US Heat Pump Deployment

Growth Impacts on the Grid

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Residential Space Conditioning in the U.S.

In 2020 RECS survey, **15%+** of households use heat pumps as their primary method of **space heating**

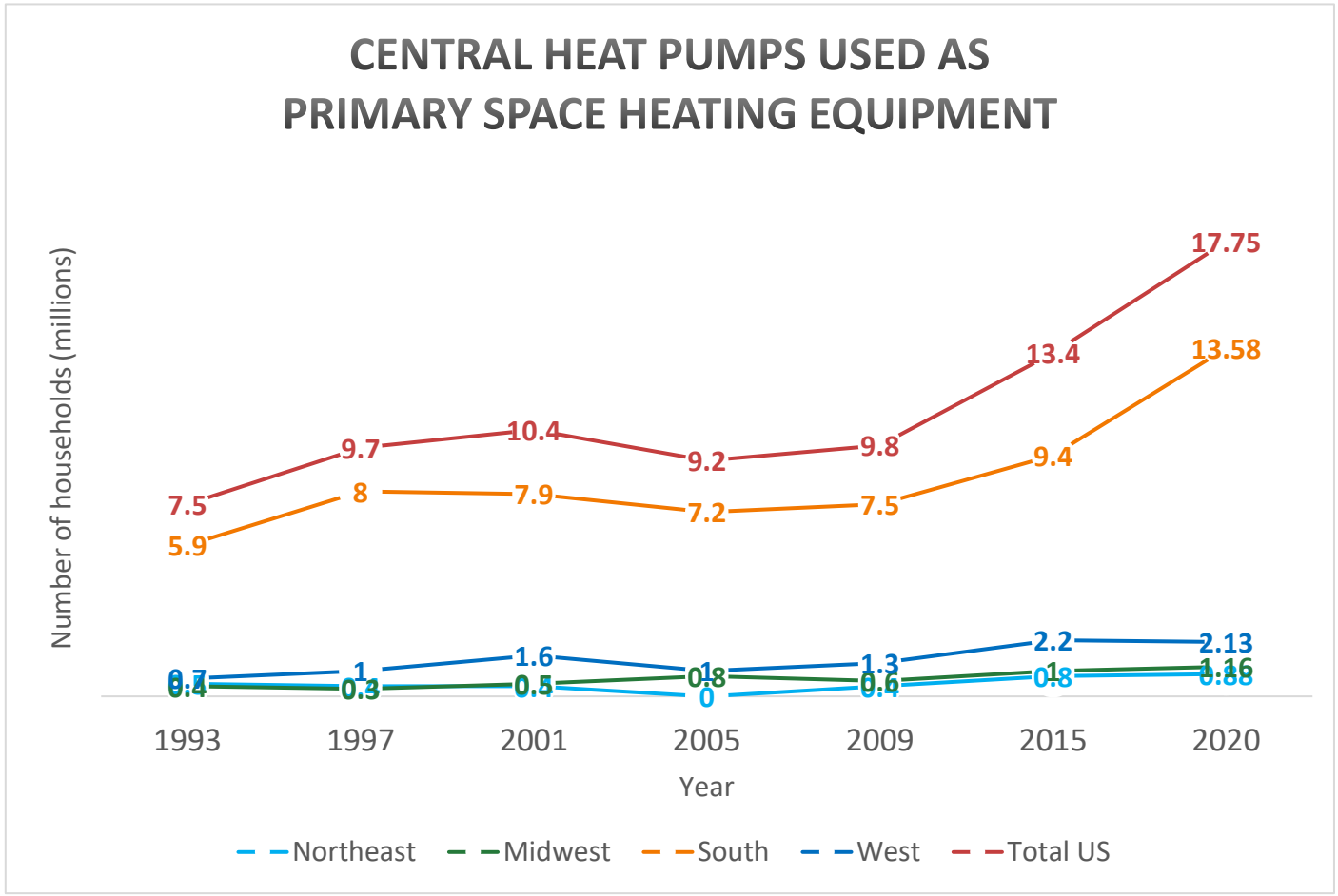
In the same survey, nearly **68%** of households use **central air conditioning** equipment

