Impacts of the Inflation Reduction Act on Consumer Energy Expenditures

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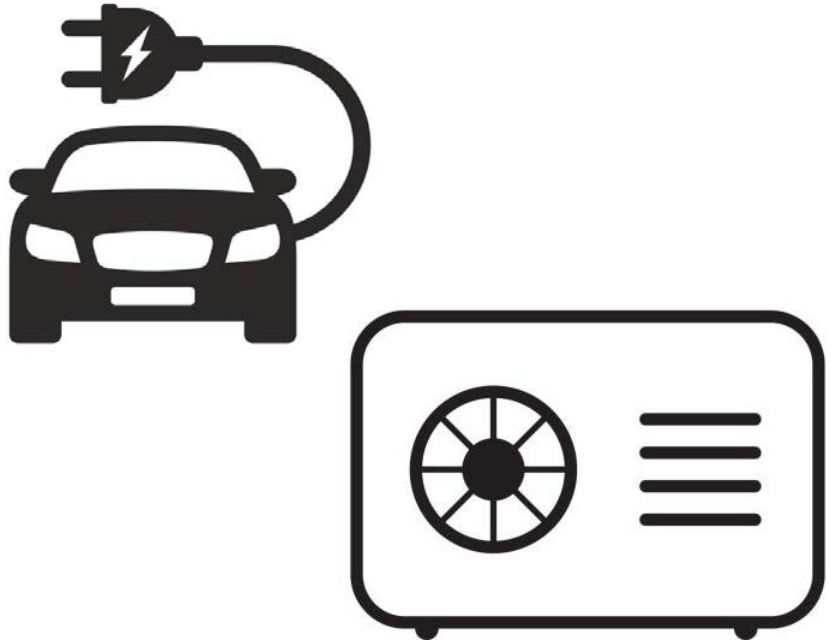
April 18, 2024

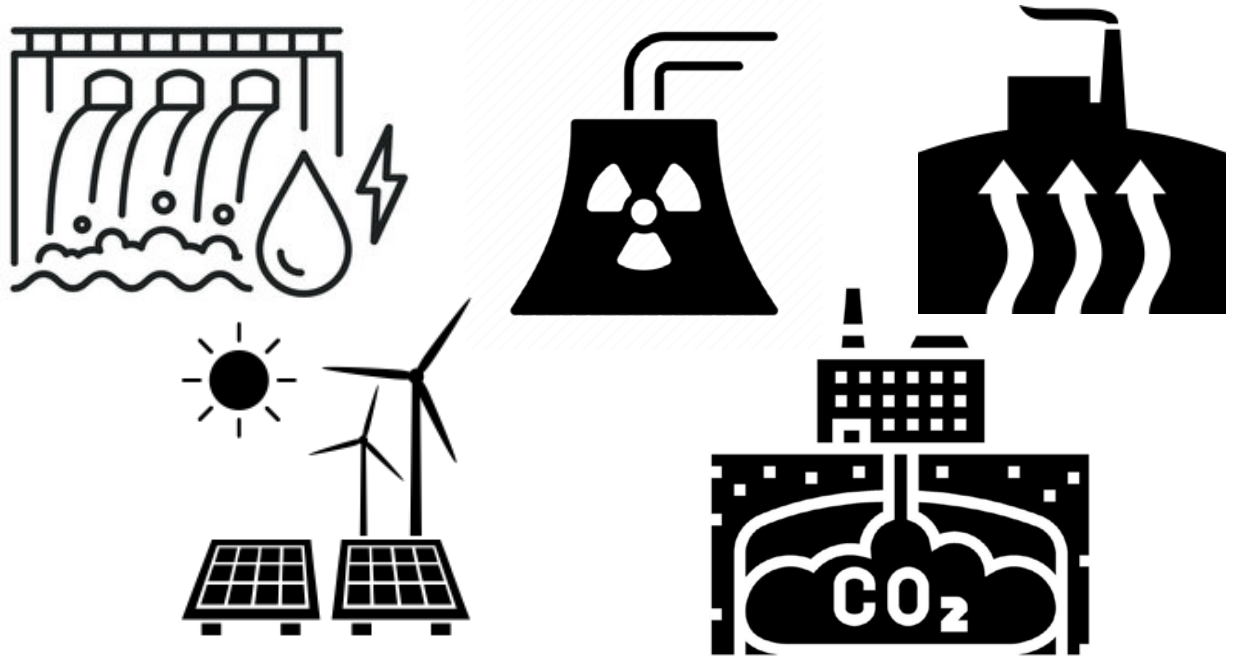
Today's Topic

As the energy-related provisions of the Inflation Reduction Act unfold, how could customer energy expenditures be impacted?

Energy Demand Incentives



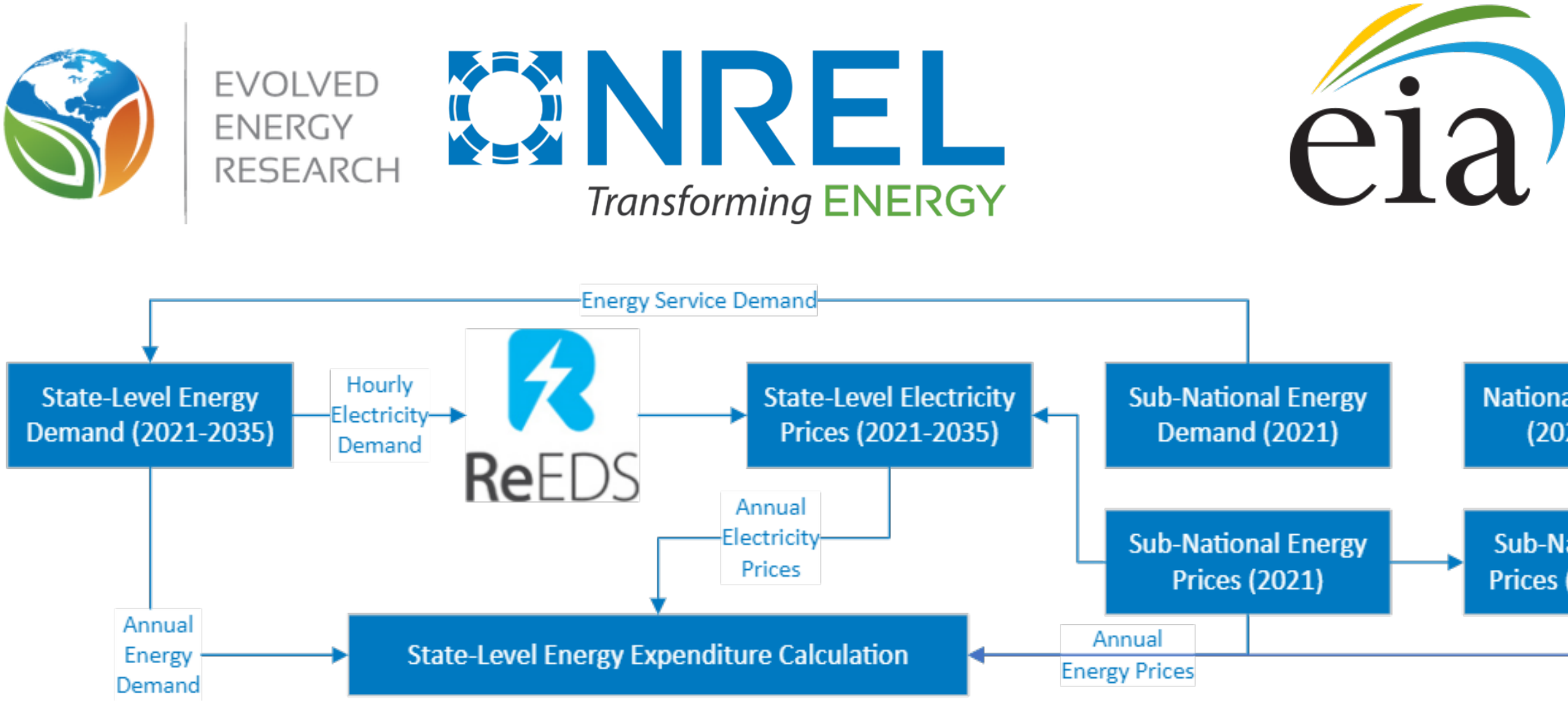
Energy Supply Incentives



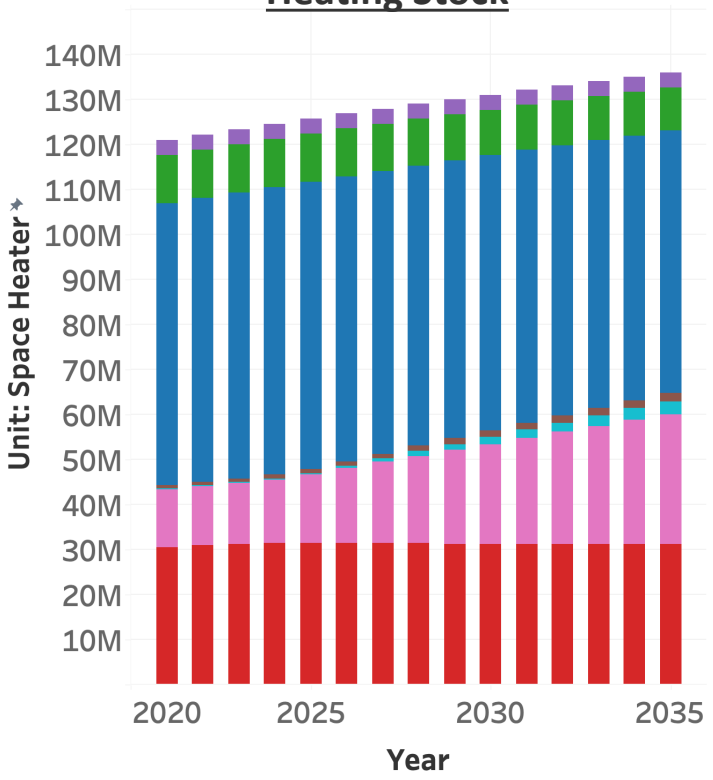
Key Scope Boundaries/Features			
Use phase only	State-level analysis	Exploring changes *over time*	Reliant on uncertain price projections
NOT considering upfront costs	NOT household-level	NOT comparison of with/without IRA scenarios	Distribution infrastructure costs, in particular, are not well represented

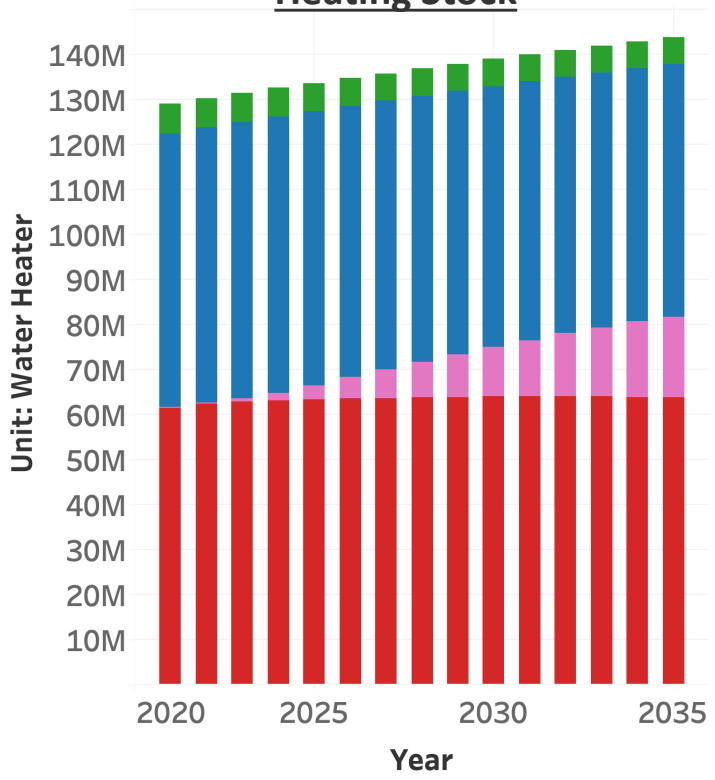
Methodology and Datasets

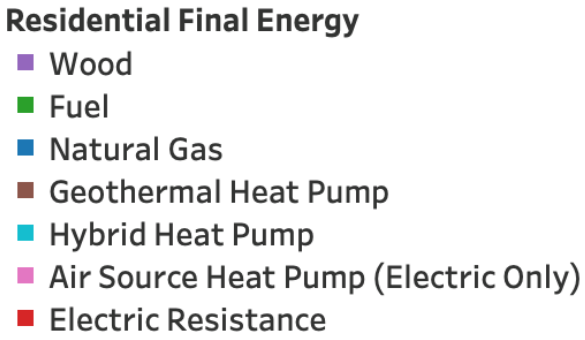
$$Energy\ Consumption\ *\ Energy\ Price = Energy\ Expenditure$$



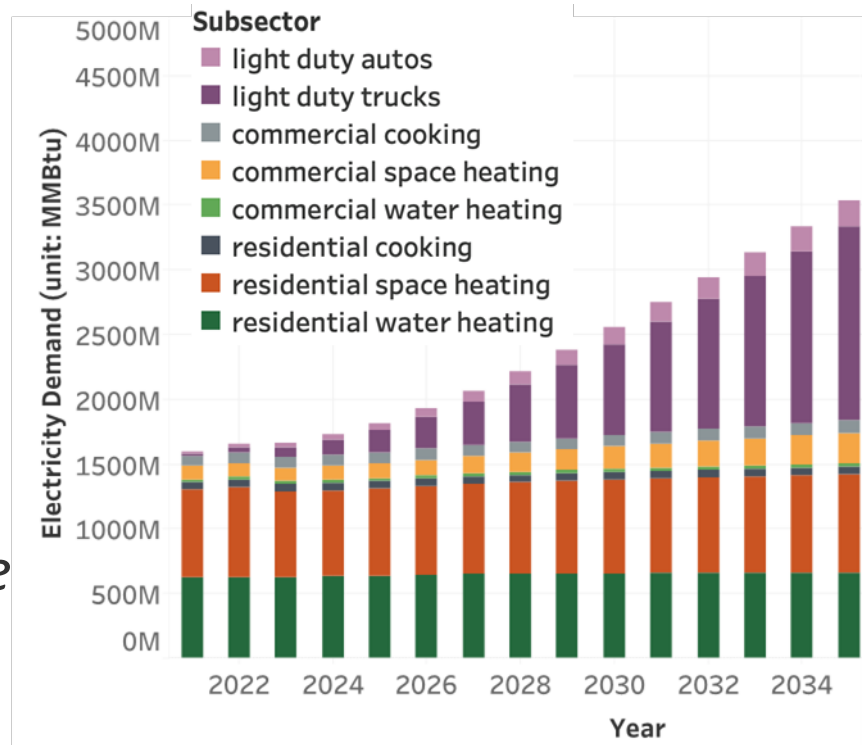
Assumptions about End-Use Adoption Rates







Annual Electricity Demand for Select Sub-Sectors

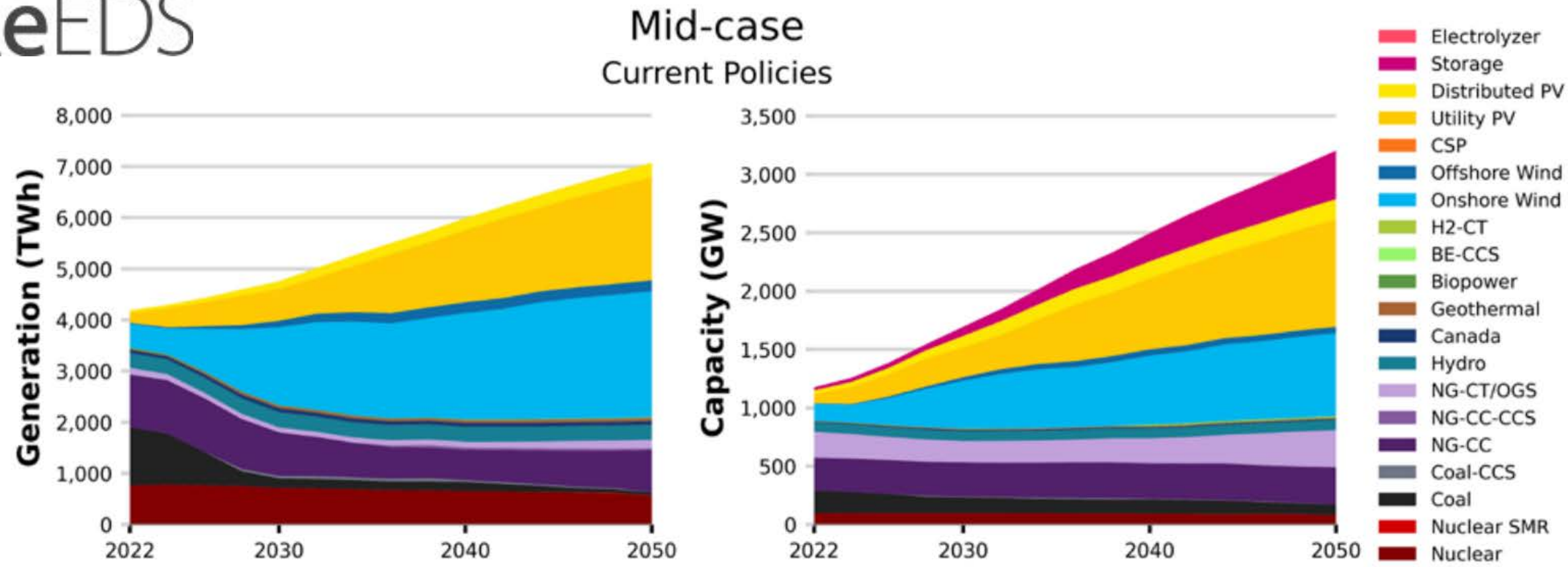


Scenarios for equipment adoption indicate that the greatest end-use impacts of IRA incentives could lie in residential space heating, residential water heating, and light-duty vehicles

https://repeatproject.org/results -- *Current Policies Scenarios*

Projections for Power Sector Evolution

ReEDS



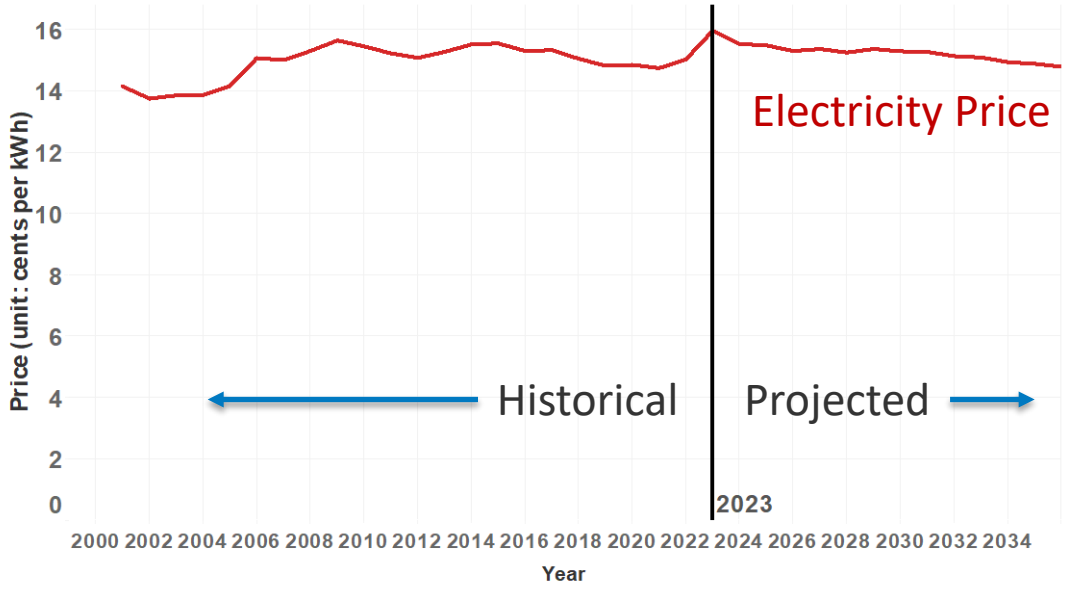
Power sector evolution scenarios indicate significant shifts in the U.S. electricity generation mix, primarily driven by technology-neutral tax credits and CCS incentives

https://www.nrel.gov/docs/fy24osti/87724.pdf -- NREL's Standard Scenarios

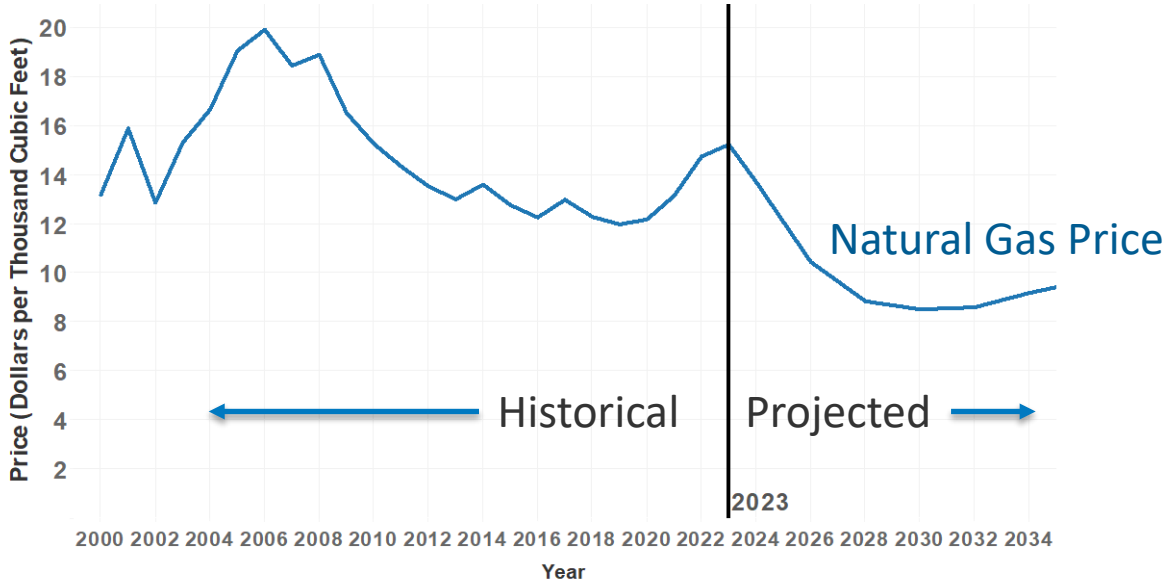
Energy Prices are Projected to **be Flat** or **Decline**

