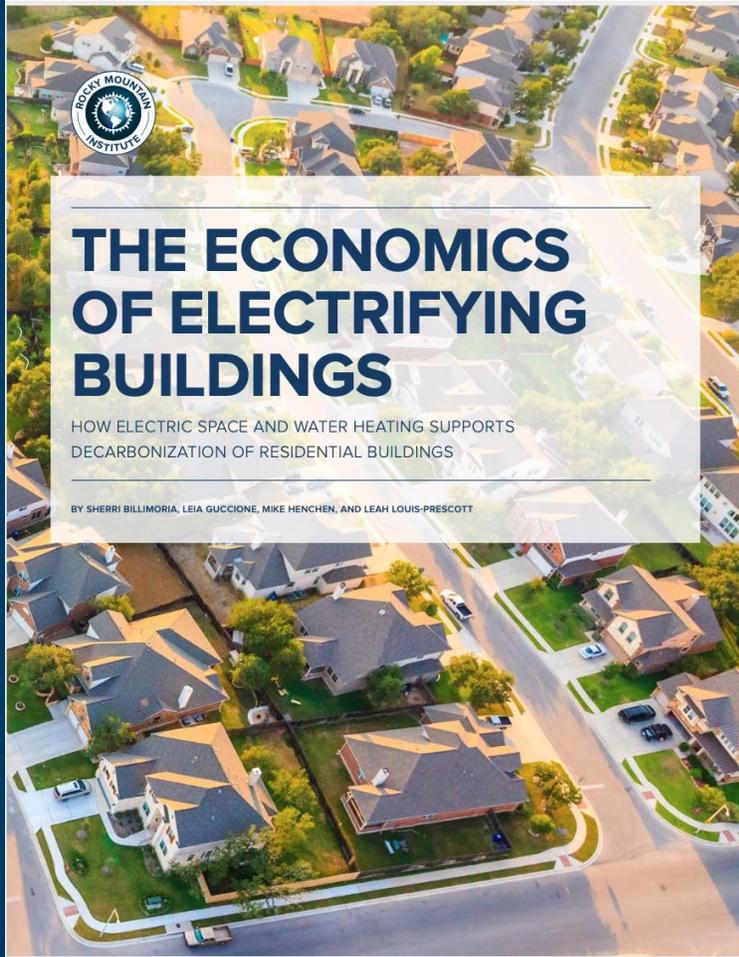
Air Pollution and Health: Buildings are the leading source of combustion-related premature deaths in MD



Annual Premature Deaths in Maryland due to Combustion Emissions (PM2.5 & Ozone) by Sector



Economics of Electrifying Buildings

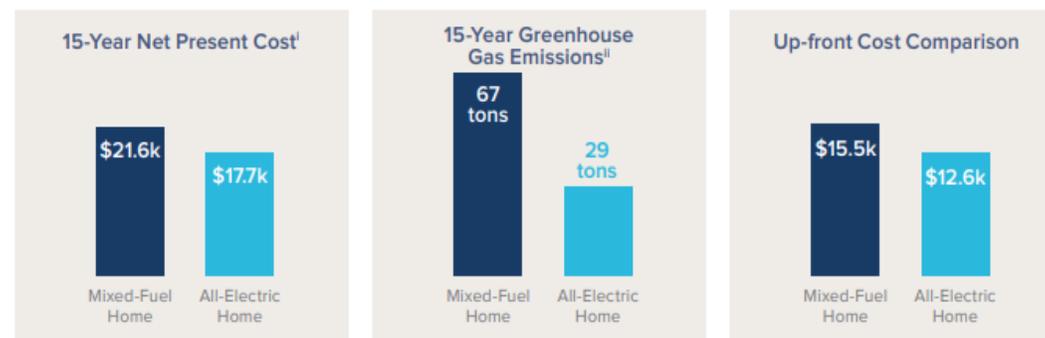


- **RMI has conducted research on the project economics of residential electrification, across a range of cities**
 - 2018: Providence, Chicago, Houston, Oakland
 - 2020 update: Seattle, Denver, Austin, Minneapolis, Columbus, NYC, Boston
- **Integrated view of project economics by city**
 - Upfront costs – labor and equipment
 - Full year, hourly energy model in EnergyPlus
 - Local gas and electricity tariffs
- **On a project basis, heat pumps can be cost-effective today for new construction and in some retrofit cases**
 - New construction
 - Retrofit - Electric resistance (operational savings)
 - Retrofit - Delivered fuels (operational savings)

RMI analyzed the costs of a new all-electric home versus a new mixed-fuel home that relies on gas for cooking, space heating, and water heating. **In Columbus, the all-electric home saves \$3,900 in net present costs and 38 tons of CO₂ emissions over a 15-year period.**

New Analysis:

New, all-electric single family homes are already cheaper across the seven cities



- **Upfront cost savings translate to a significantly lower 15-year net present cost due to**
 - Single appliance for heating and cooling (vs furnace and AC cost)
 - Avoided gas connection costs
- **Large projected carbon emissions avoided per home over fifteen years, even with modest assumptions on decarbonization of electricity sources (NREL)**
- **Operating costs were comparable (+/-3%) in three cities, and lower for the remaining four**
 - Avoided gas fixed charges
 - Higher efficiency equipment for heating and cooling
 - In some cases (Minneapolis and Boston), special electric heating rates during winter

Policy Implications

- **Update / remove gas line extension allowances**
- **Leverage all-electric new construction and opportunistic retrofits scenarios to jump start the heat pump market**
- **Invest in market development programs to drive demand and cost compression for retrofits**
- **Reform rates to improve the business case for electrification and ensure bill parity or savings across the board.**
- **Prioritize electrification planning for low-income communities**

Questions/Discussion

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