In 2021, space conditioning accounted for roughly **42%** of residential energy usage

References: Residential Energy Consumption Survey (RECS) - Energy Information Administration (eia.gov)
Residential Buildings Factsheet | Center for Sustainable Systems (umich.edu)
https://www.eia.gov/todayinenergy/detail.php?id=52558

Heat pumps could play a large role in decarbonizing space conditioning

US Heat Pump Adoption Regionally Driven

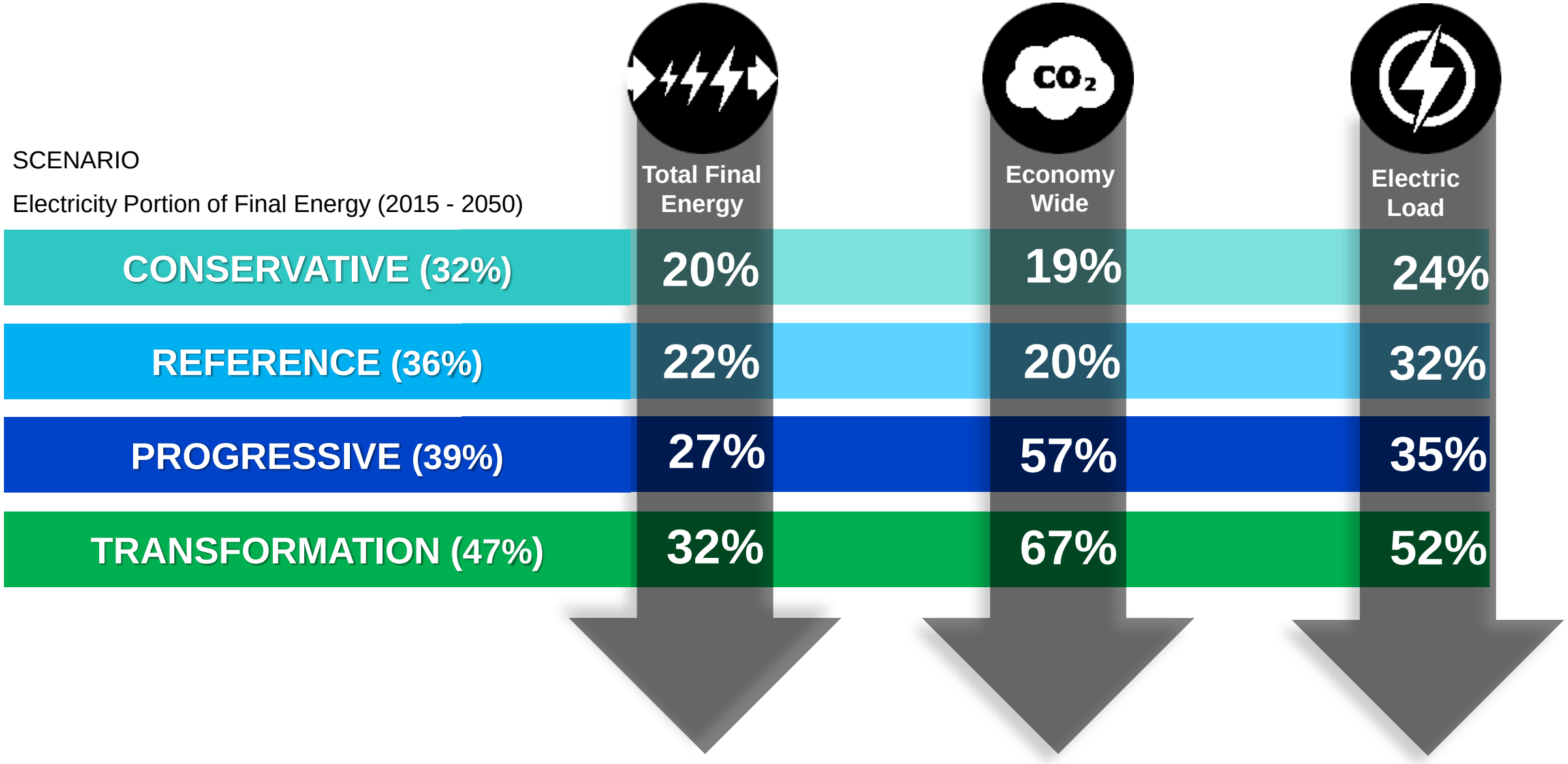


Reference: Residential Energy Consumption Survey (RECS) - Energy Information Administration (eia.gov)

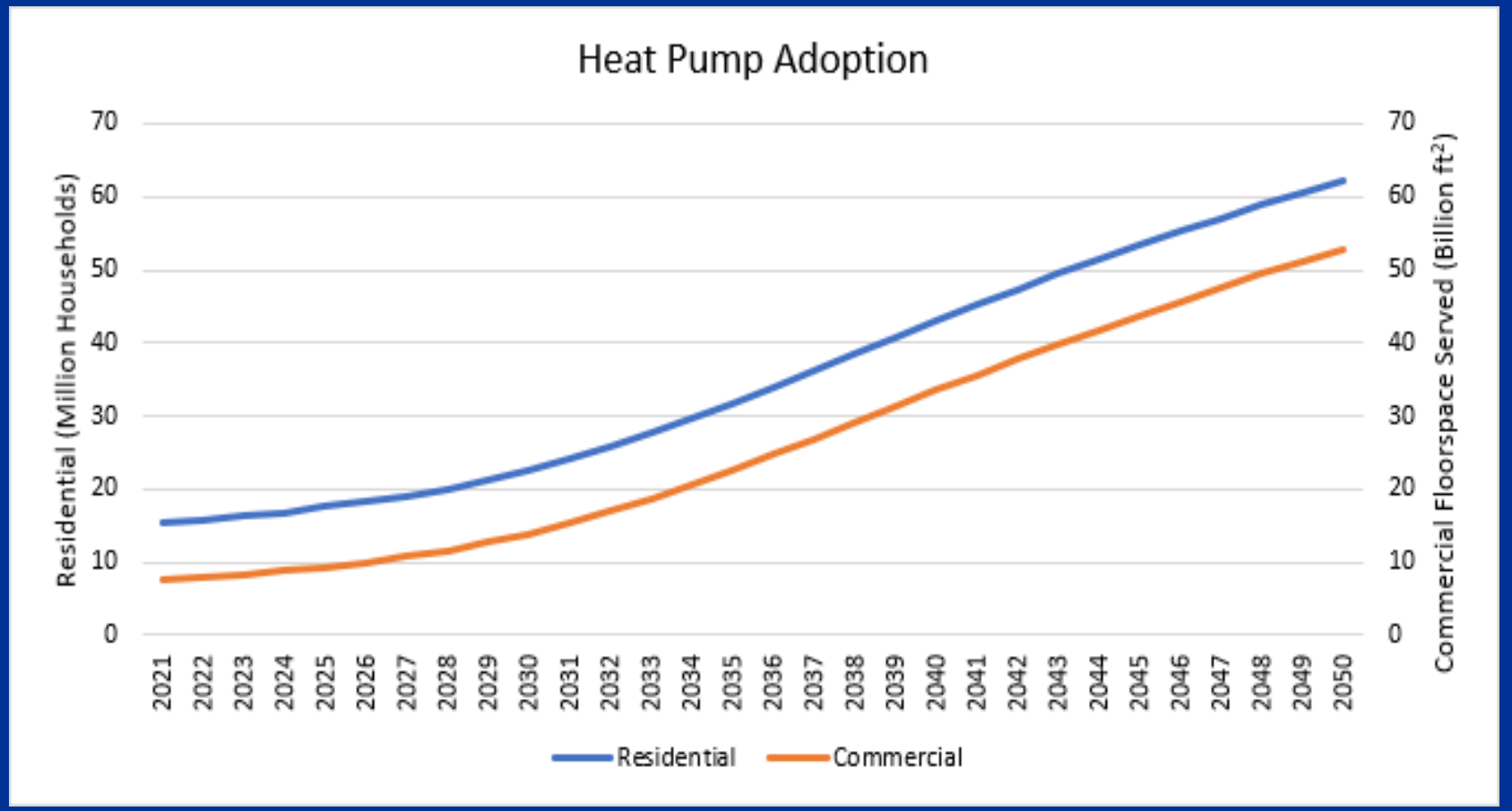
- **Growth largely in the South**
- **Skepticism remains in colder regions**
- **Gaps in understanding the technology remain for owners & contractors**