ReEDS

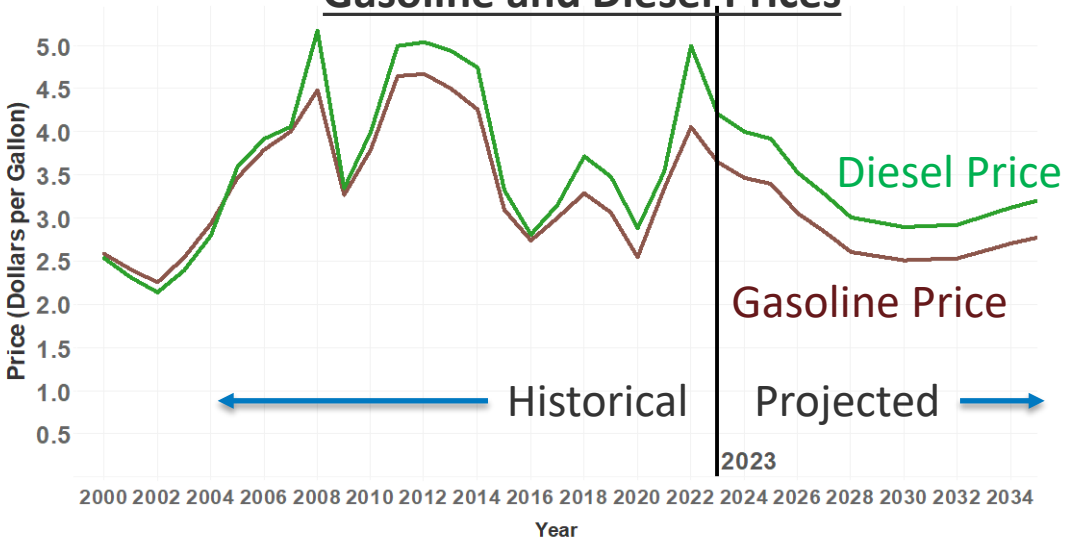
Residential Electricity Price



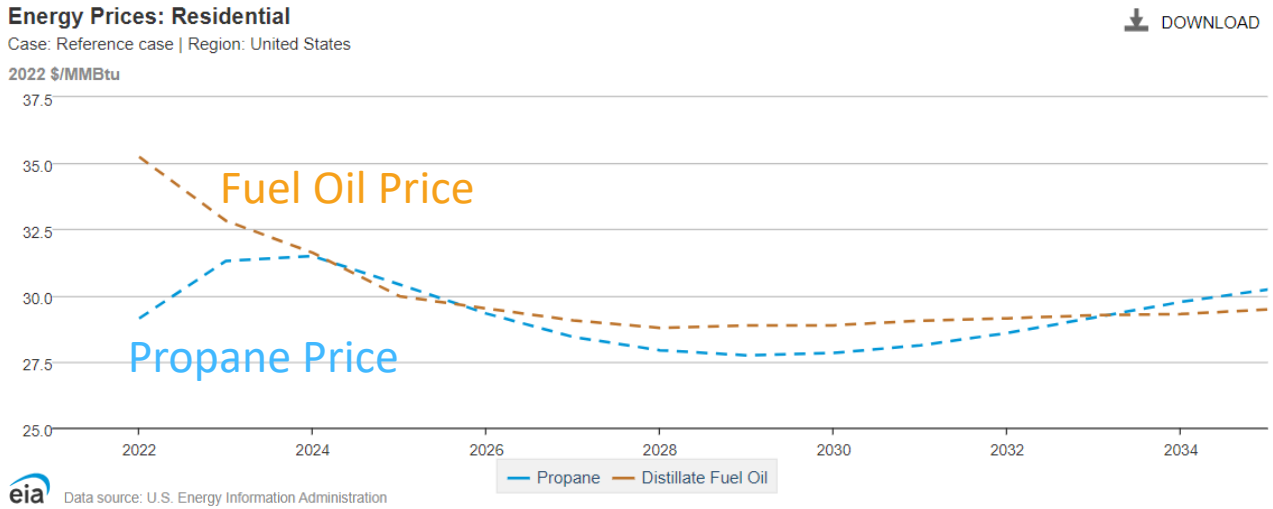
Residential Natural Gas Price



Gasoline and Diesel Prices



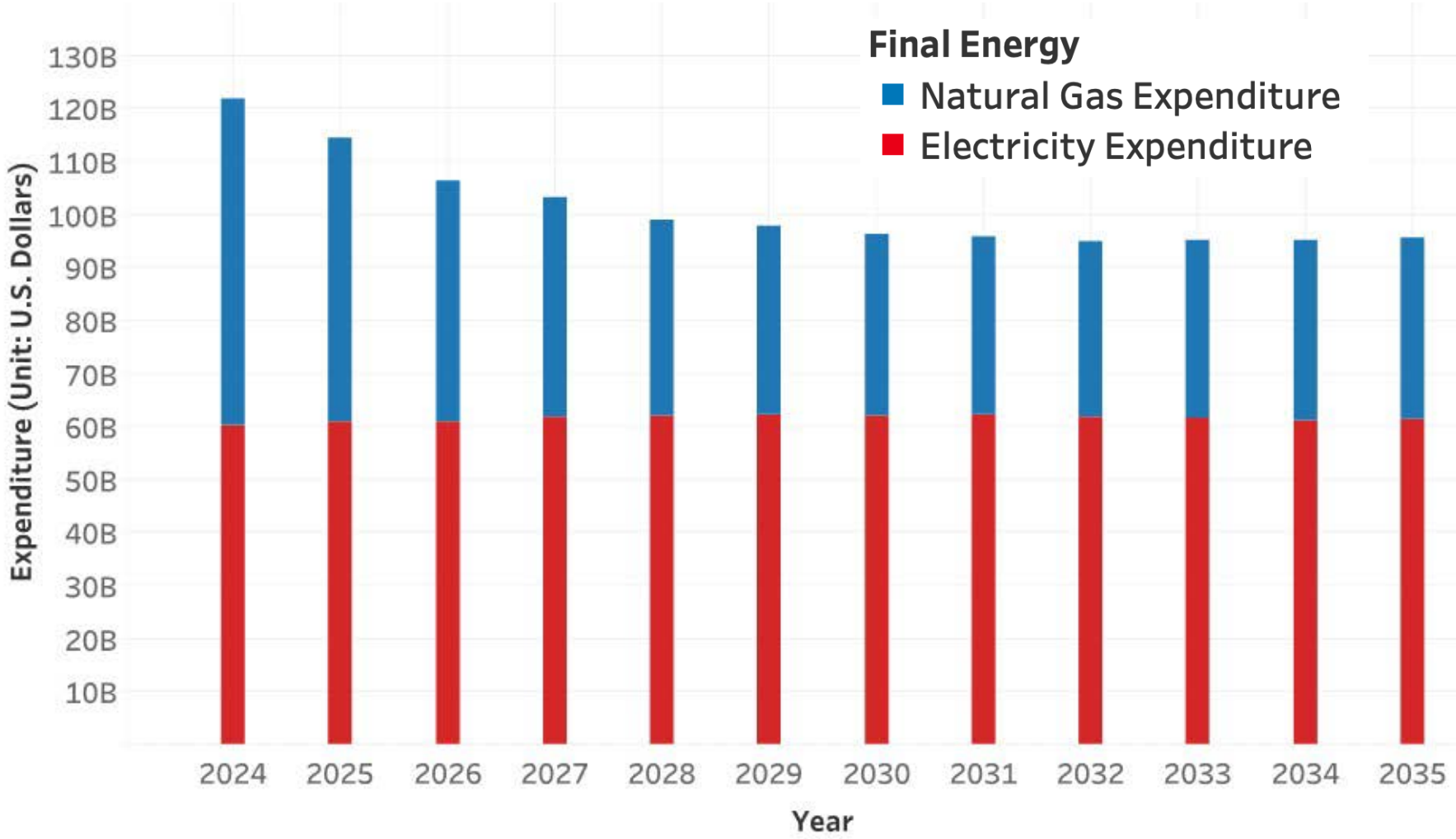
Residential Fuel Oil and Propane Prices



National Trends: Energy Expenditures for Residential Space and Water Heating

$$Energy\ Consumption * Energy\ Price = Energy\ Expenditure$$

Near-term reductions in natural gas expenditures



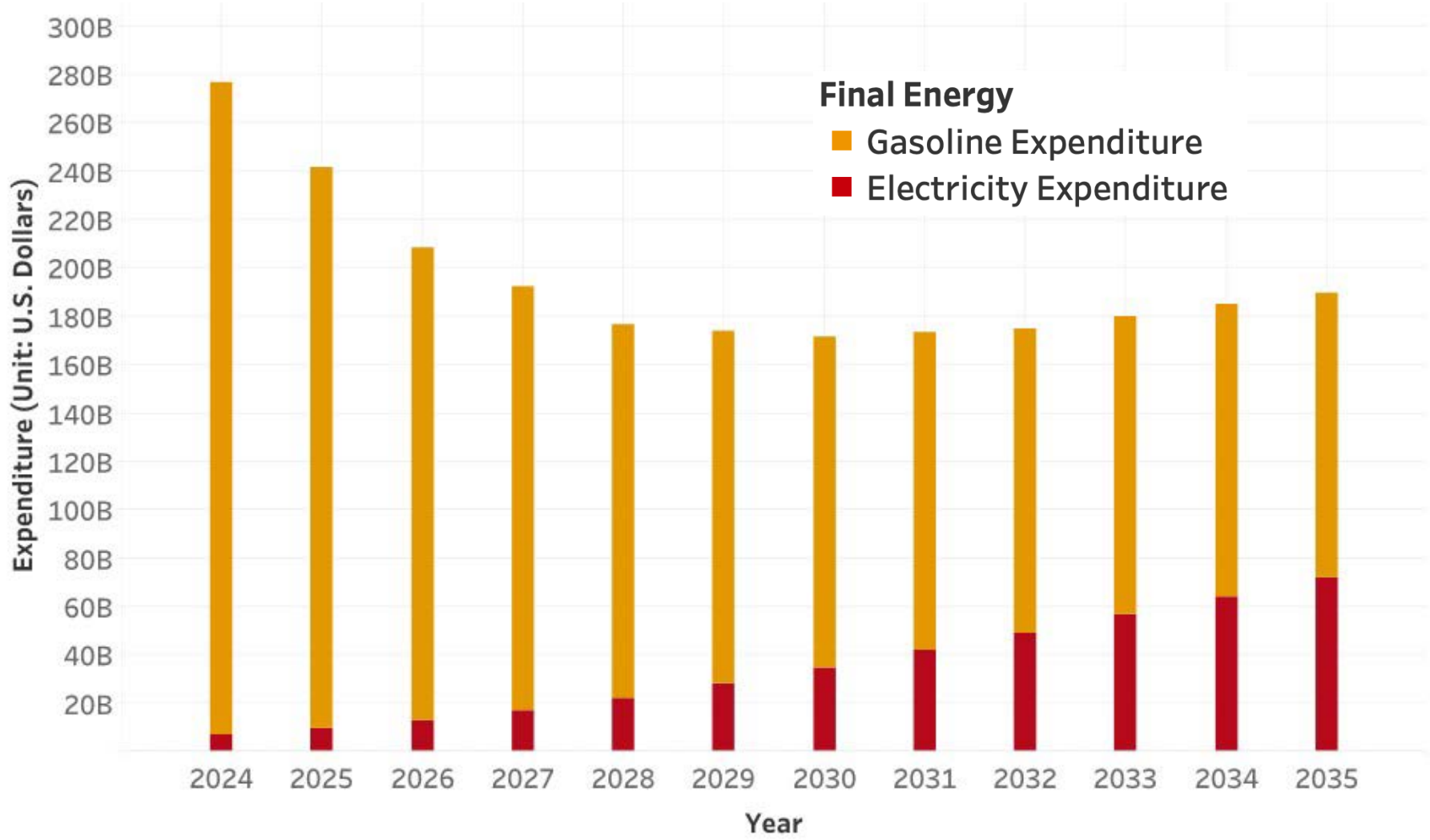
Net Effect: Reduction in energy expenditures for residential space and water heating (relative to 2021)

Modest increases in electricity expenditures

National Trends: Energy Expenditures for Light-Duty Vehicles (Fueling and Charging)

$$Energy\ Consumption * Energy\ Price = Energy\ Expenditure$$

Sustained reductions in gasoline expenditures (prior to 2030)

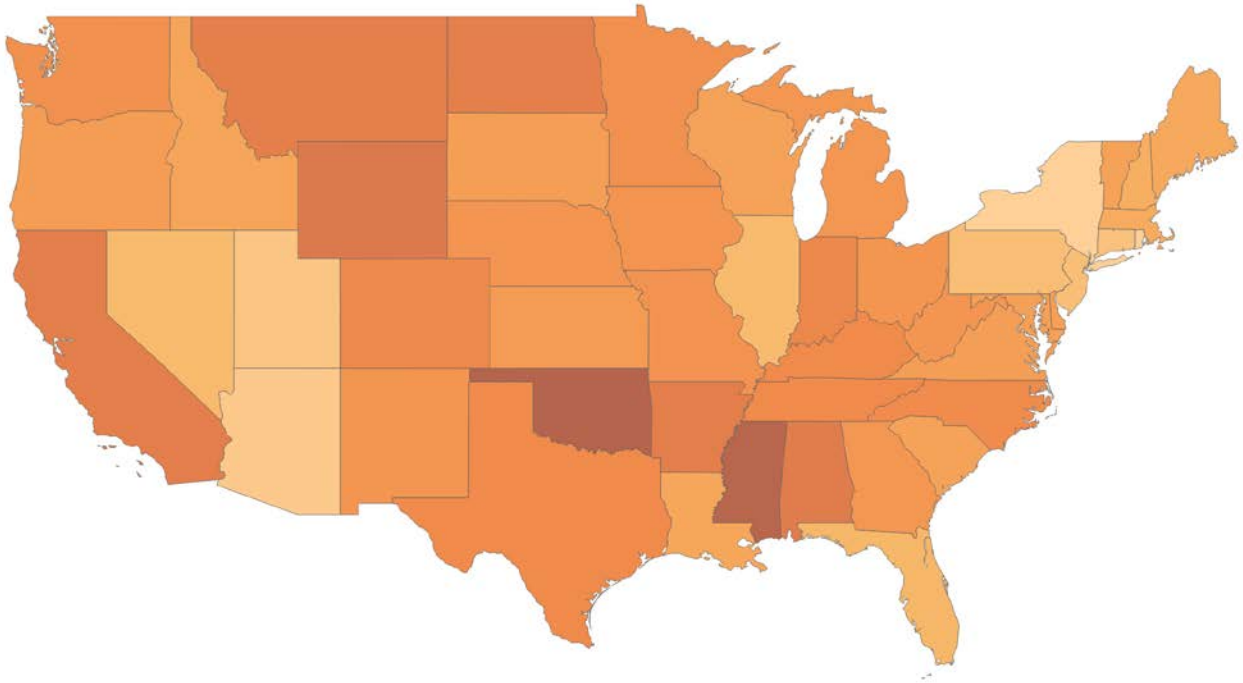


Net Effect: Reduction in energy expenditures for "fueling" light-duty autos and trucks (relative to 2021)

Sustained increases in electricity expenditures

Sub-National Trends

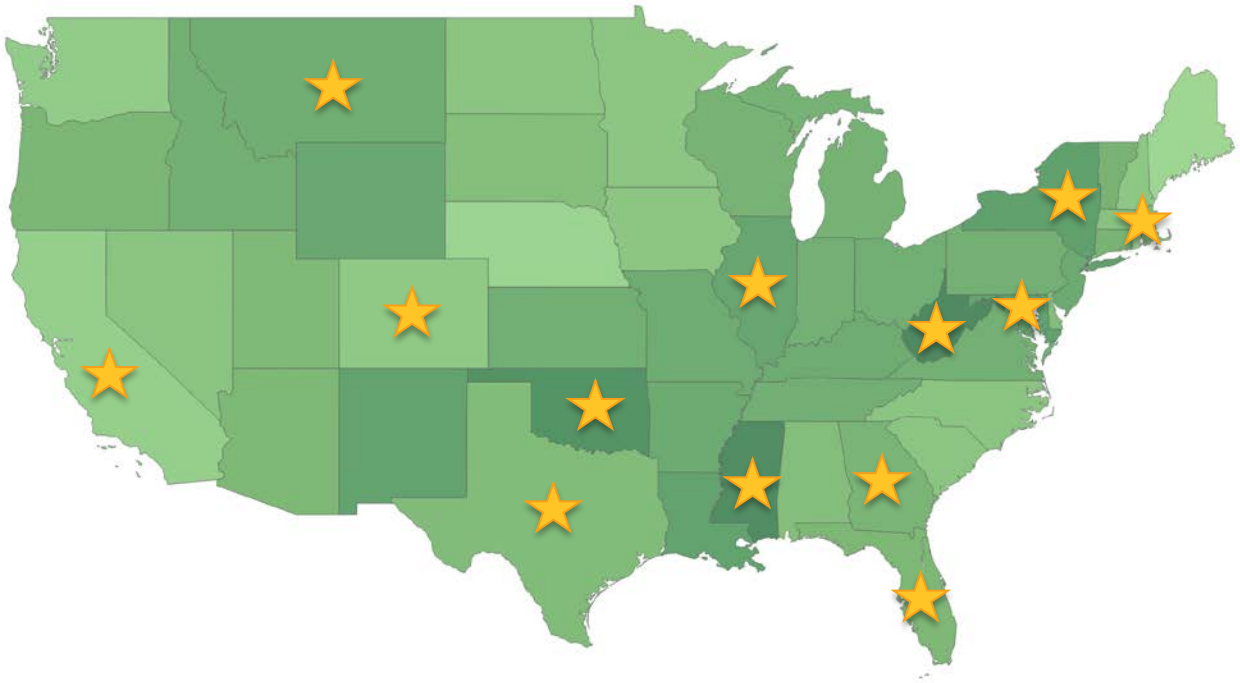
Expenditure-per-capita for residential space heating, residential water heating, and light-duty vehicles: 2021



Expenditure per capita, 2021 (Unit: U.S. Dollars per capita)

1,014 — 2,072

Difference in expenditures for residential space heating, residential water heating, and light-duty vehicles: 2035 - 2021

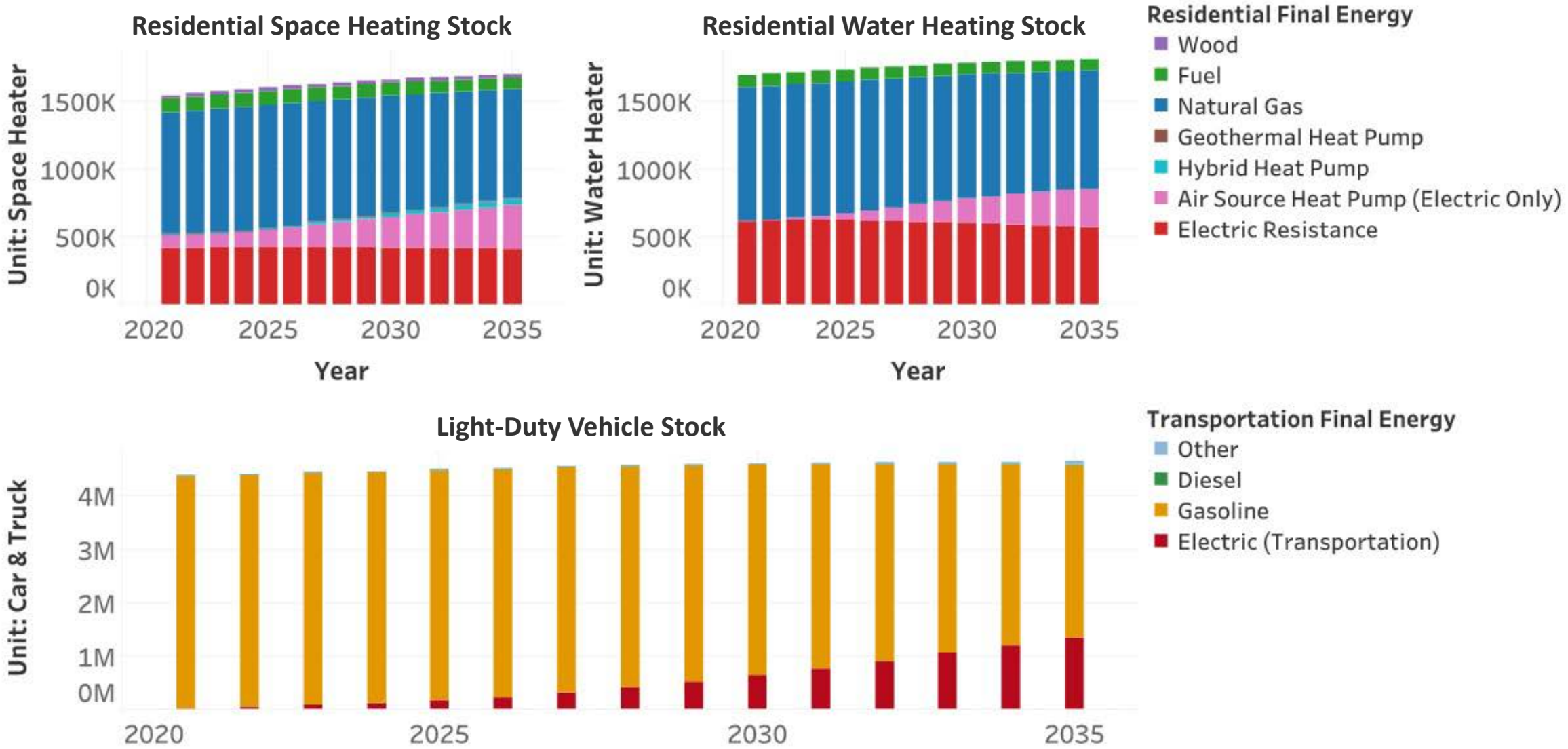


Difference between 2035 and 2021 (unit: percent)

-50.00 — 0.00

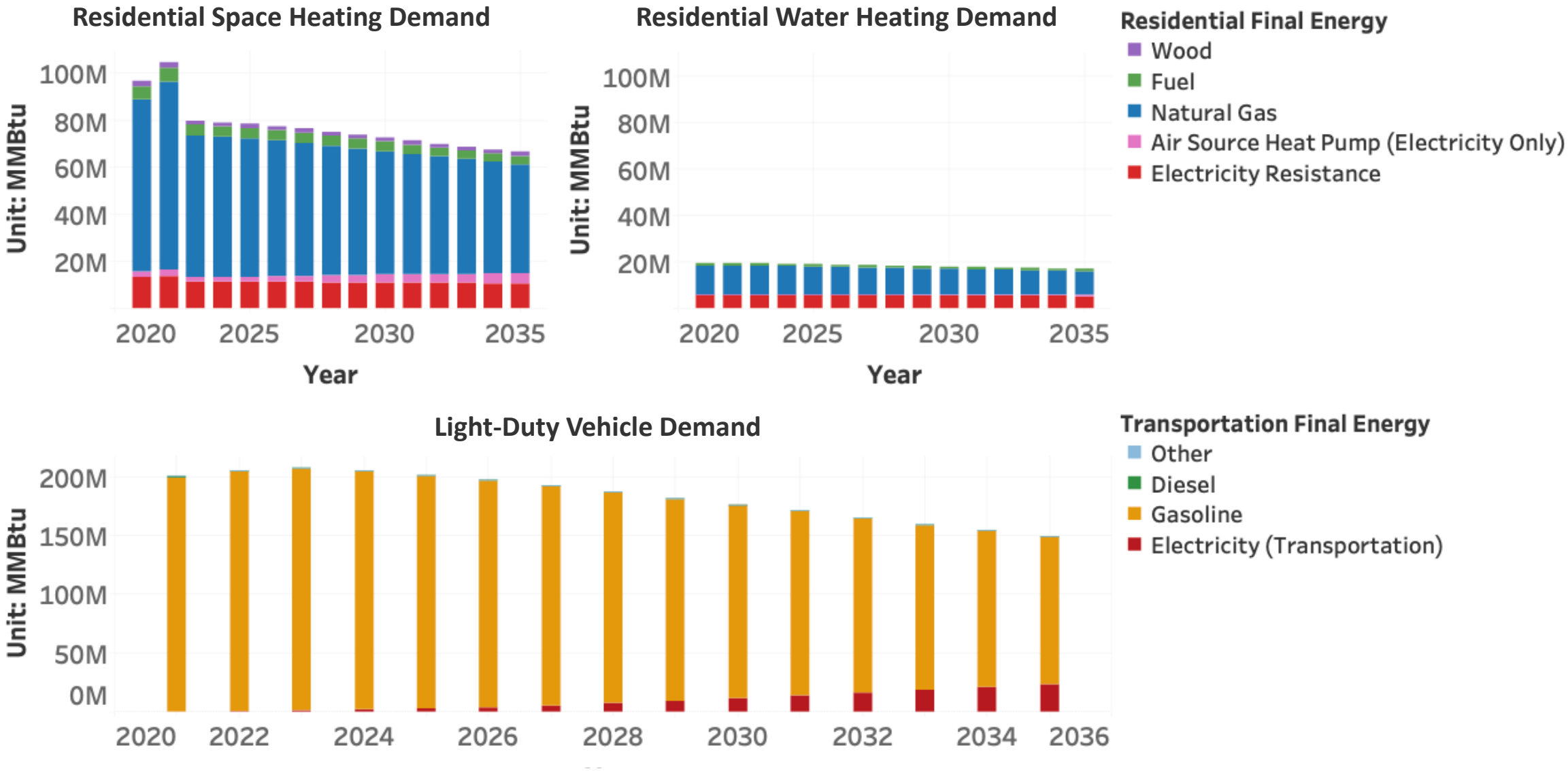
State-level energy expenditures for residential space heating, residential water heating, and light-duty vehicles are projected to remain flat or decline over time for every state

State-Level Profile: Oklahoma Equipment Stock



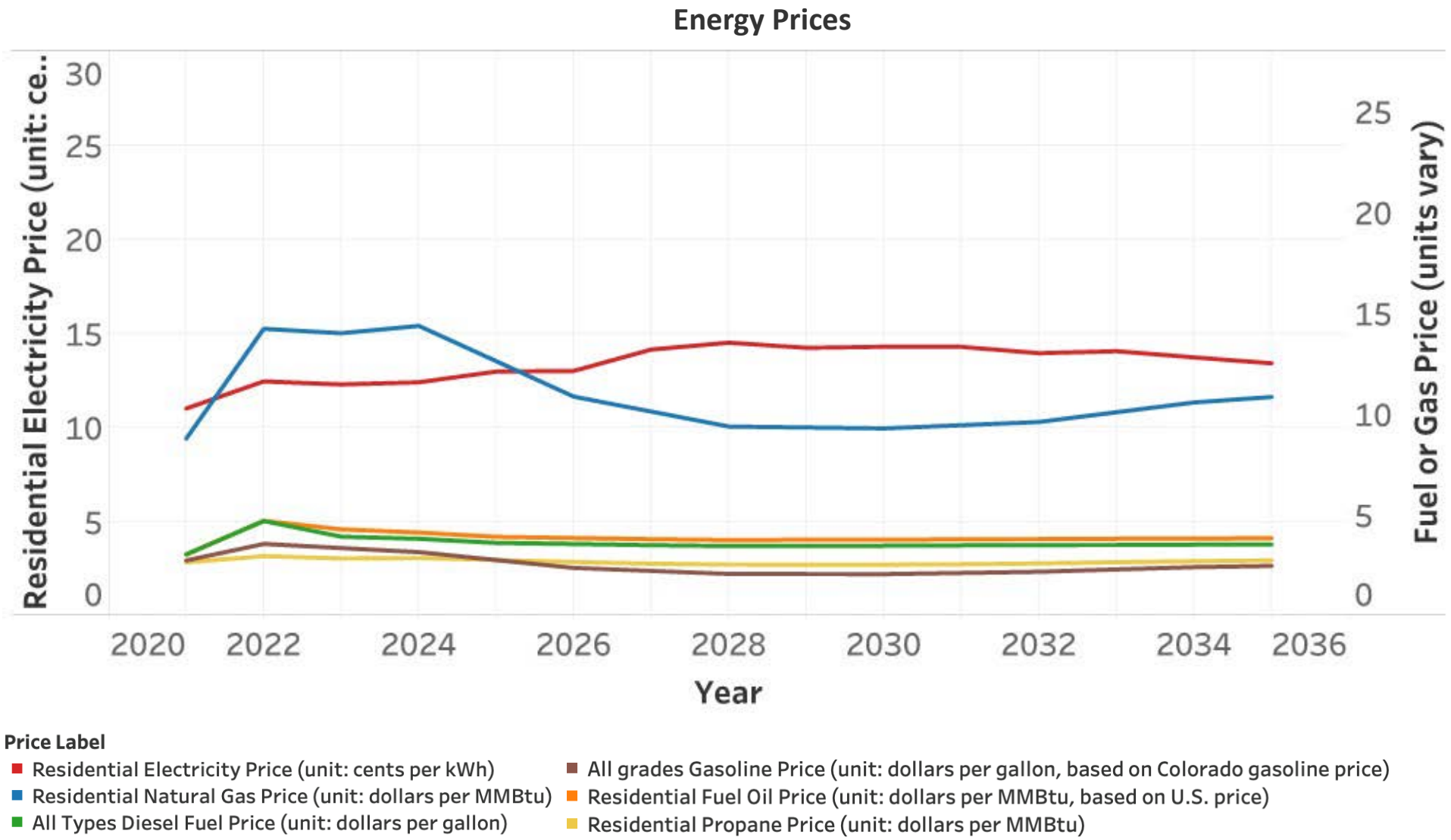
Many states indicate significant potential for electric vehicle adoption and air source heat pump adoption, the latter of which can supplement or displace a wide range of existing technologies

State-Level Profile: Oklahoma Energy Demand



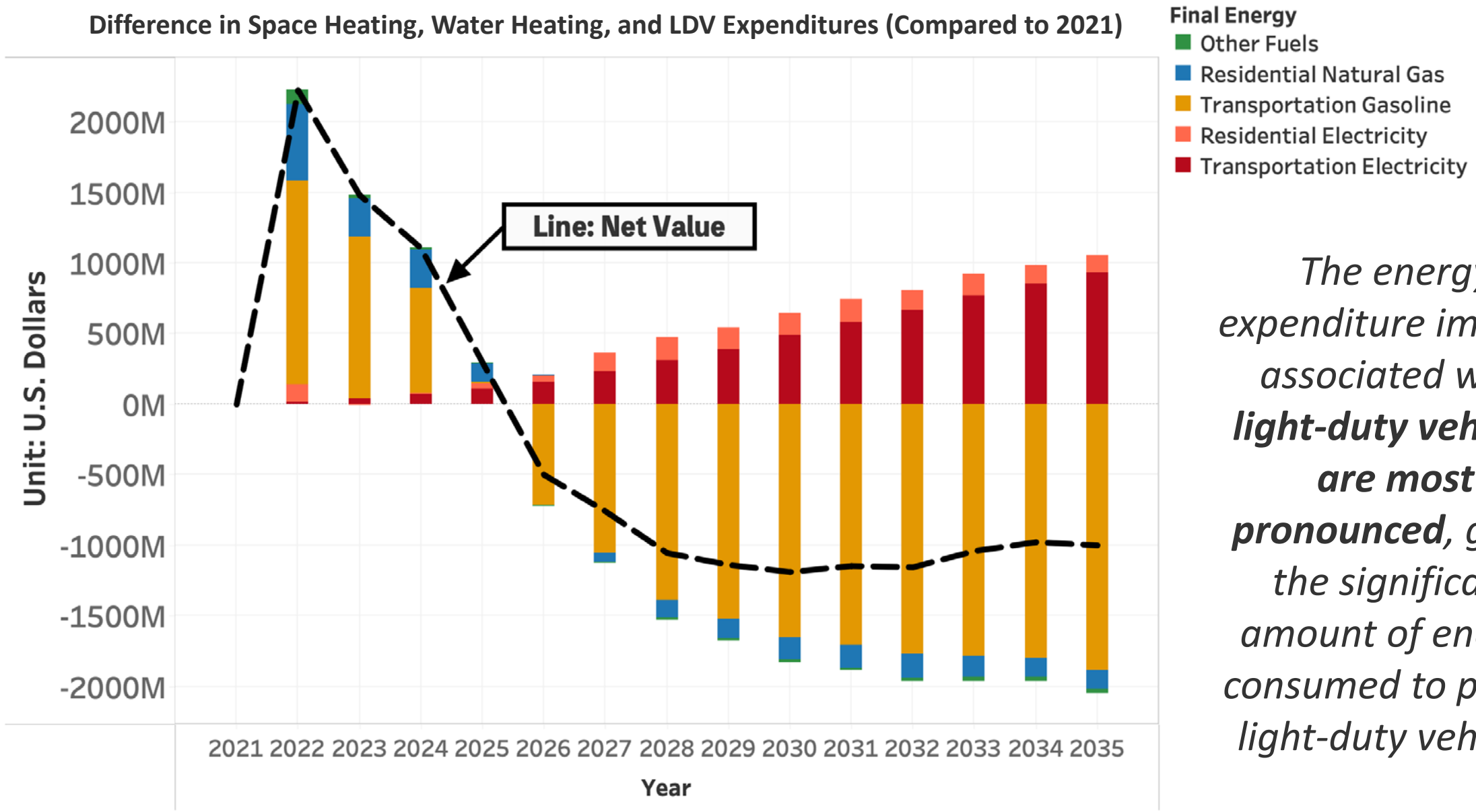
Energy demand for light-duty vehicles typically exceeds that associated with residential heating, but electric vehicle adoption could lower energy demand for light-duty vehicles

State-Level Profile: Oklahoma Energy Prices



Energy prices are projected to remain flat or decline through 2035, and the relative prices of residential electricity and natural gas influences expenditure impacts

State-Level Profile: Oklahoma Energy Expenditures



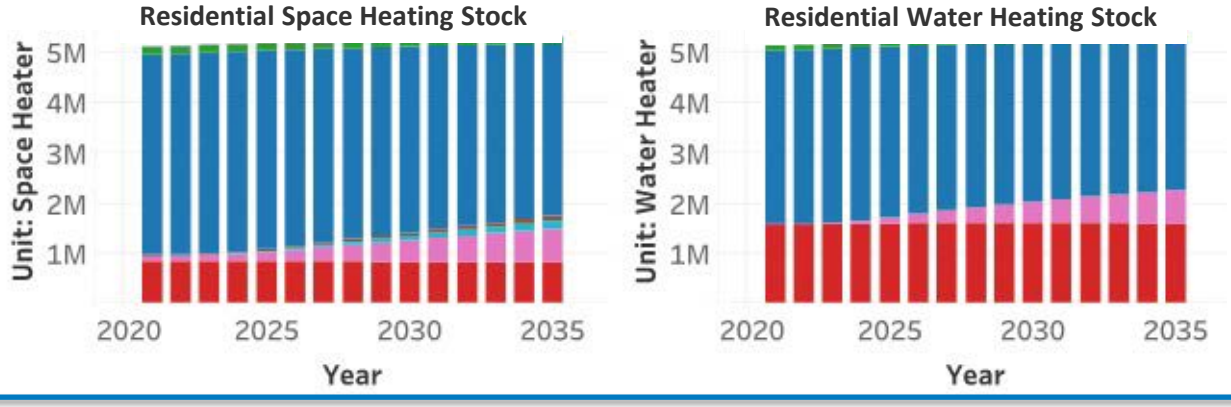
*The energy expenditure impacts associated with **light-duty vehicles are most pronounced**, given the significant amount of energy consumed to propel light-duty vehicles*

How Might the Picture Differ in My State?

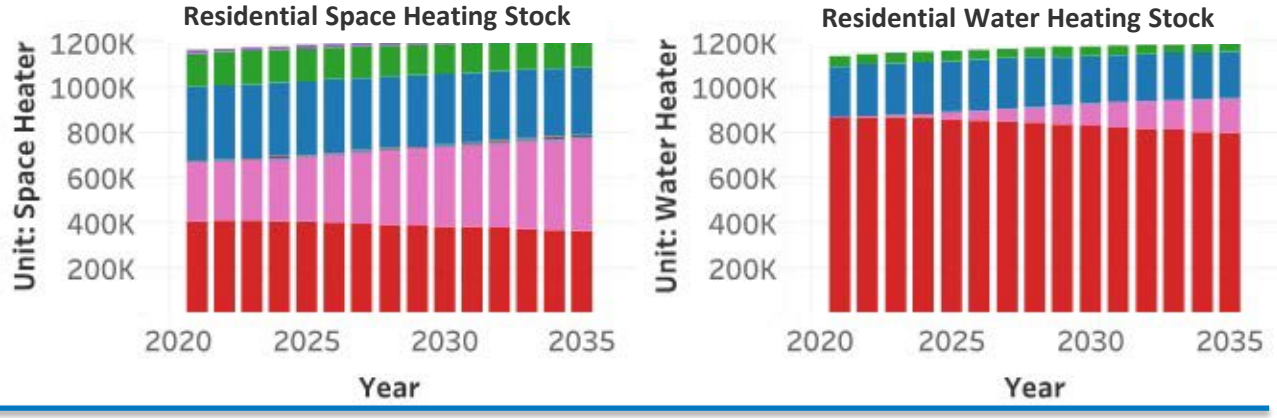
Residential Heating Equipment Mix

Wood
Fuel
Natural Gas
Geothermal Heat Pump
Hybrid Heat Pump
Air Source Heat Pump (Electric Only)
Electric Resistance

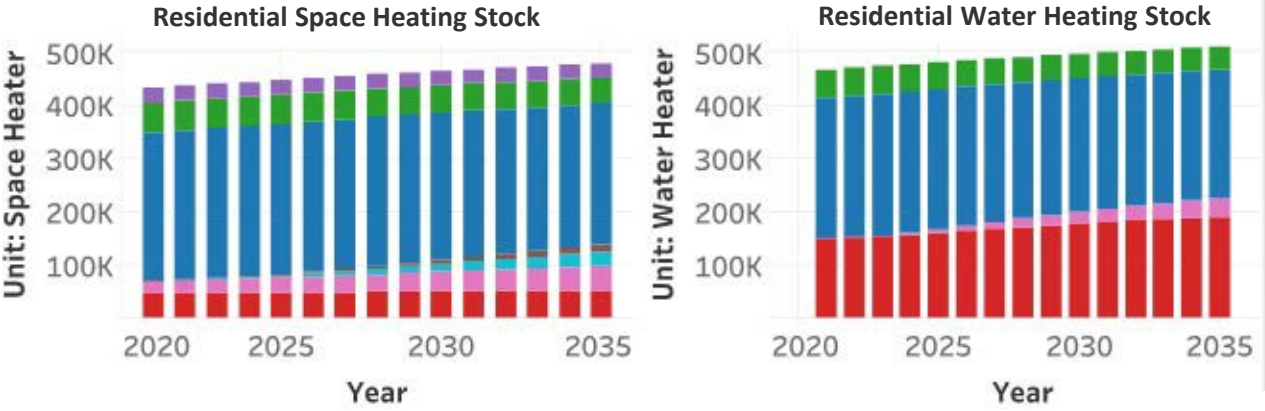
Significant natural gas heating equipment (e.g., California, Colorado, **Illinois**, Oklahoma)



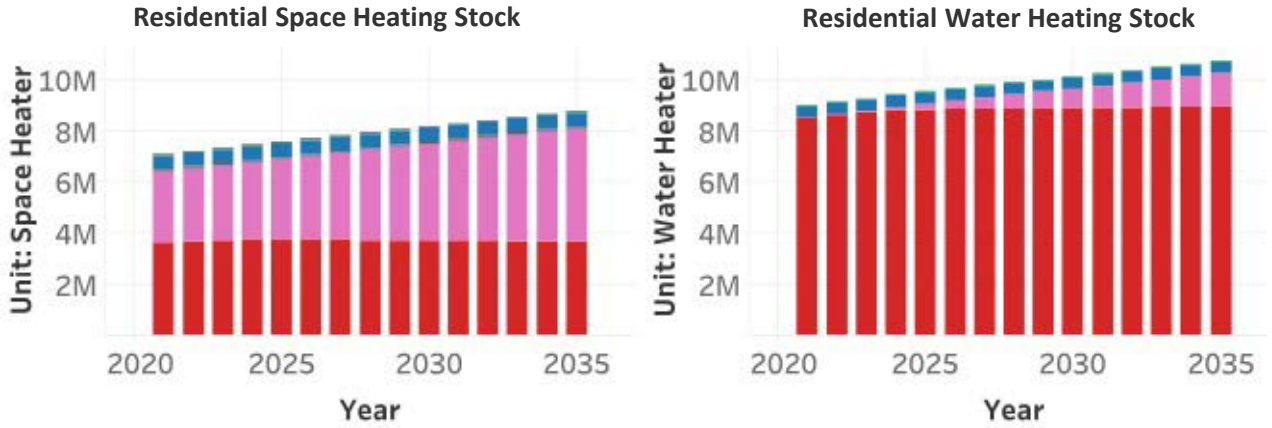
Diverse mix of heating equipment (e.g., Georgia, **Mississippi**, Texas, West Virginia)



Significant fuel oil and/or propane heating equipment (e.g., Maryland, Massachusetts, **Montana**, New York)



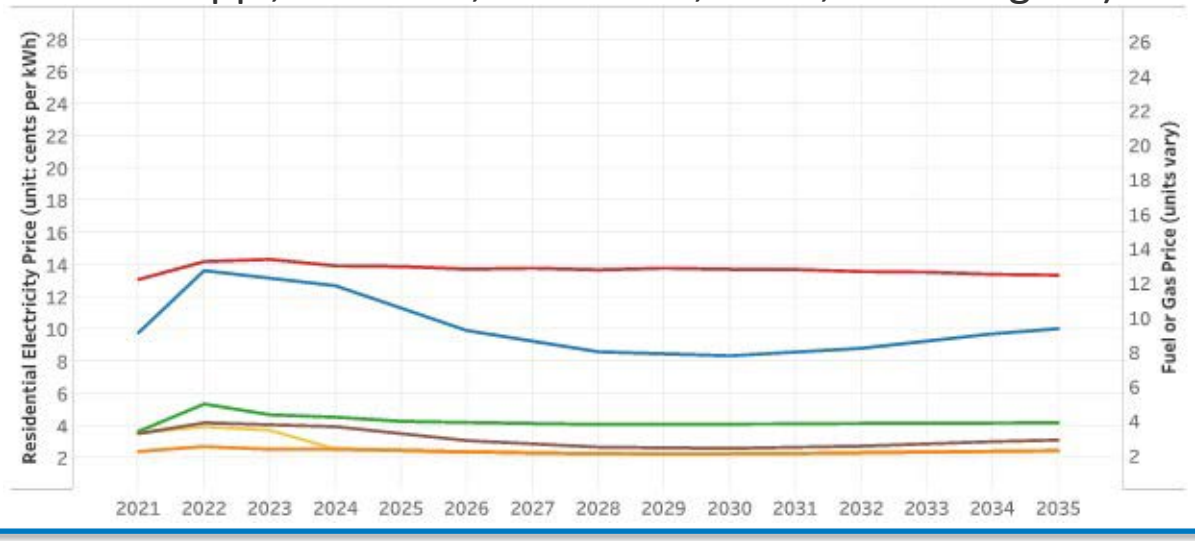
Almost fully electrified space heating (e.g., **Florida**)



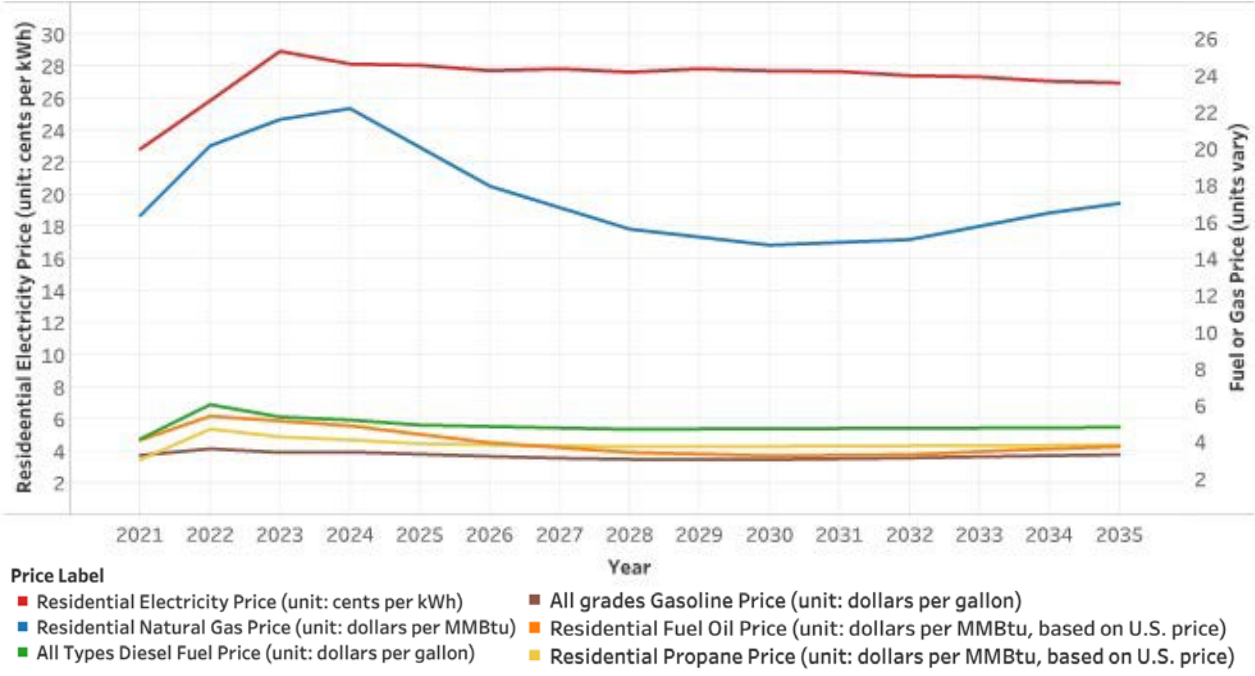
Key Features: current adoption levels for heat pump equipment; which equipment type is assumed to be displaced by incentivized air source heat pump equipment adoption; the presence of "hybrid" configurations