Over last 10yrs, residential adoption of heat pumps has increased dramatically

US Electrification Impacts: Energy, CO_2, Demand



Projected US Heat Pump Growth & Drivers



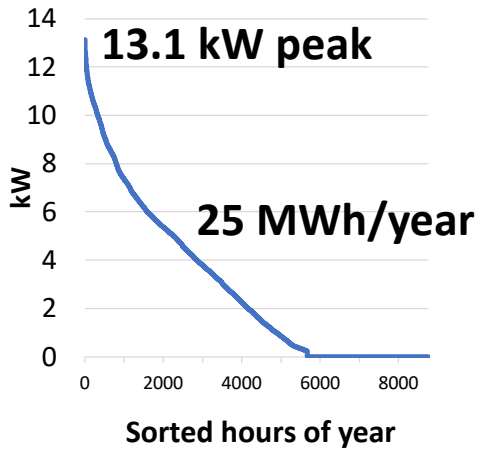
New construction

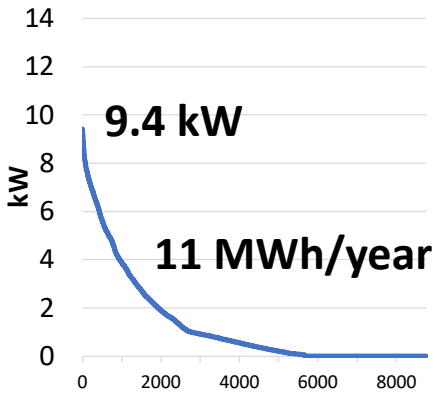
Fuel switching

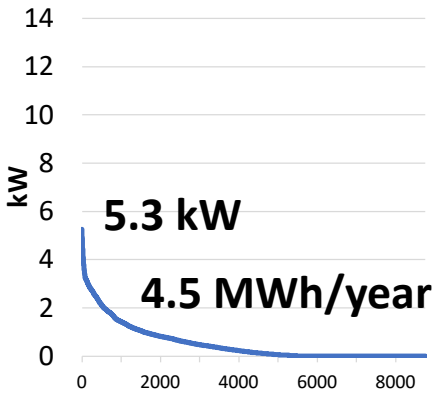
Conversion Efficiencies

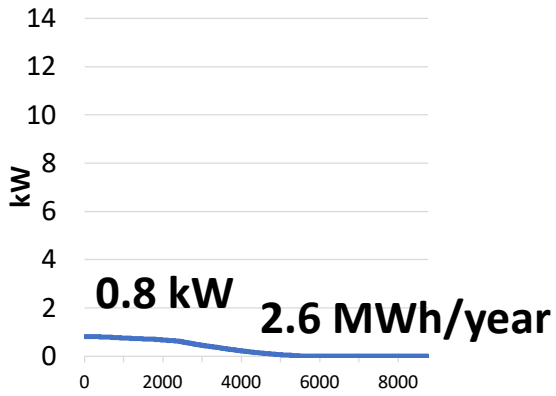
Space Heating Load Shape Examples

Sorted annual (diversified) load for representative house, a 3,000 ft² single-family home in central Michigan