Energy Prices: Relative and Absolute Magnitudes

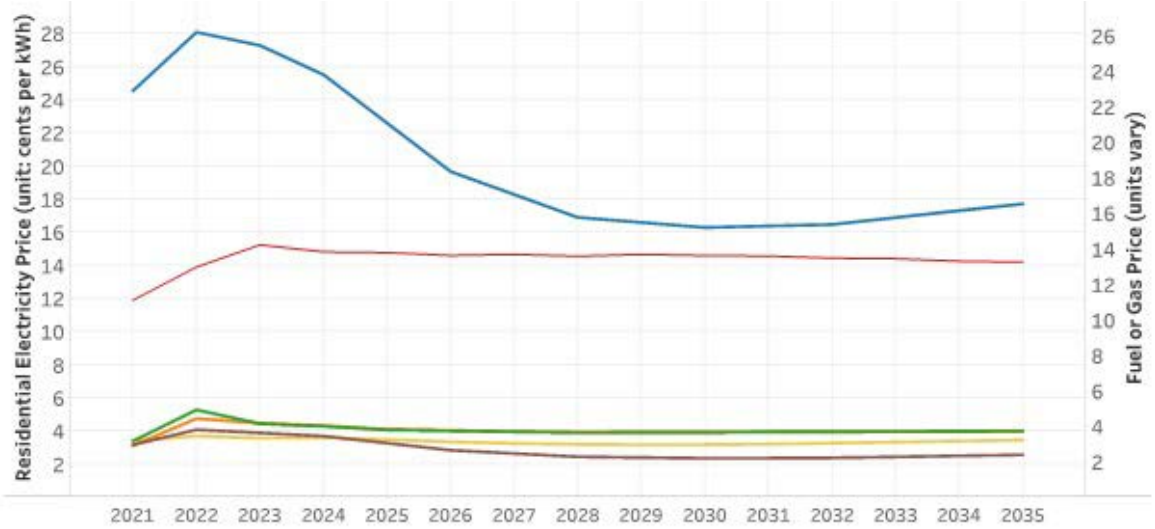
Relatively low energy prices (e.g., **Colorado**, Illinois, Maryland, Mississippi, Montana, Oklahoma, Texas, West Virginia)



Relatively high energy prices (e.g., **California**, Massachusetts, New York)



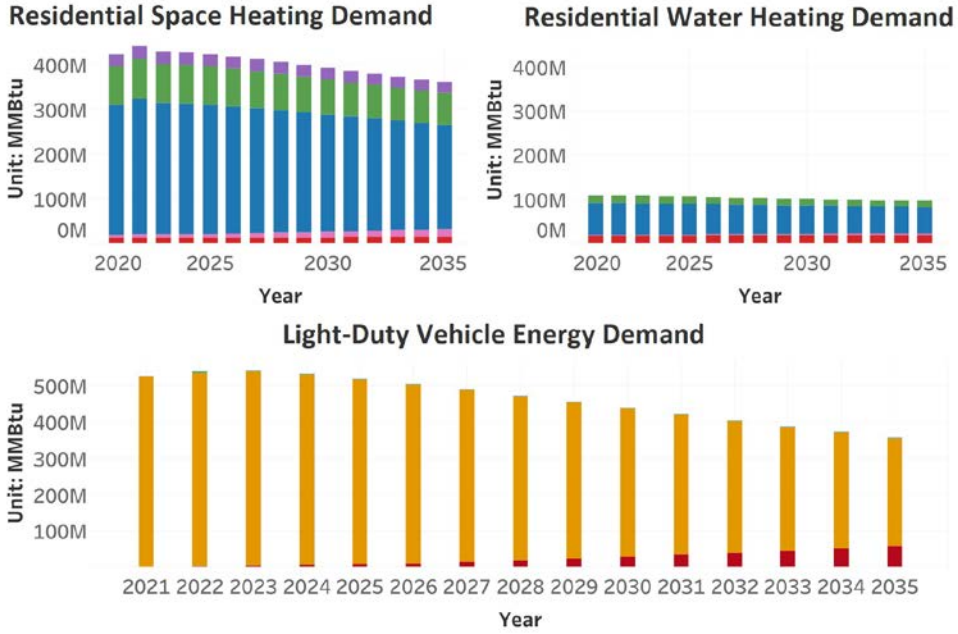
Relatively high natural gas prices and low electricity prices (e.g., **Florida**, Georgia)

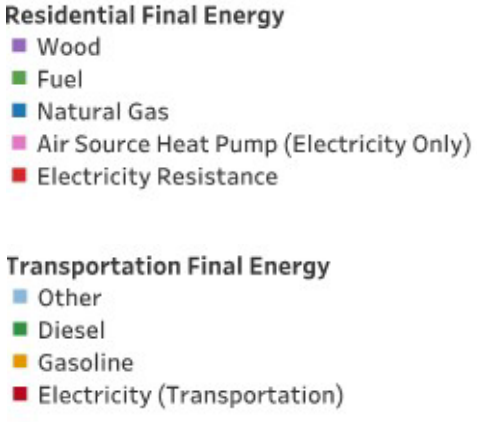


Key Features: whether electricity and natural gas prices are comparable to one another or very different; if different, whether electricity > natural gas, or natural gas > electricity

Relative Energy Demand for Heating and Transportation

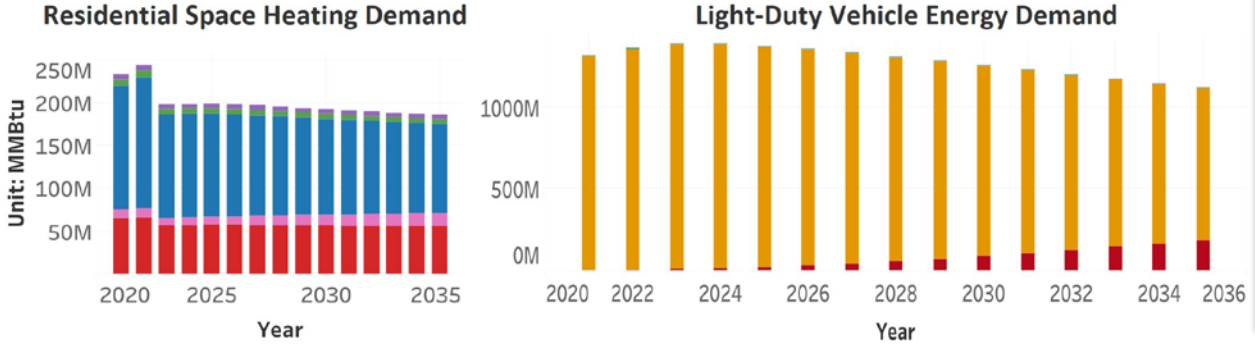
Light-duty vehicle energy demand is comparable to that associated with residential heating (e.g., Colorado, Illinois, Maryland, Massachusetts, Montana, **New York**, Oklahoma)



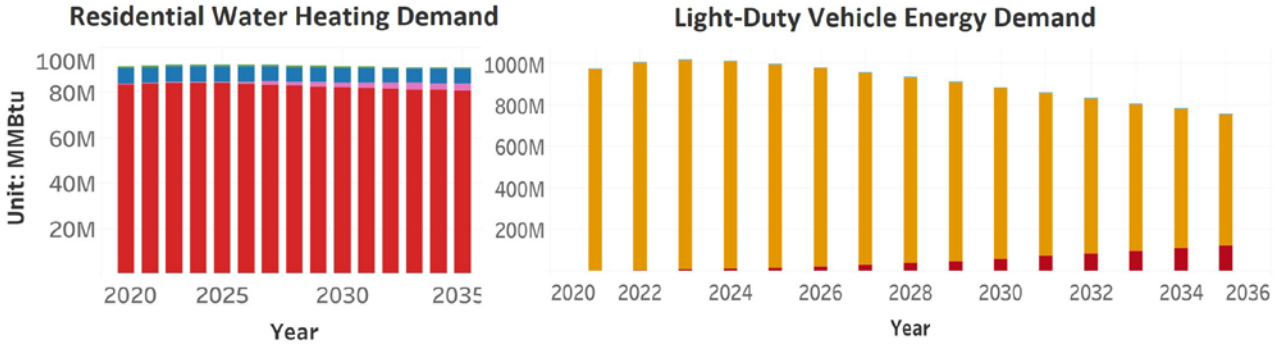


Key Features: relative magnitudes of energy demand for light-duty vehicles versus residential space and water heating; space heating demand is typically much greater than water heating demand in cold climate regions

Light-duty vehicle energy demand is significantly higher than that associated with residential heating (e.g., Mississippi, California, Georgia, **Texas**, West Virginia)



Light-duty vehicle energy demand is dramatically higher than that associated with residential heating (e.g., **Florida**)



Caveats, Limitations, and Additional Resources

- **Price projections are highly uncertain** and have a **strong influence on energy expenditure projections**
  - Gas price projections are especially uncertain, due to the combined effects of (a) the potential for falling demand and (b) current distribution network infrastructure that requires continued maintenance
- We are **not exploring impacts at the individual household level** (which will vary based on many factors)
- We are **not explicitly factoring in upfront equipment costs**; we are assuming customer adoption rates
- **More detailed studies are available**, especially for individual sub-sectors:
  - Steinberg (2023). Evaluating Impacts of the Inflation Reduction Act and Bipartisan Infrastructure Law on the U.S. Power System.
  - DOE (2023). Investing in American Energy.
  - DOE (2024). For Most Americans, A Heat Pump Can Lower Bills Right Now.
  - Wilson (2024). Heat pumps for all? Distributions of the costs and benefits of residential air-source heat pumps in the United States.
  - NREL (2024). State Level Residential Building Stock and Energy Efficiency & Electrification Packages Analysis (Tableau dashboards).
  - Walker (2023). Challenges and Opportunities for Home Decarbonization.
  - Munankarmi (2023). Modeled Results of Four Residential Energy Efficiency Measure Packages for Deriving Advanced Building Construction Research Targets.
  - Alternative Fuels Data Center: Vehicle Cost Calculator. https://afdc.energy.gov/calc/

Thank you!

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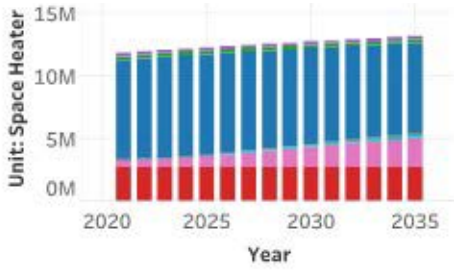
Additional State-Level Profiles

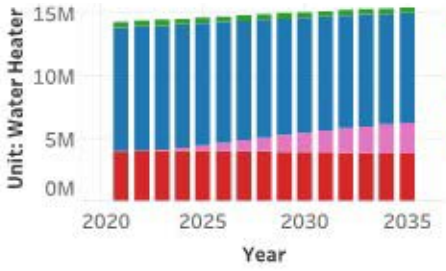
Additional Results

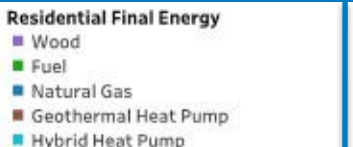
State-Level Profile: California

Residential Space Heating Stock

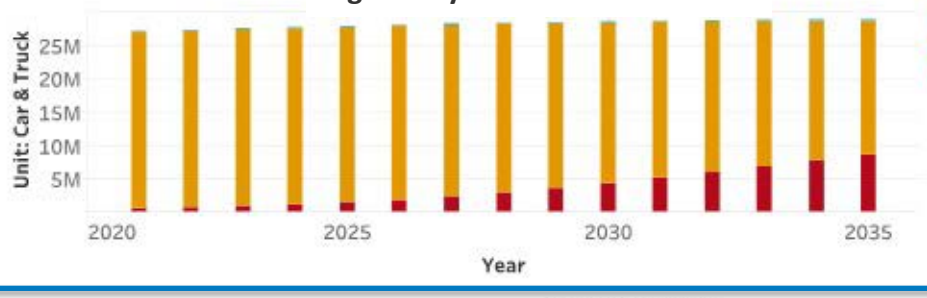


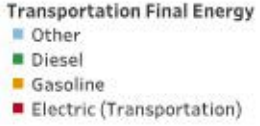
Residential Water Heating Stock



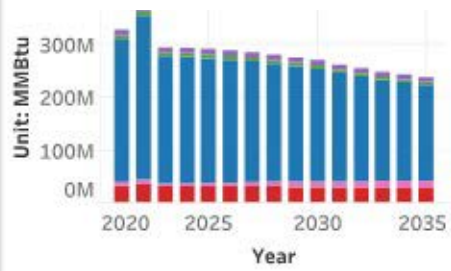


Light Duty Vehicle Stock

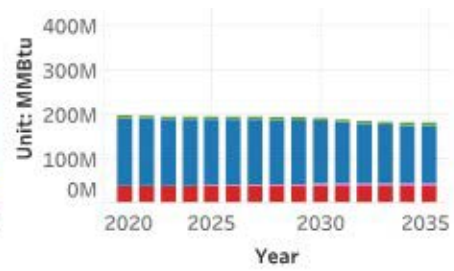


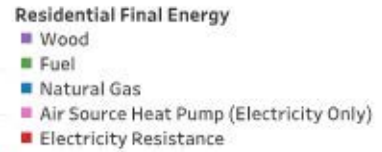


Residential Space Heating Demand

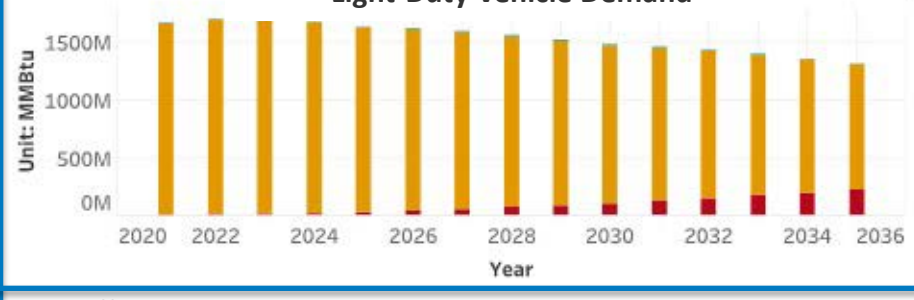


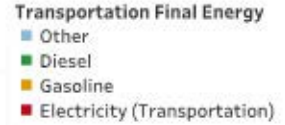
Residential Water Heating Demand



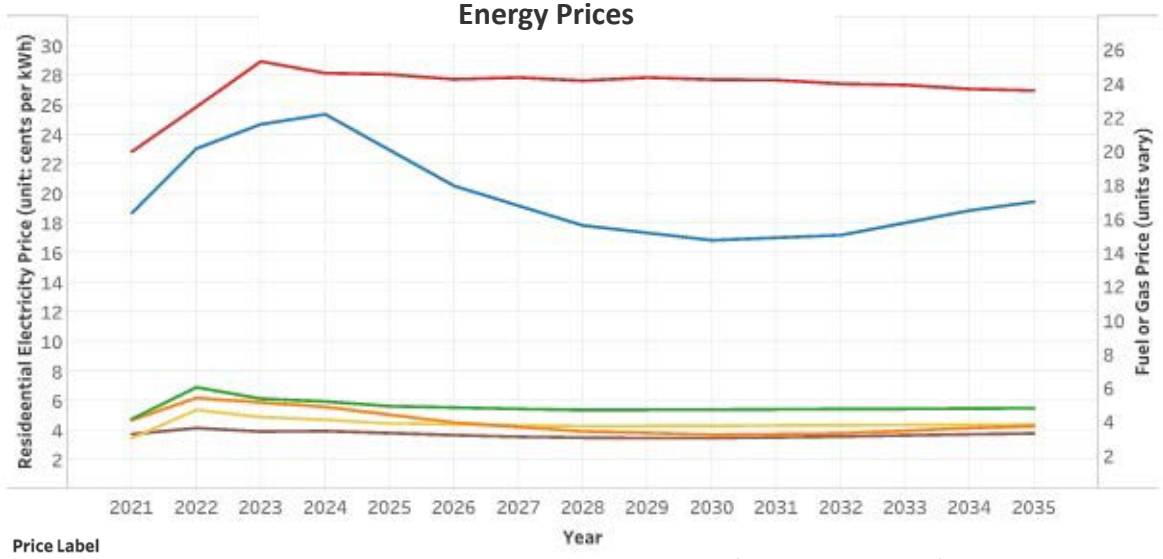


Light-Duty Vehicle Demand

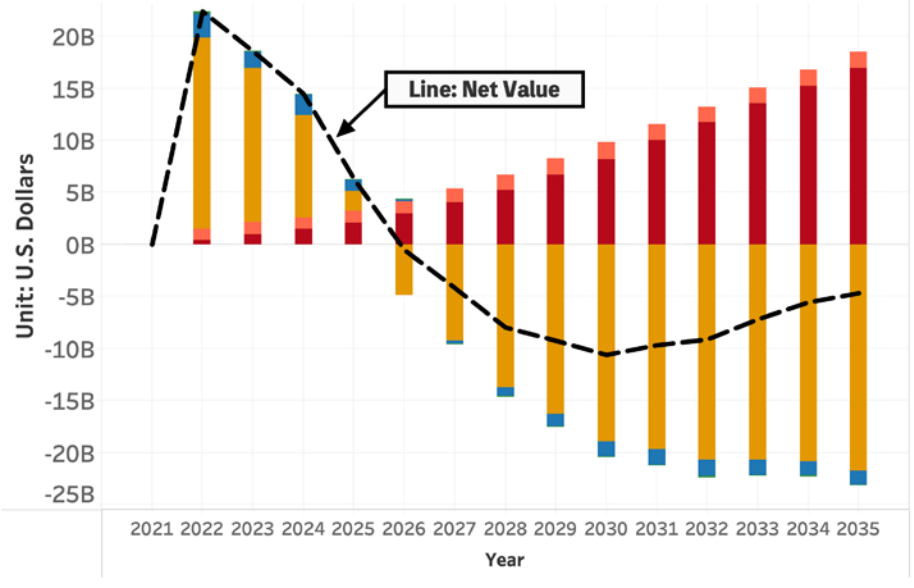


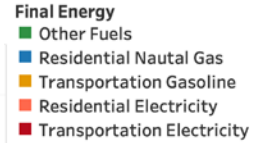


Energy Prices



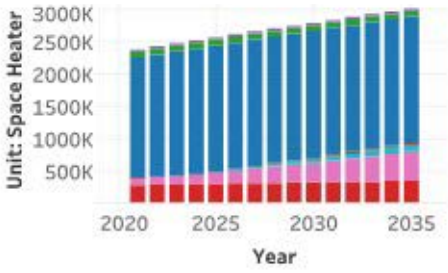
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



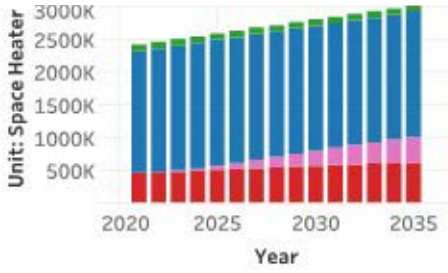


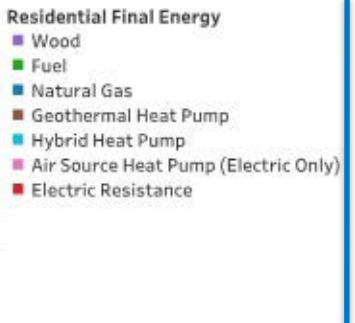
State-Level Profile: Colorado

Residential Space Heating Stock

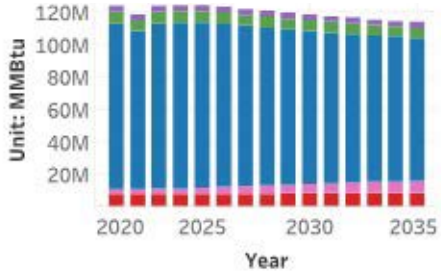


Residential Water Heating Stock

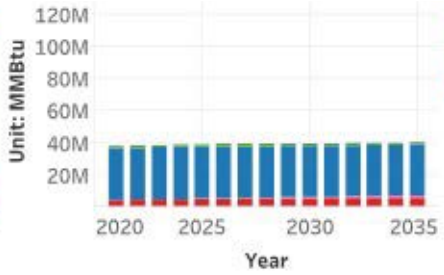


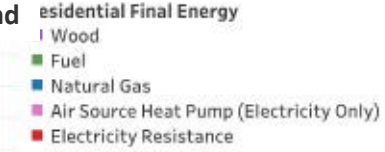


Residential Space Heating Demand

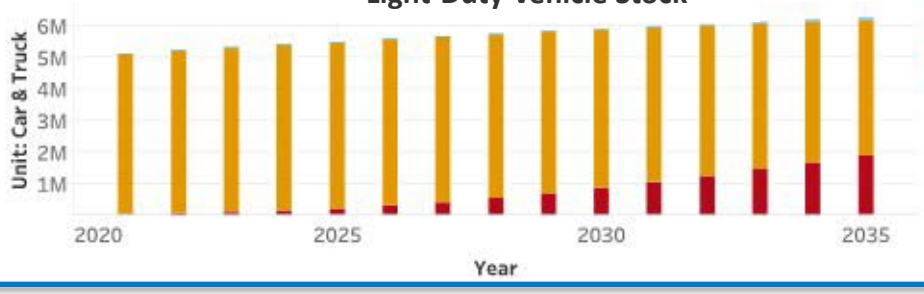


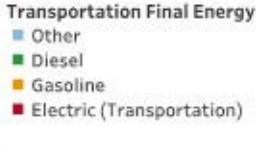
Residential Water Heating Demand



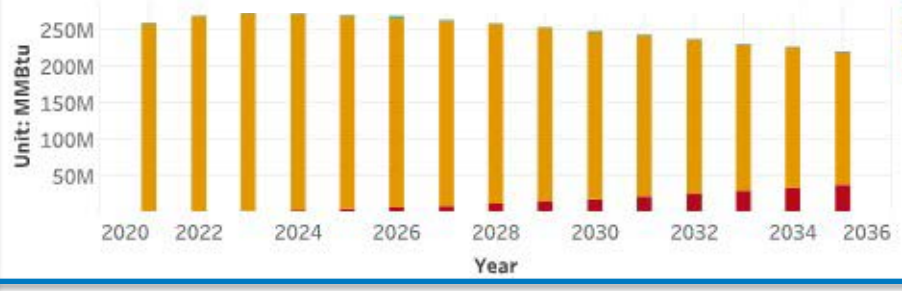


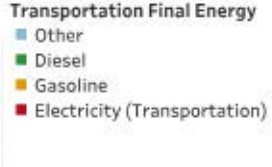
Light-Duty Vehicle Stock



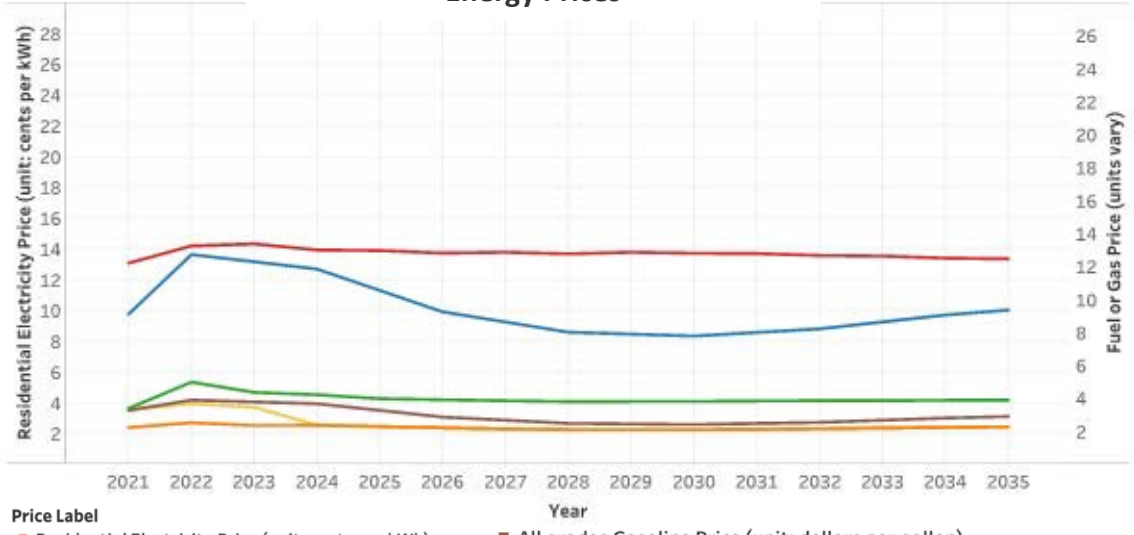


Light-Duty Vehicle Demand

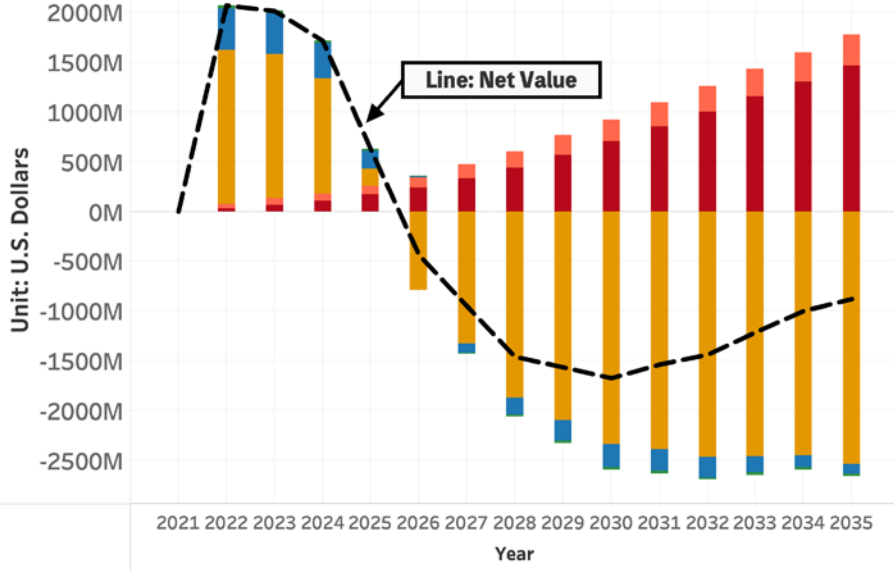


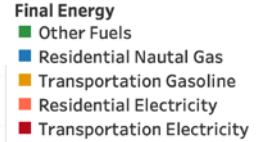


Energy Prices



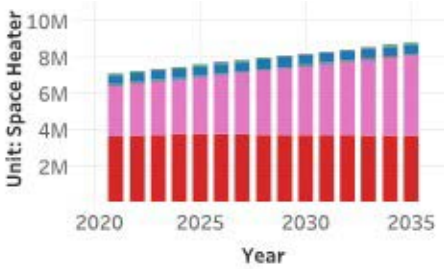
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



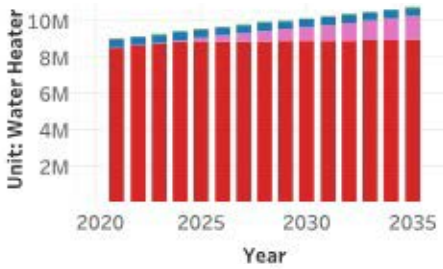


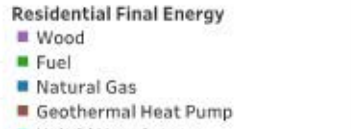
State-Level Profile: Florida

Residential Space Heating Stock

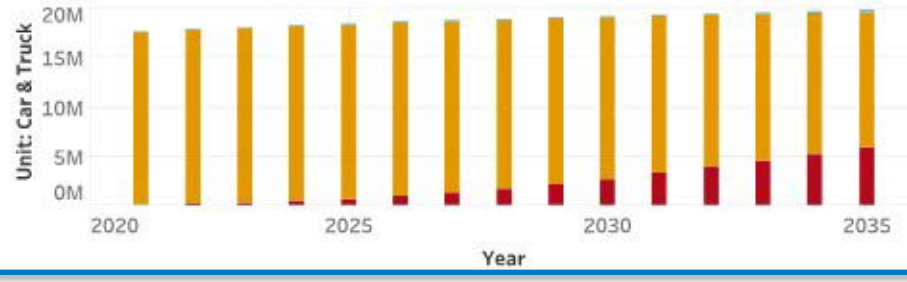


Residential Water Heating Stock

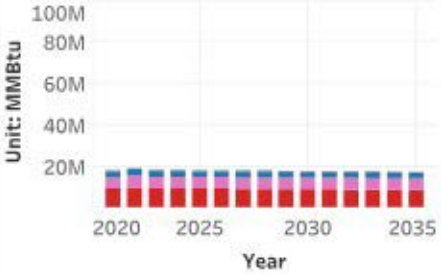




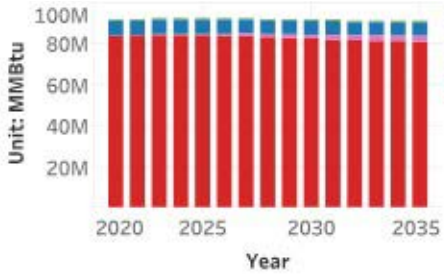
Light-Duty Vehicle Stock

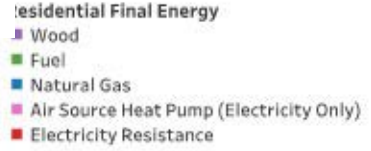


Residential Space Heating Demand

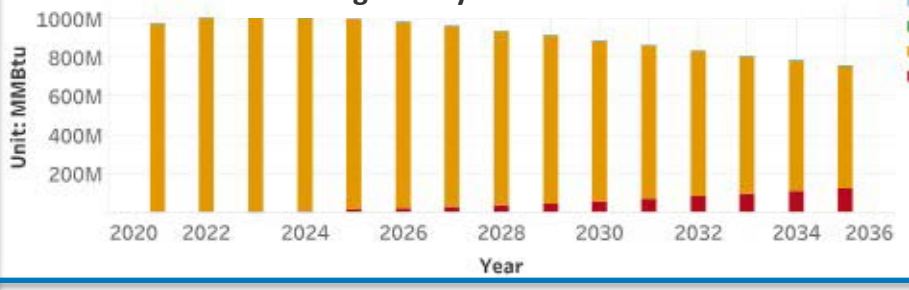


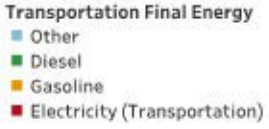
Residential Water Heating Demand



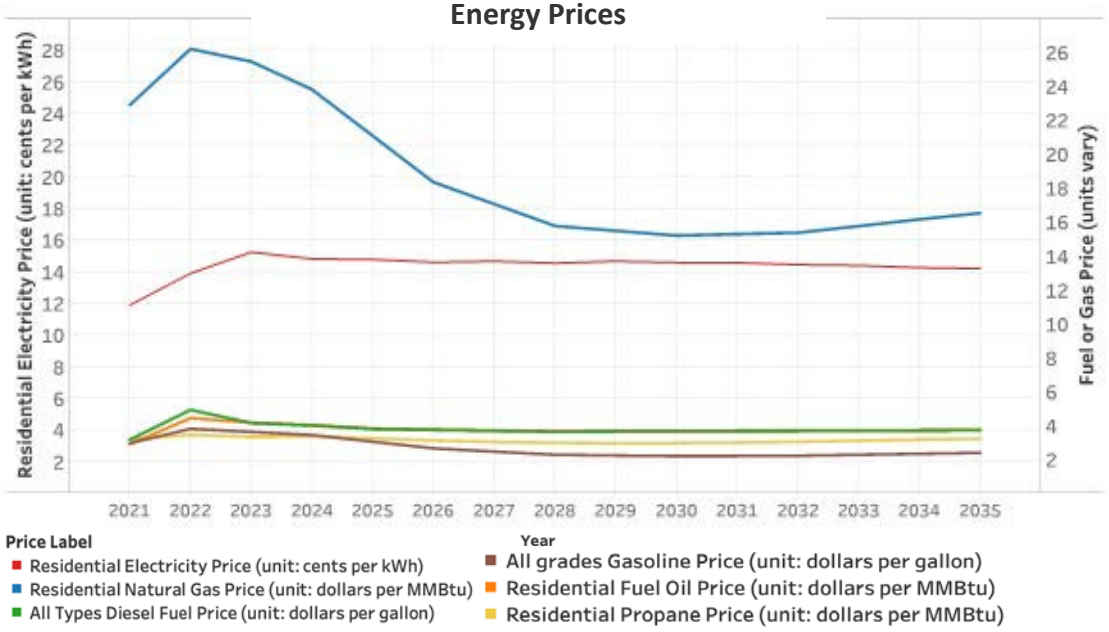


Light-Duty Vehicle Demand

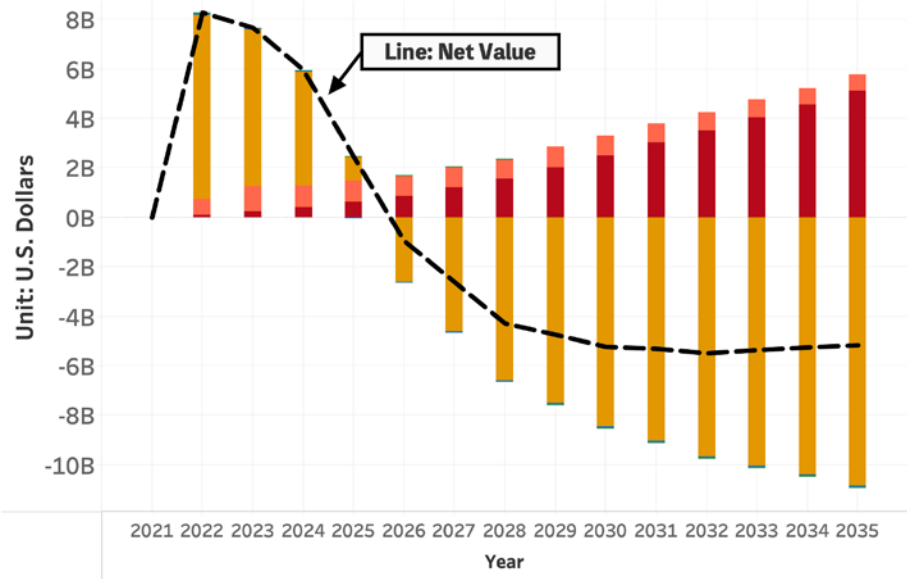


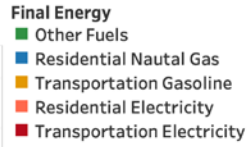


Energy Prices



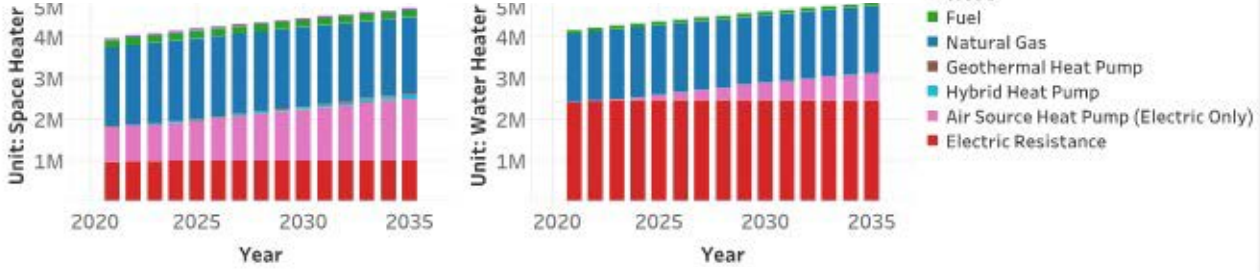
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



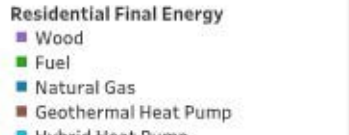


State-Level Profile: Georgia

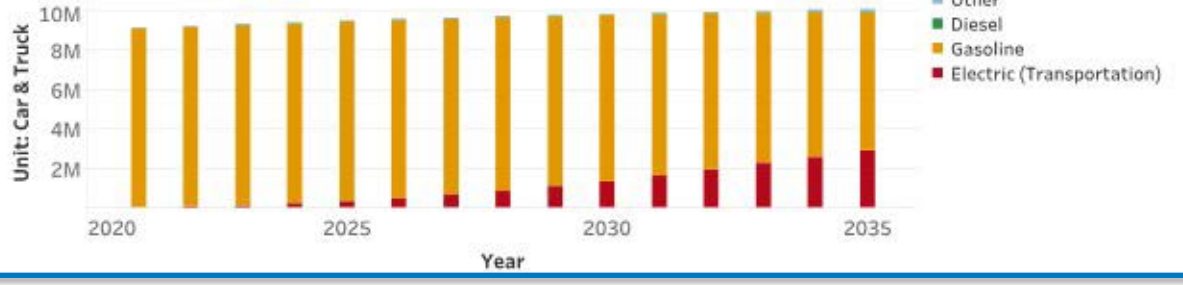
Residential Space Heating Stock



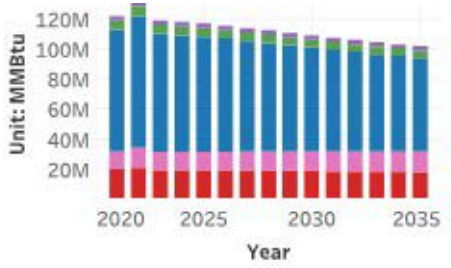
Residential Water Heating Stock



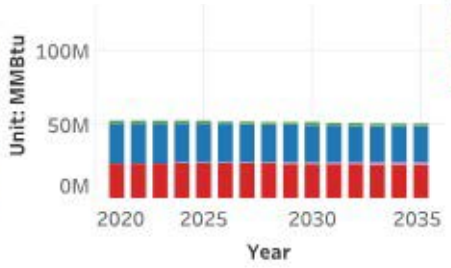
Light-Duty Vehicle Stock

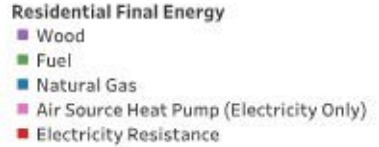


Residential Space Heating Demand

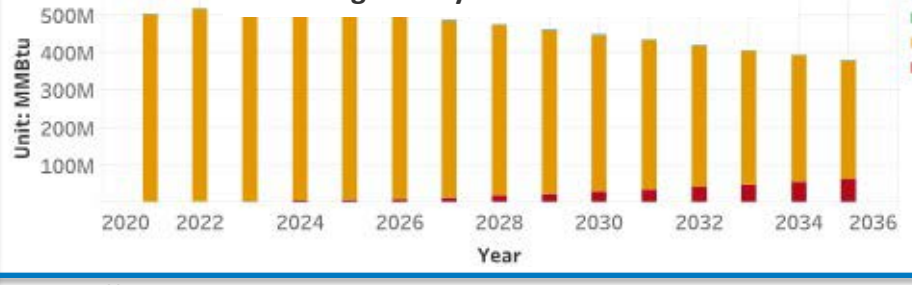


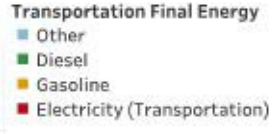
Residential Water Heating Demand



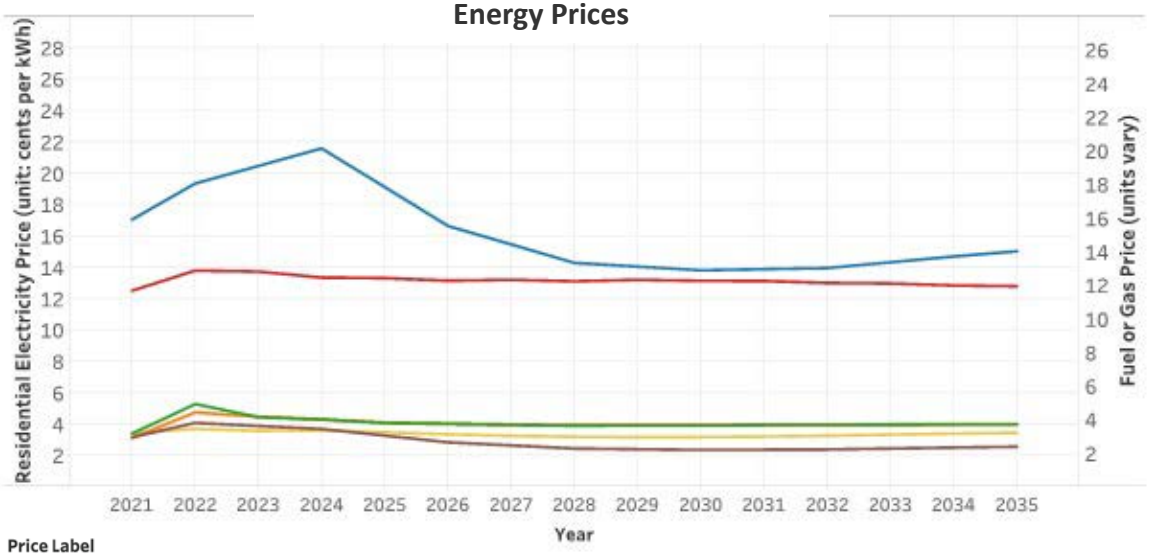


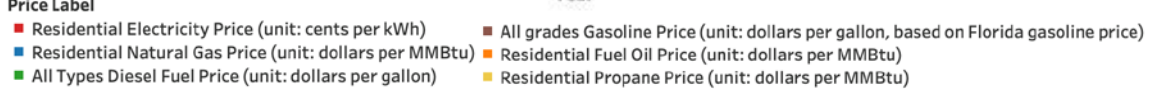
Light-Duty Vehicle Demand



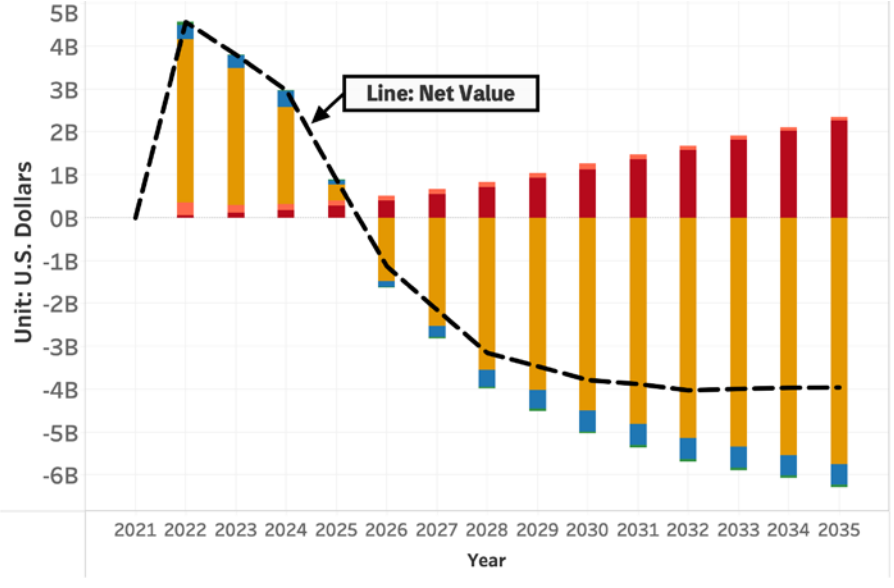


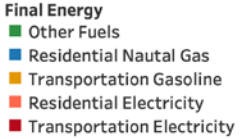
Energy Prices





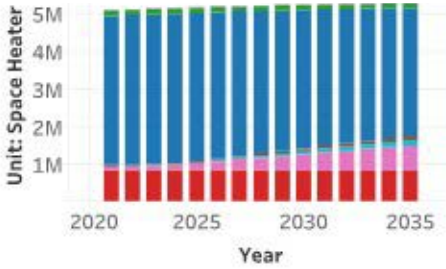
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