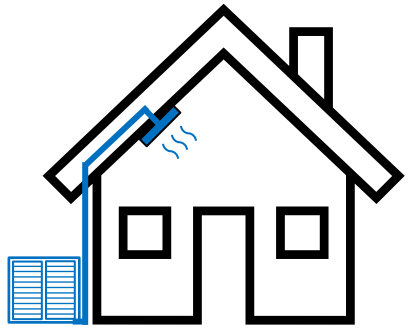




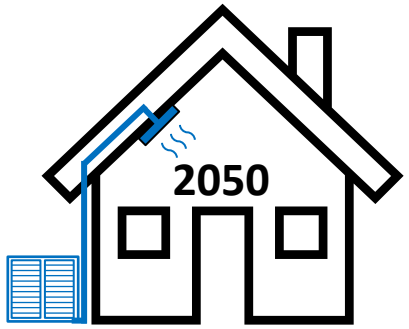




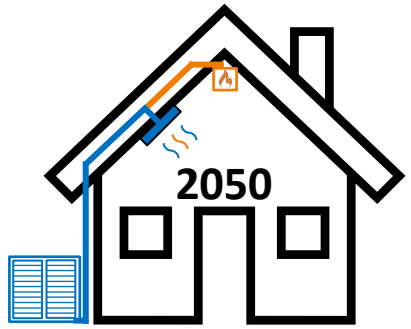
Older home with electric resistance heating



Current new home with current (single speed) air-source heat pump



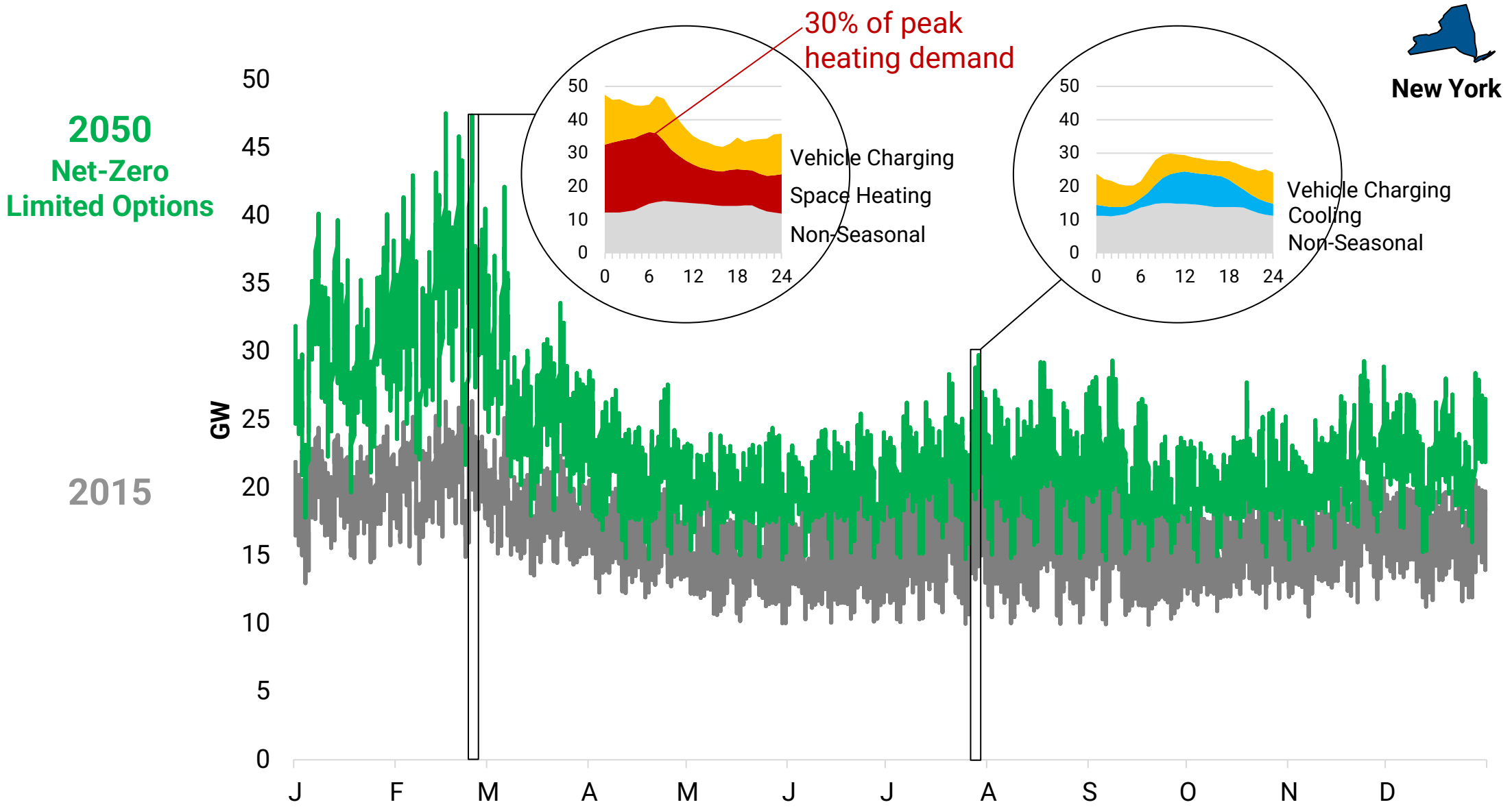
Future new home with **future** variable speed air-source heat pump