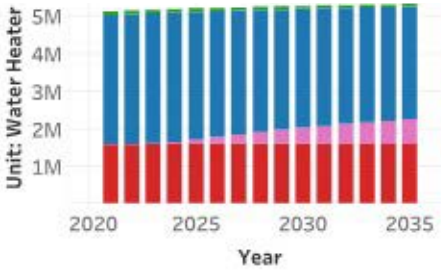


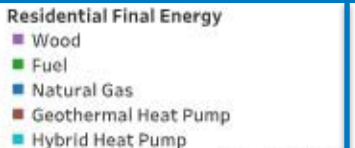
State-Level Profile: Illinois

Residential Space Heating Stock

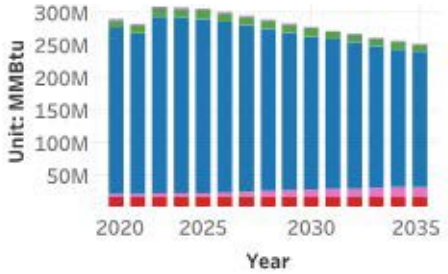


Residential Water Heating Stock

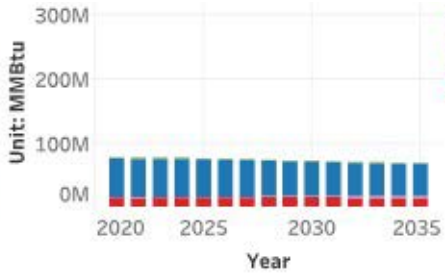


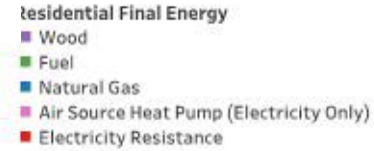


Residential Space Heating Demand

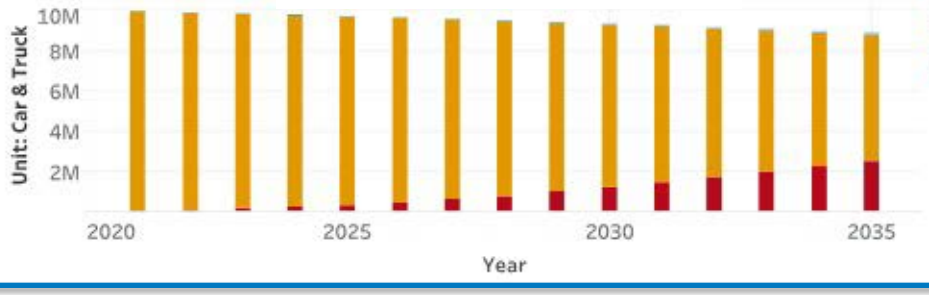


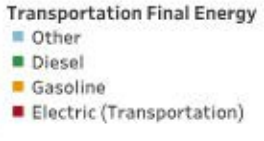
Residential Water Heating Demand



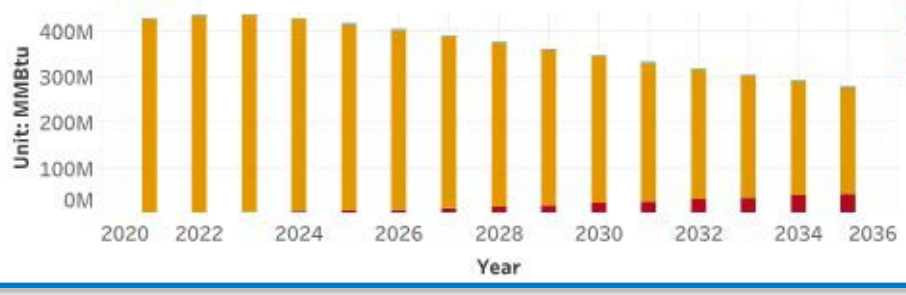


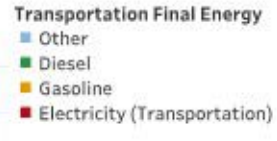
Light-Duty Vehicle Stock





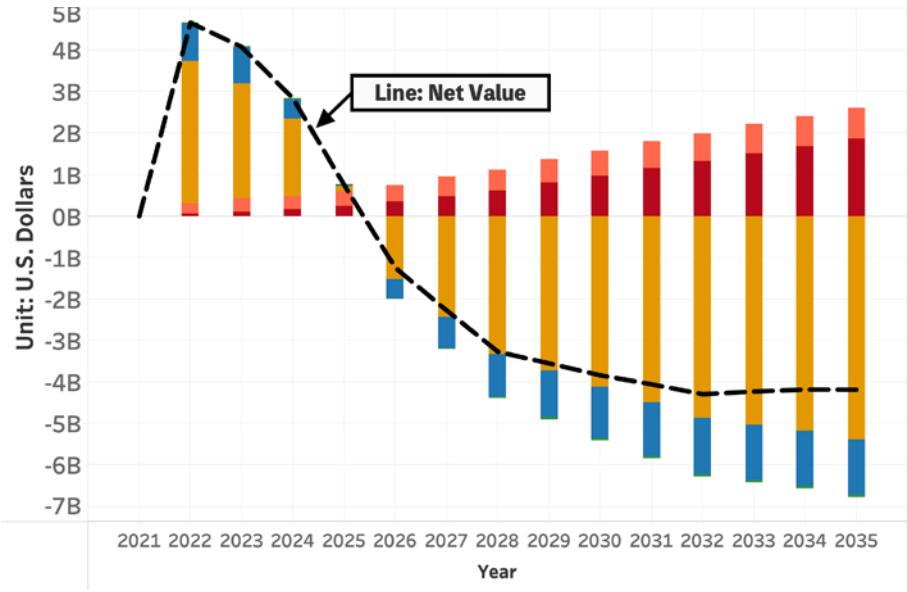
Light-Duty Vehicle Demand

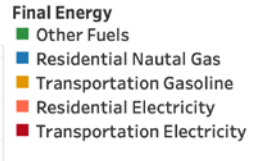




Energy Prices

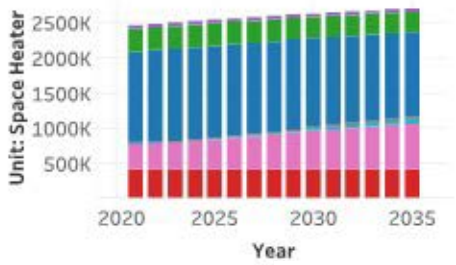
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



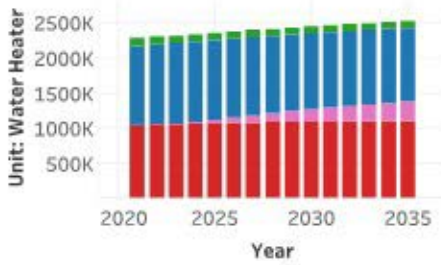


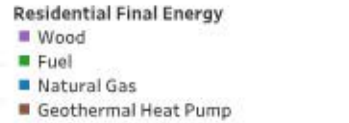
State-Level Profile: Maryland

Residential Space Heating Stock

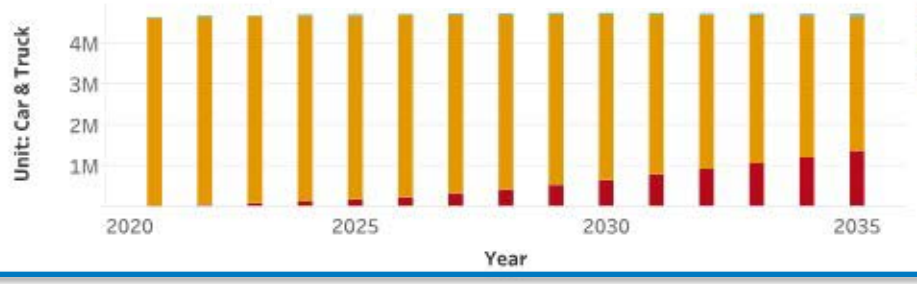


Residential Water Heating Stock

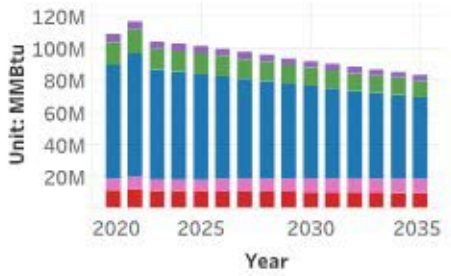




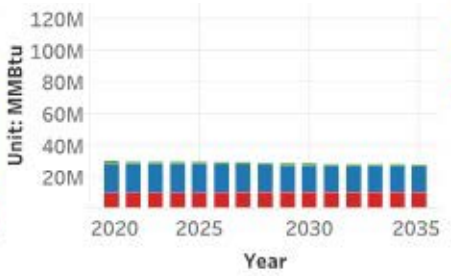
Light-Duty Vehicle Stock

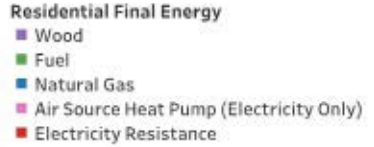


Residential Space Heating Demand

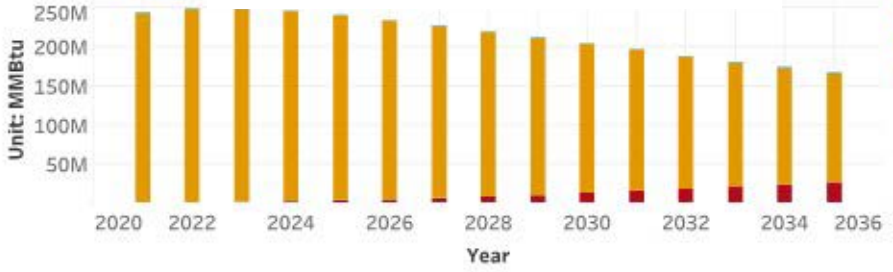


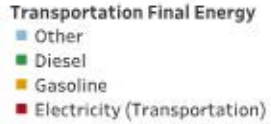
Residential Water Heating Demand



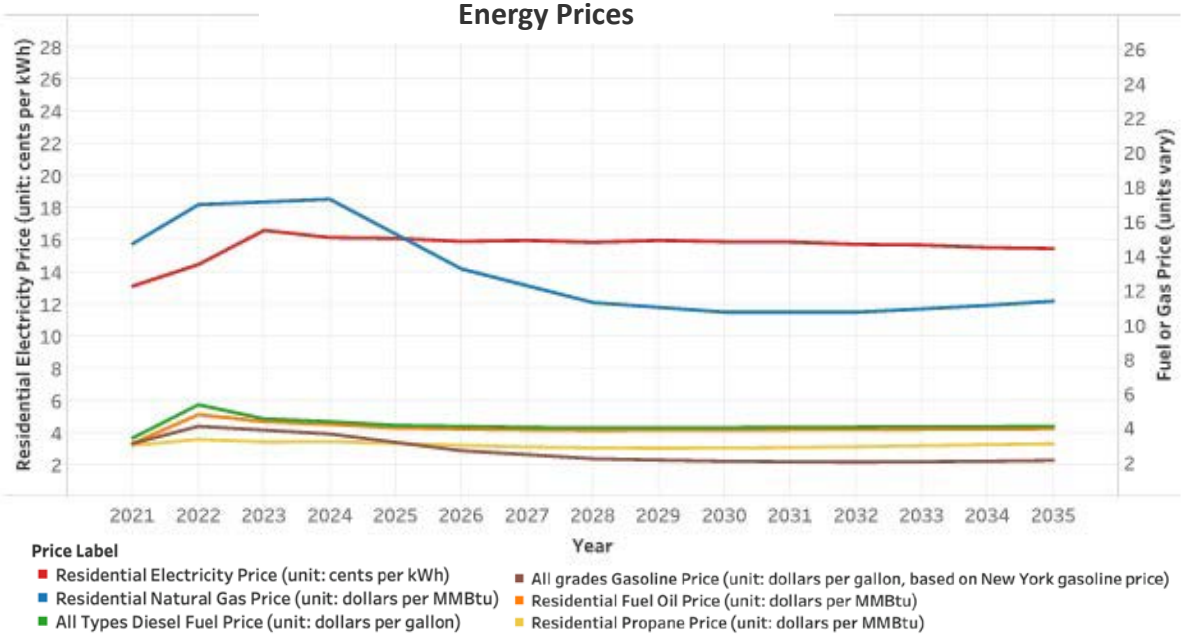


Light-Duty Vehicle Demand

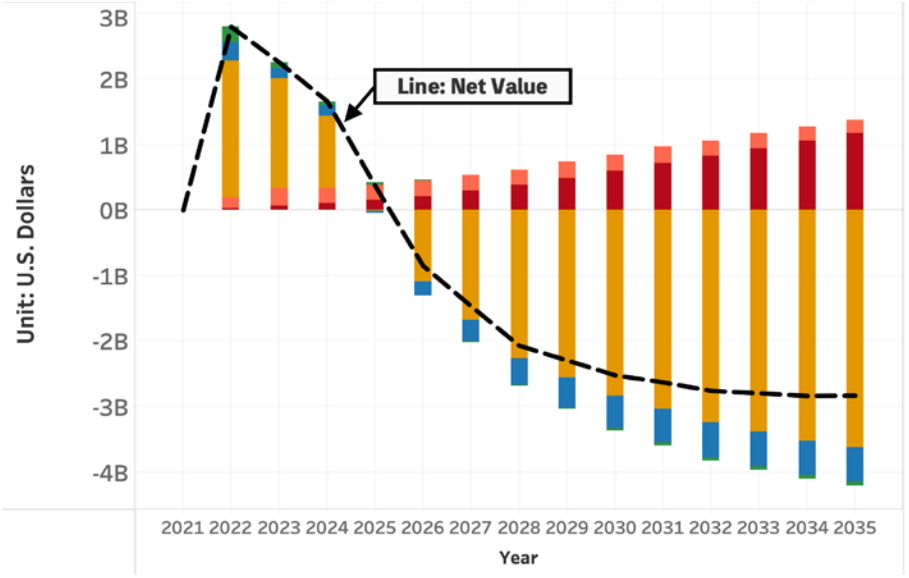


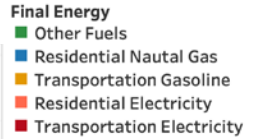


Energy Prices



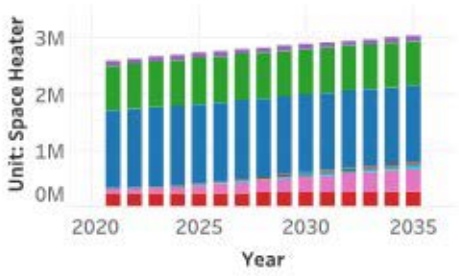
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



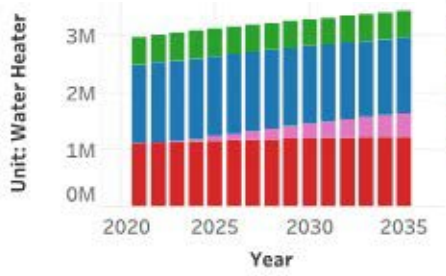


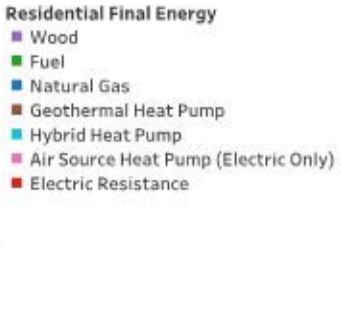
State-Level Profile: Massachusetts

Residential Space Heating Stock

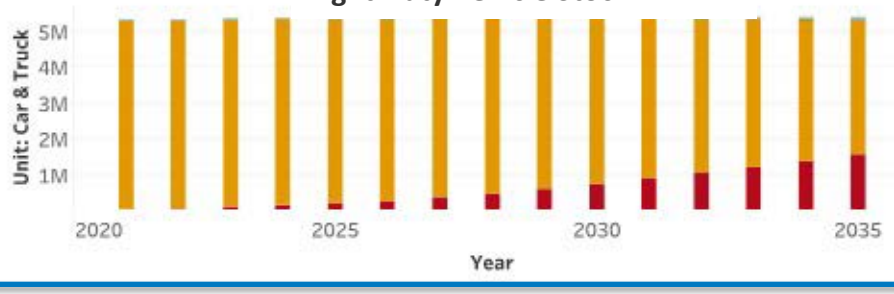


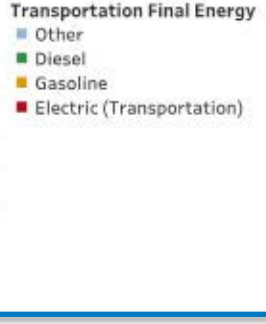
Residential Water Heating Stock



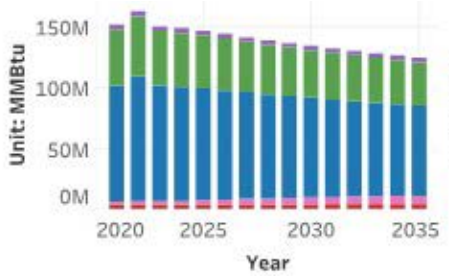


Light Duty Vehicle Stock

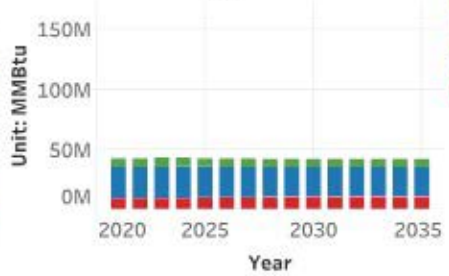


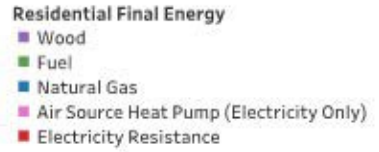


Residential Space Heating Demand

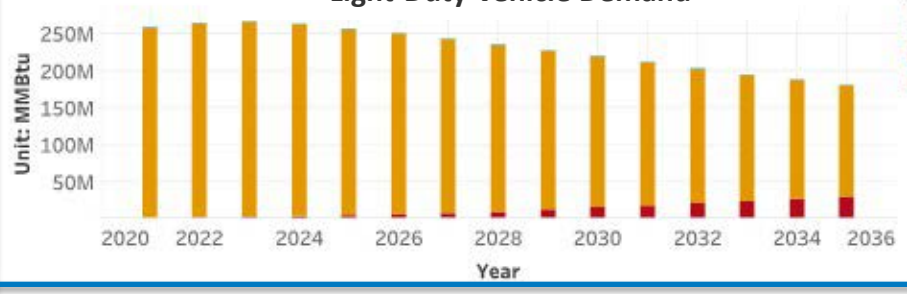


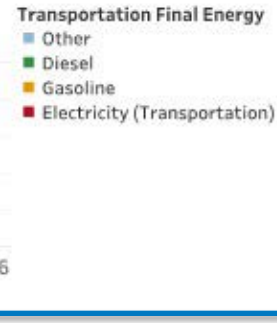
Residential Water Heating Demand



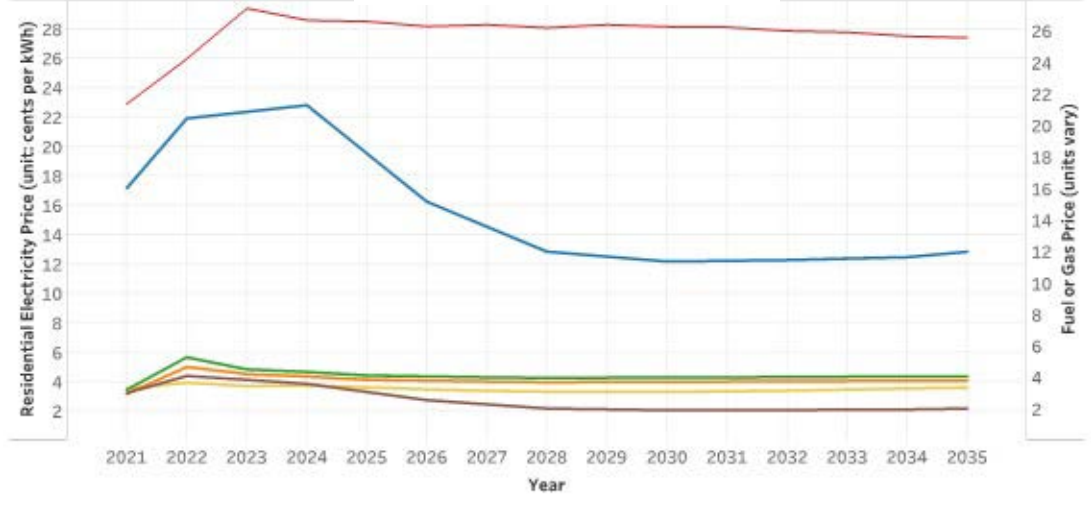


Light-Duty Vehicle Demand

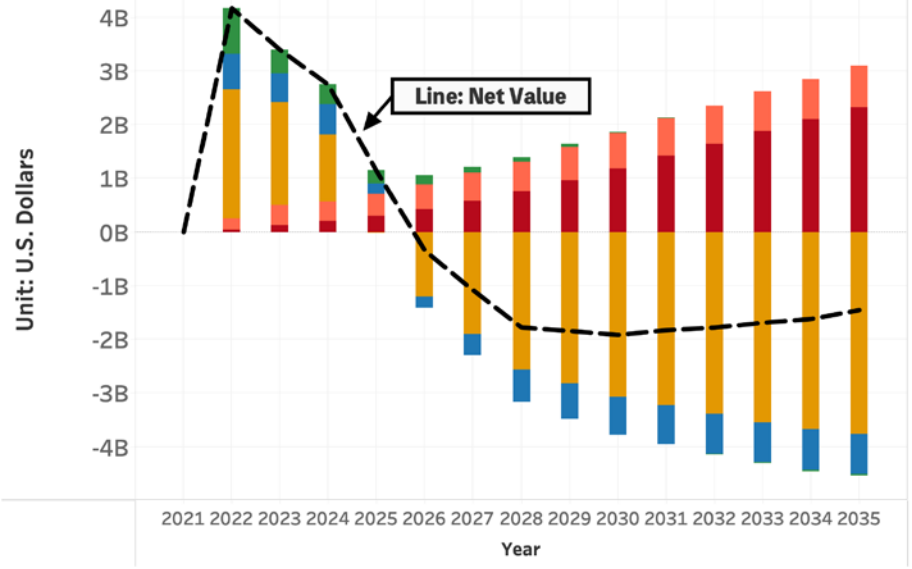


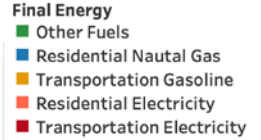


Energy Prices



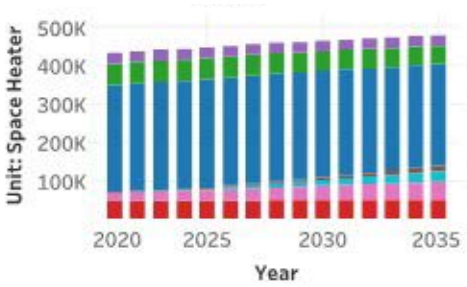
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