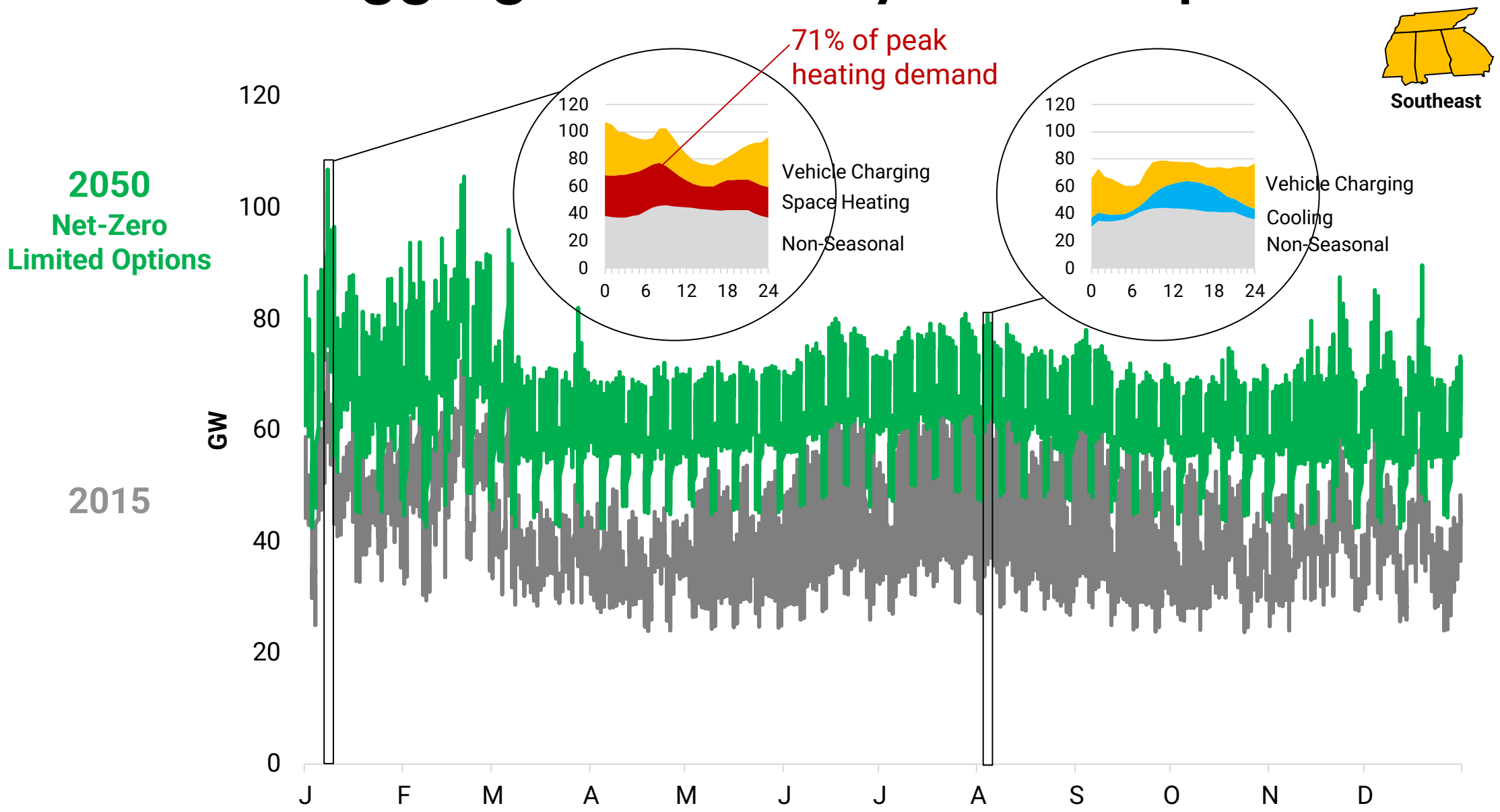
Future new home with **future** heat pump + hybrid gas back-up