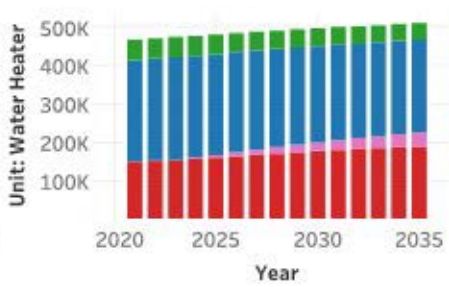


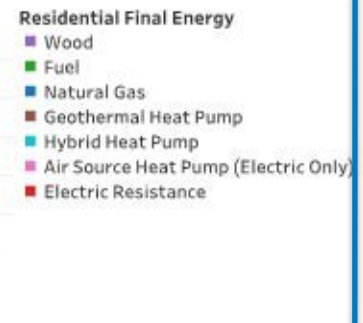
State-Level Profile: Montana

Residential Space Heating Stock

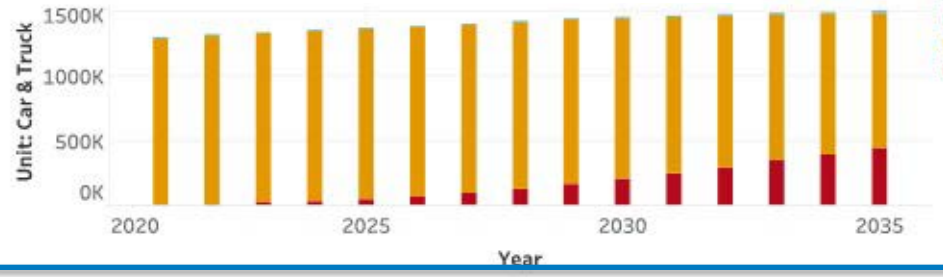


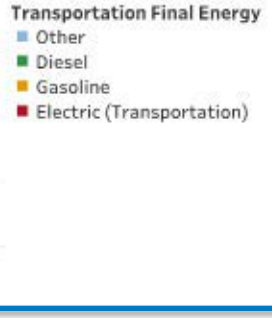
Residential Water Heating Stock



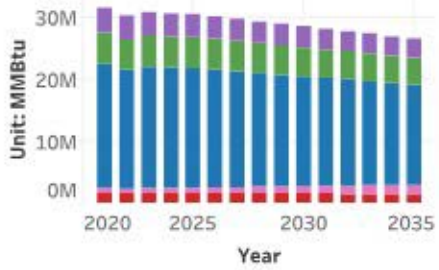


Light-Duty Vehicle Stock

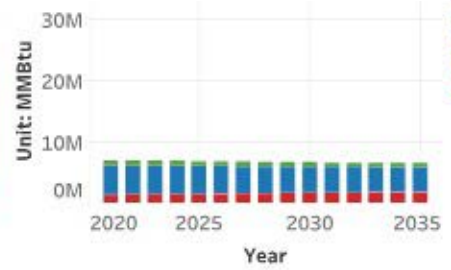


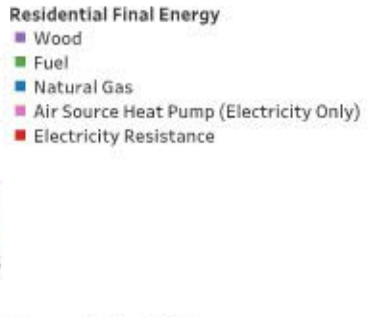


Residential Space Heating Demand

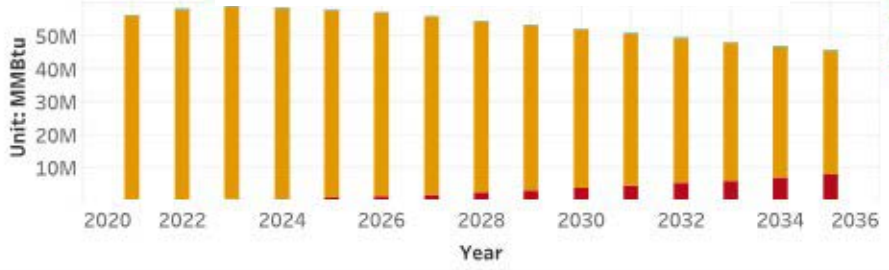


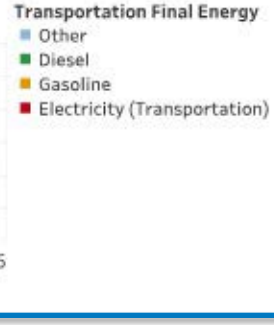
Residential Water Heating Demand



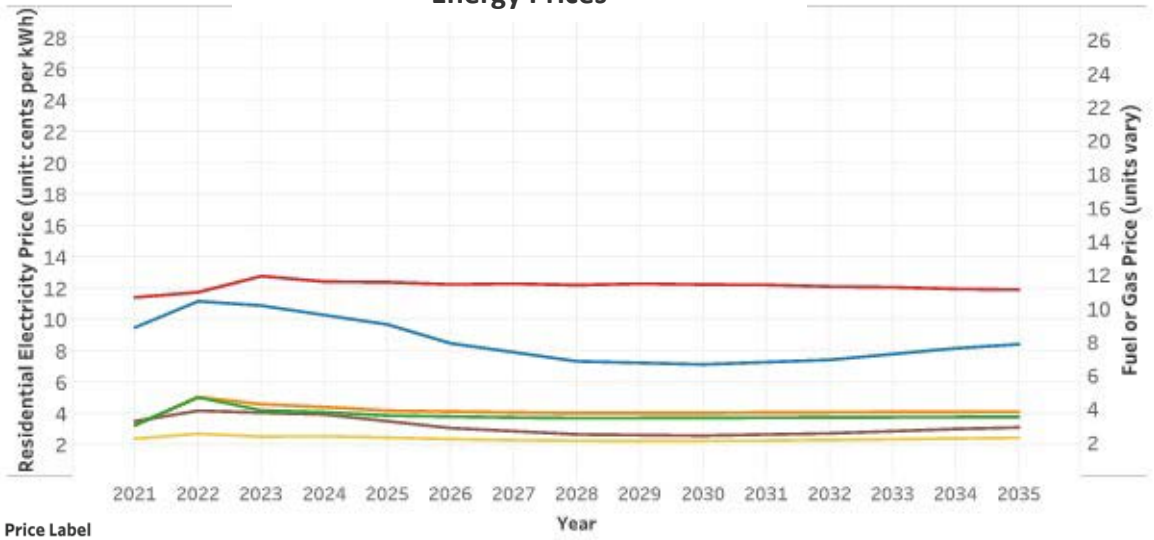


Light-Duty Vehicle Demand

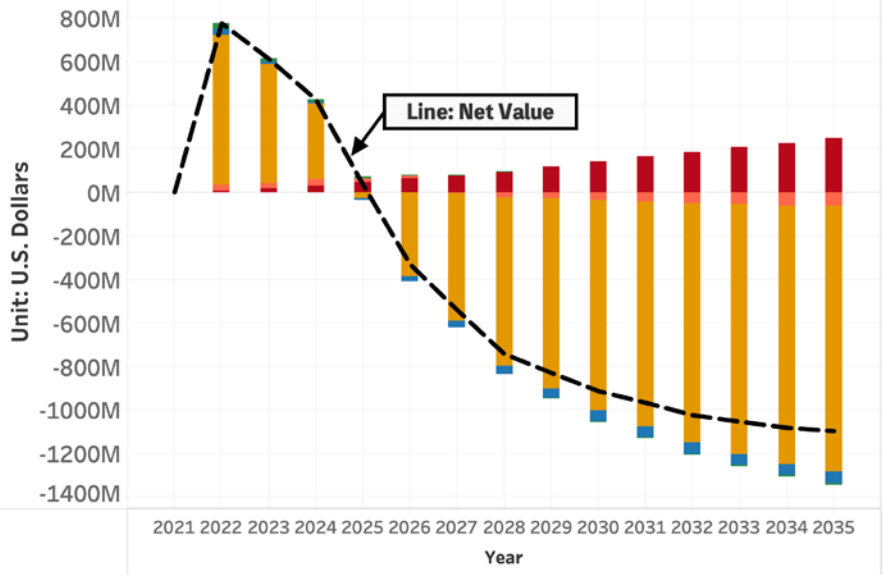


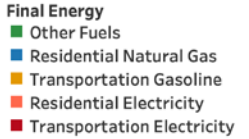


Energy Prices



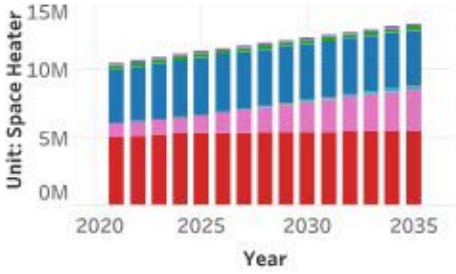
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



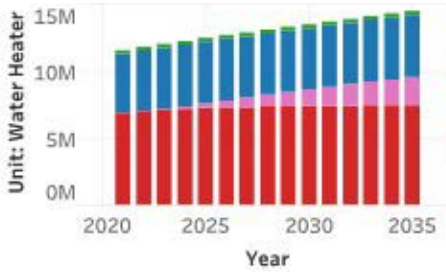


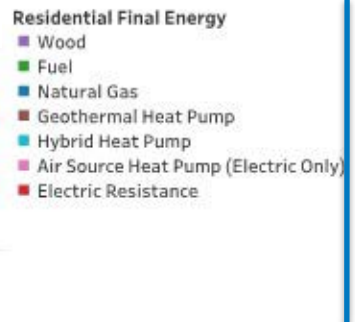
State-Level Profile: Texas

Residential Space Heating Stock

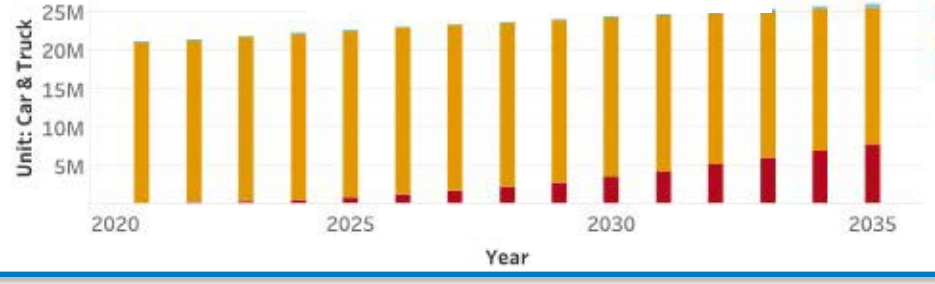


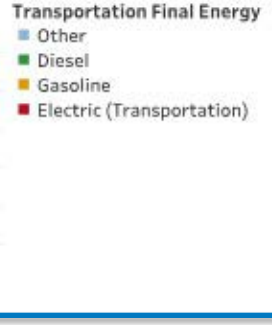
Residential Water Heating Stock



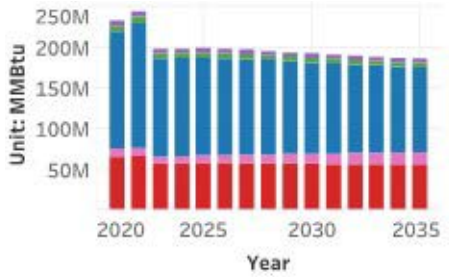


Light Duty Vehicle Stock

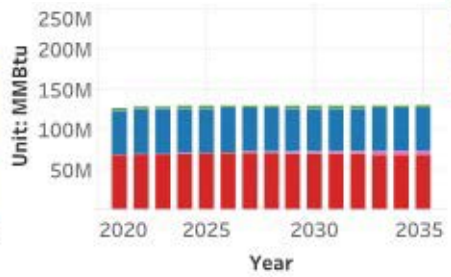


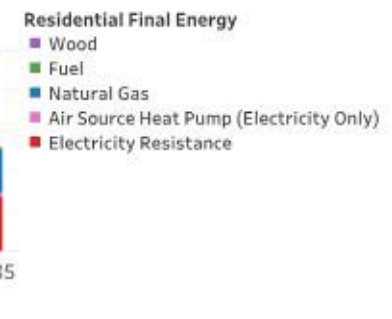


Residential Space Heating Demand

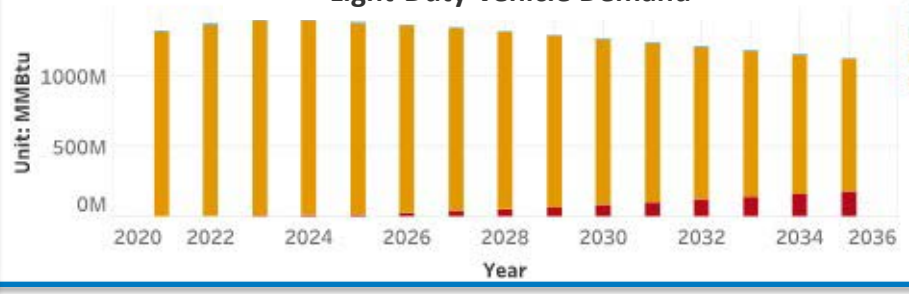


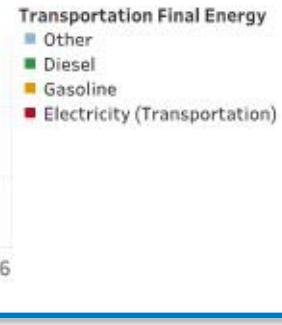
Residential Water Heating Demand



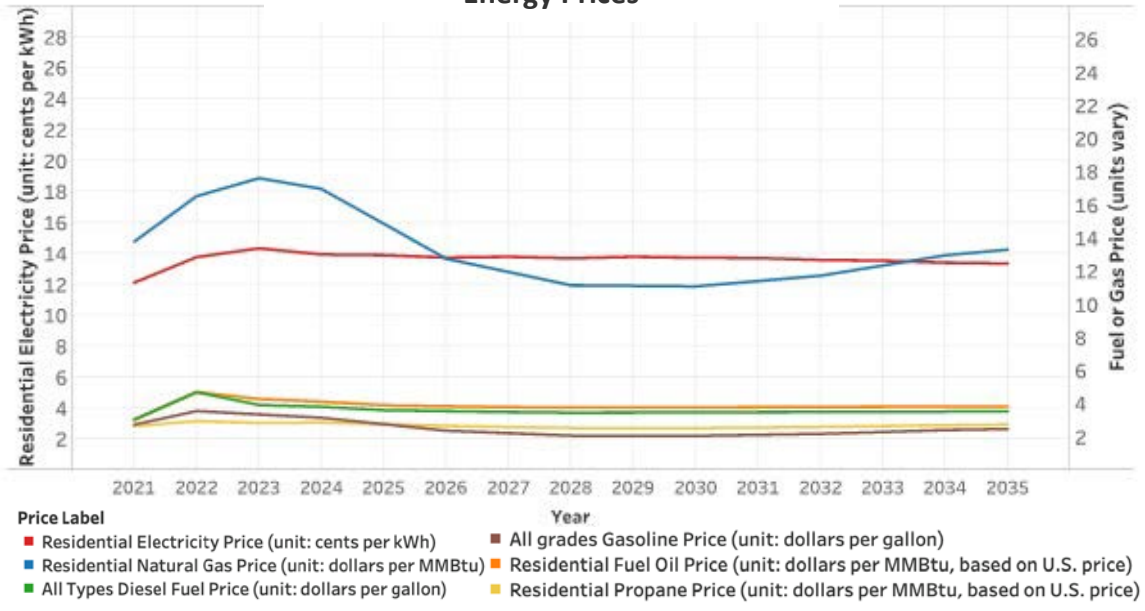


Light-Duty Vehicle Demand

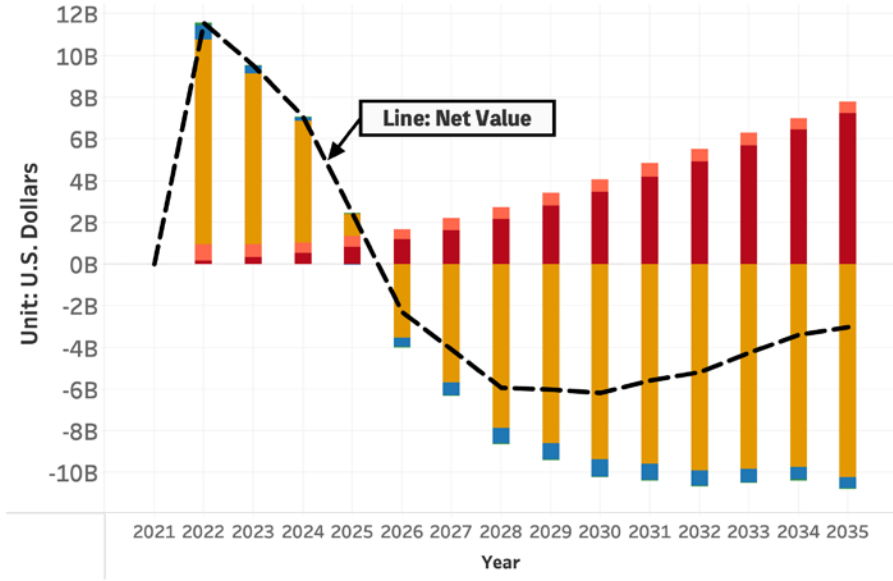


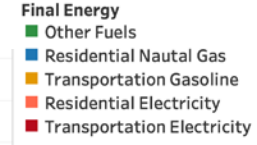


Energy Prices



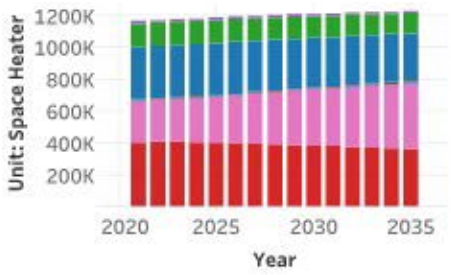
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