Heat pump reduces gas use by **70%** overall, but only by **30%** at the peak

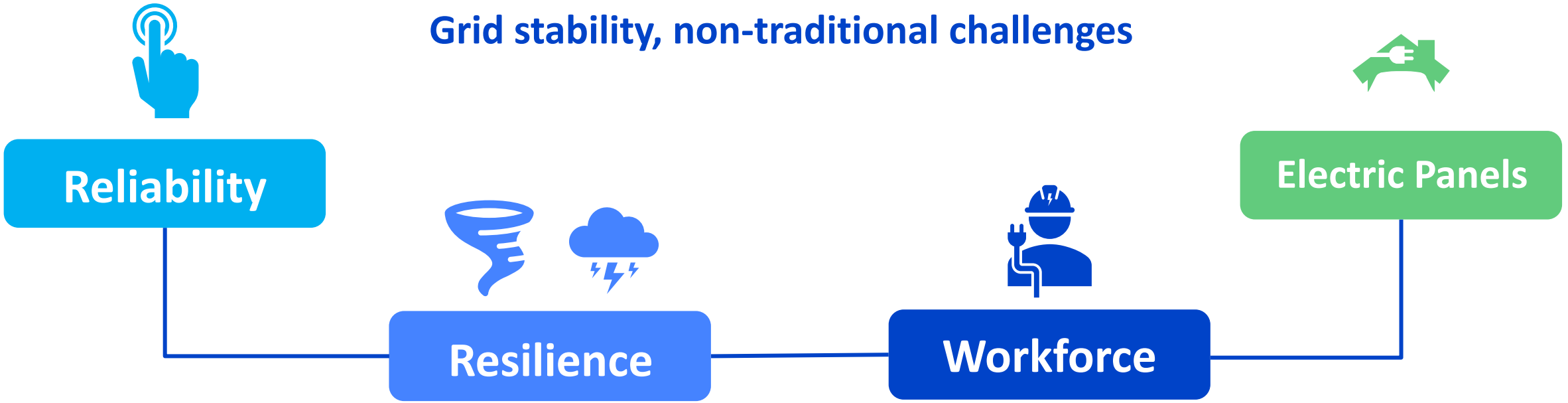
New York Aggregate Electricity Load Shape



Southeast Aggregate Electricity Load Shape



Heat Pump Growth Impediments



Positive Impacts From Heat Pump Growth