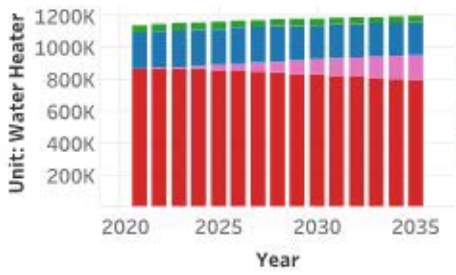


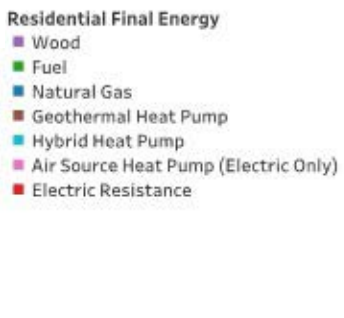
State-Level Profile: Mississippi

Residential Space Heating Stock

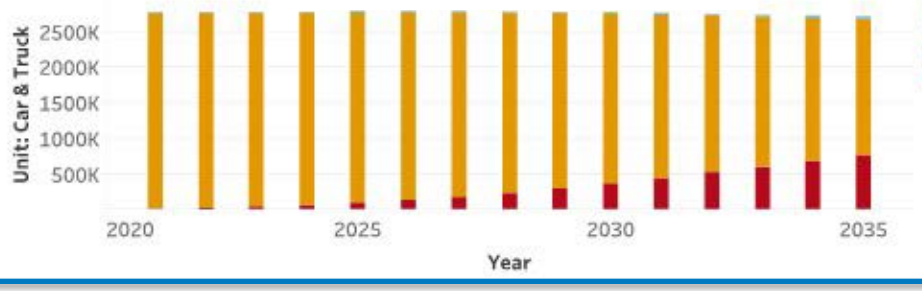


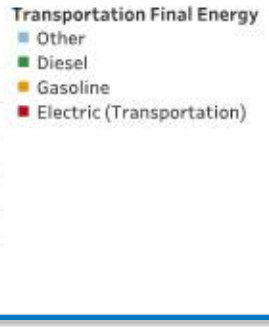
Residential Water Heating Stock



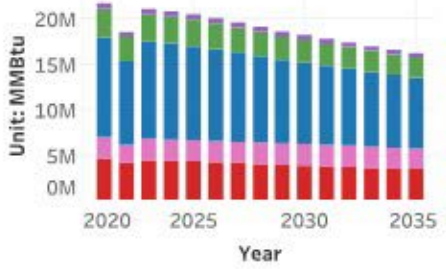


Light-Duty Vehicle Stock

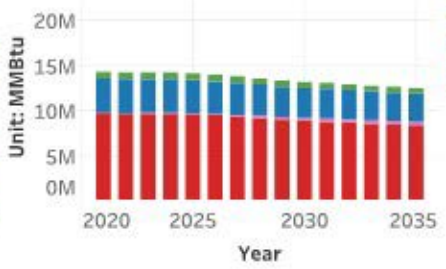


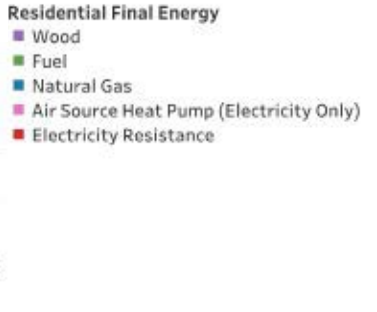


Residential Space Heating Demand

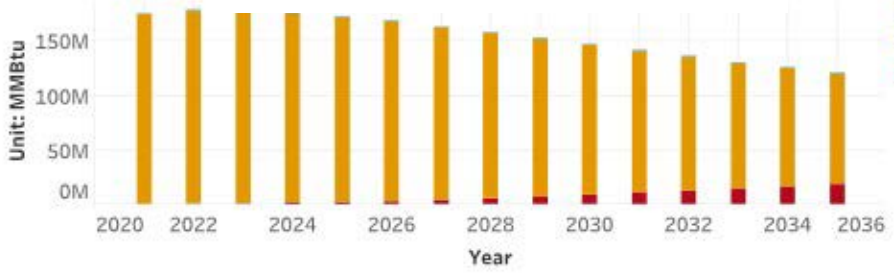


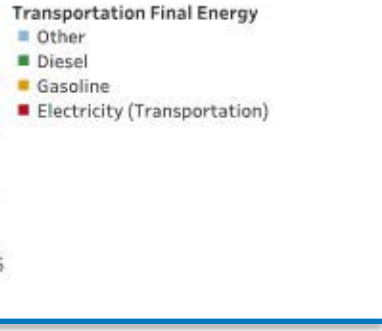
Residential Water Heating Demand



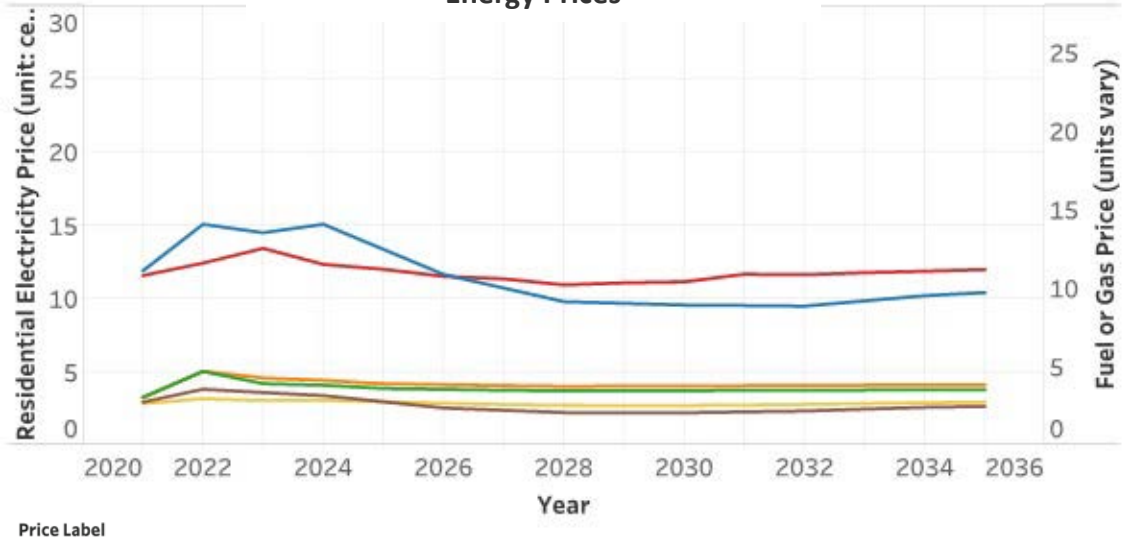


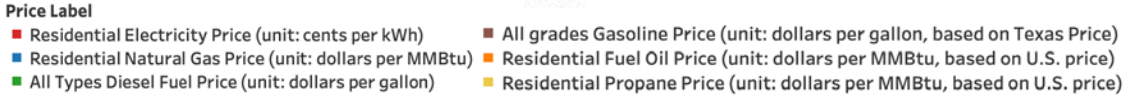
Light-Duty Vehicle Demand



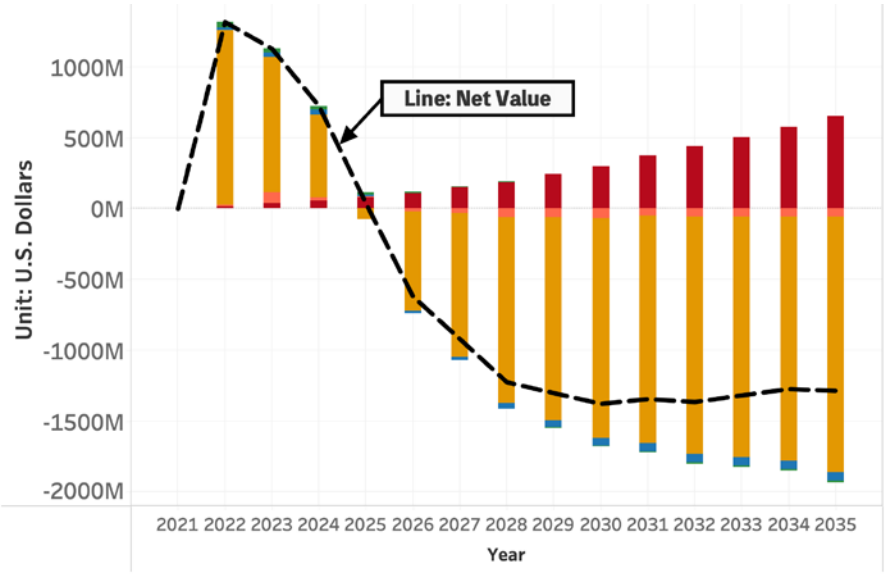


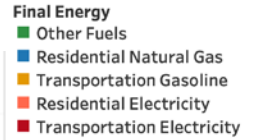
Energy Prices





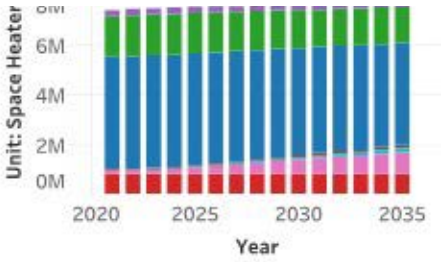
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



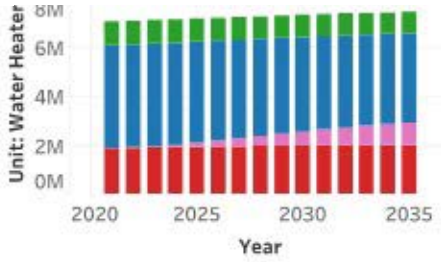


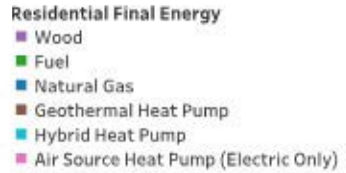
State-Level Profile: New York

Residential Space Heating Stock

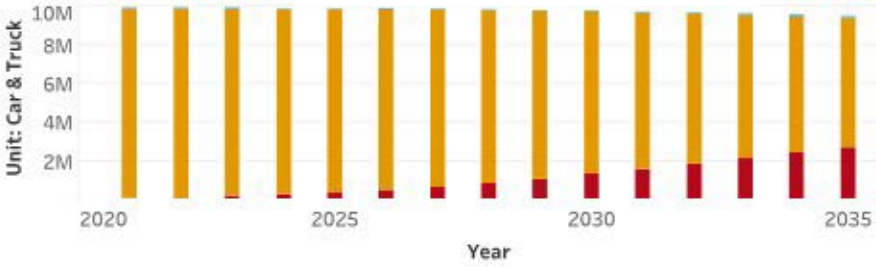


Residential Water Heating Stock

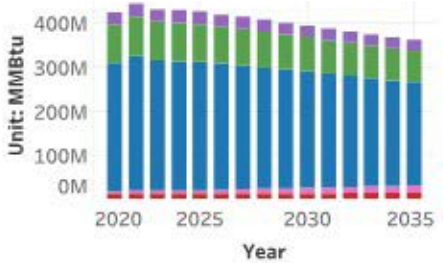




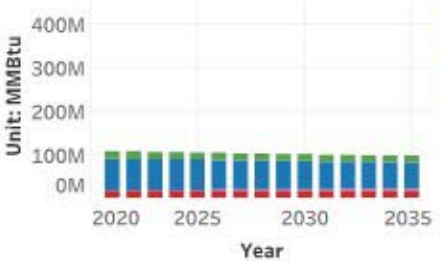
Light-Duty Vehicle Stock

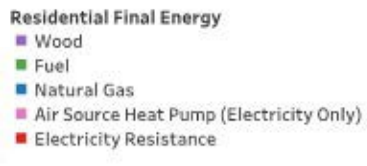


Residential Space Heating Demand

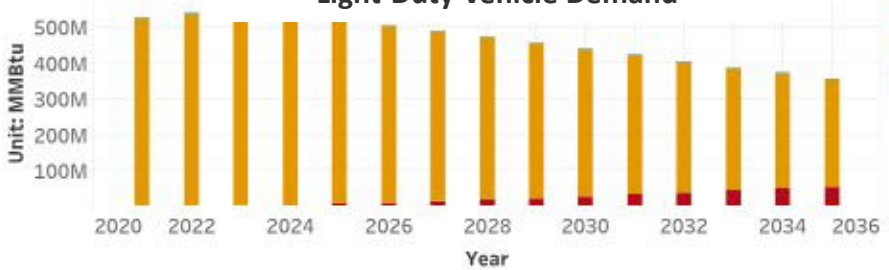


Residential Water Heating Demand

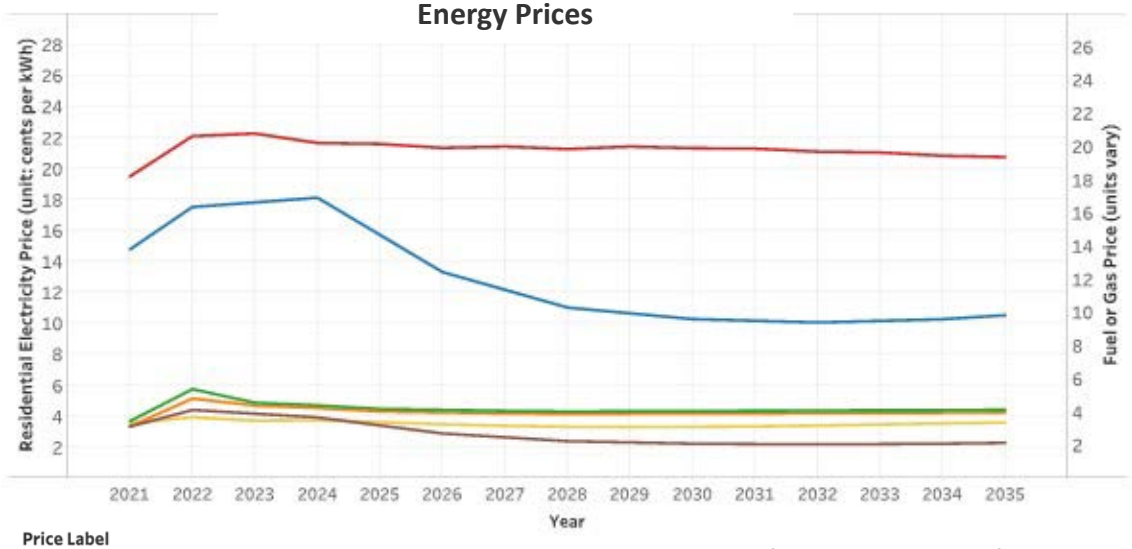




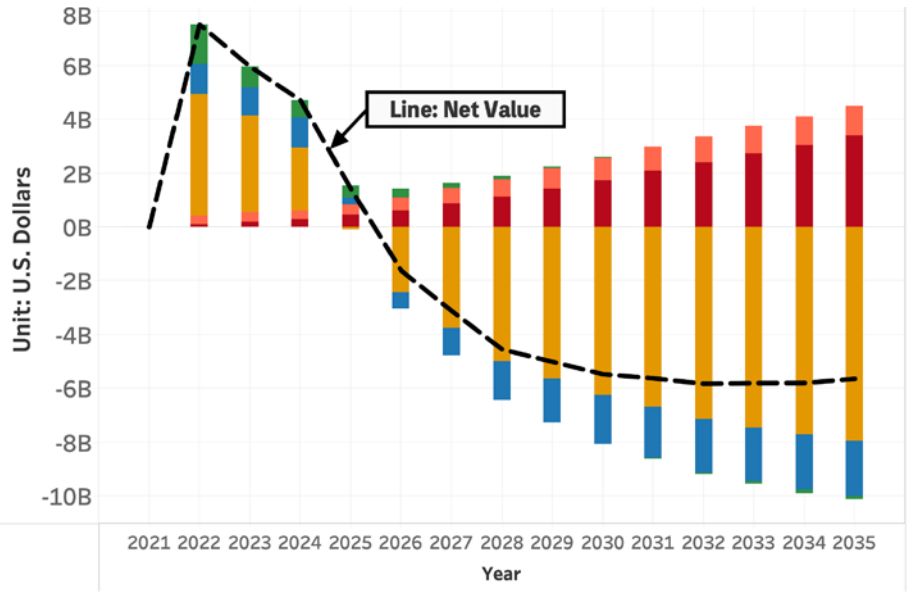
Light-Duty Vehicle Demand

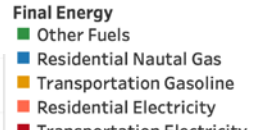


Energy Prices



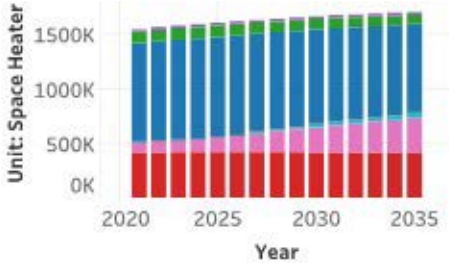
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



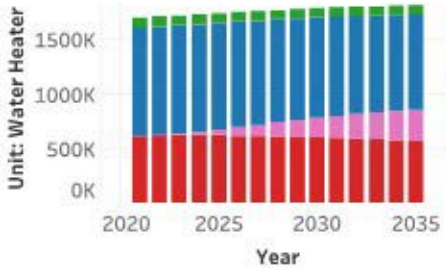


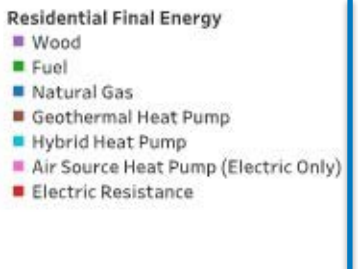
State-Level Profile: Oklahoma

Residential Space Heating Stock

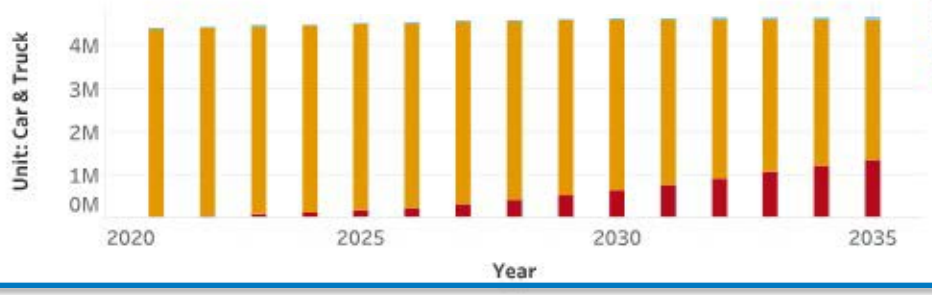


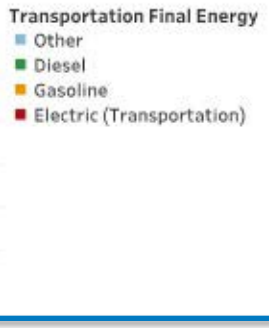
Residential Water Heating Stock



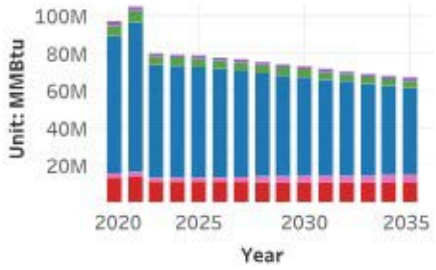


Light-Duty Vehicle Stock

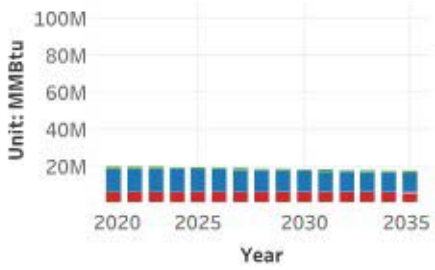


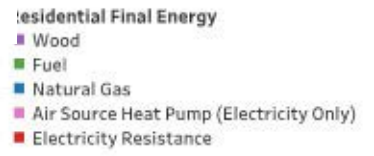


Residential Space Heating Demand

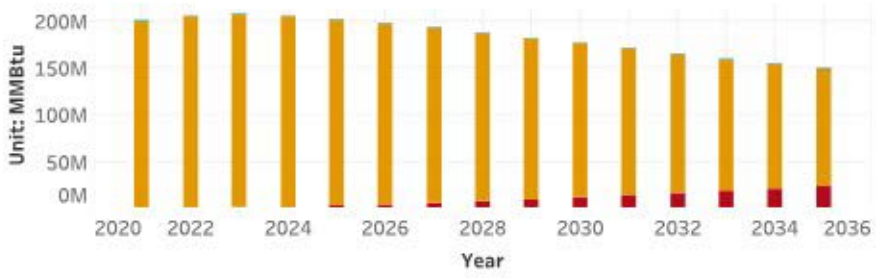


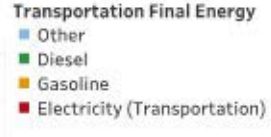
Residential Water Heating Demand



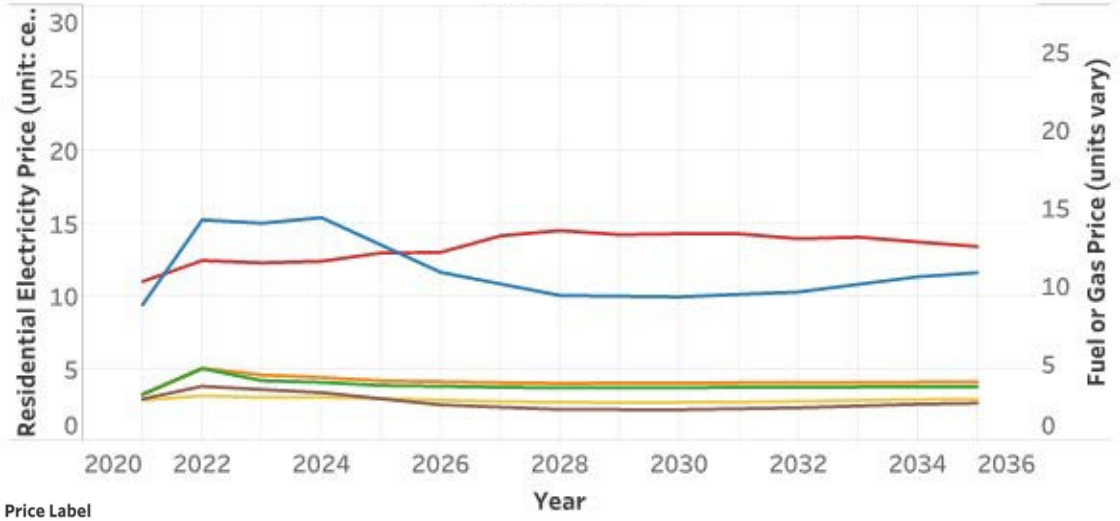


Light-Duty Vehicle Demand

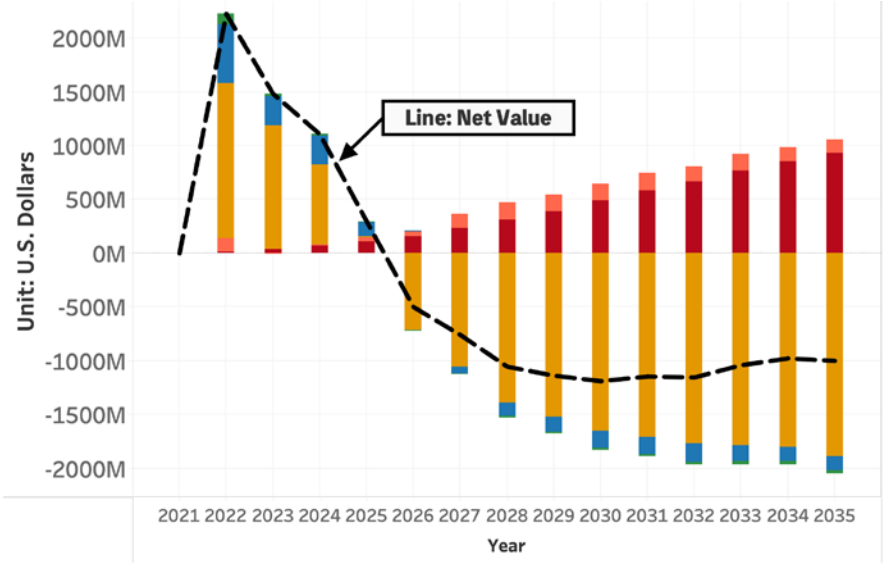


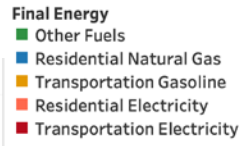


Energy Prices



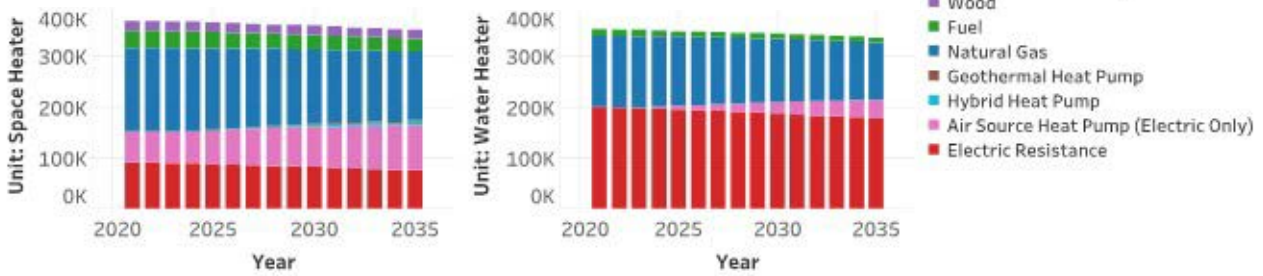
Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)



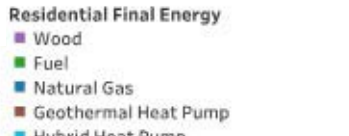


State-Level Profile: West Virginia

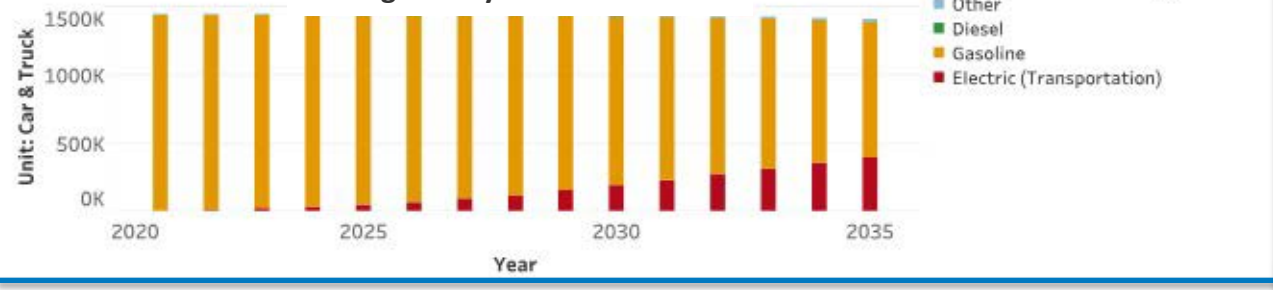
Residential Space Heating Stock

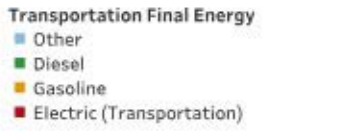


Residential Water Heating Stock

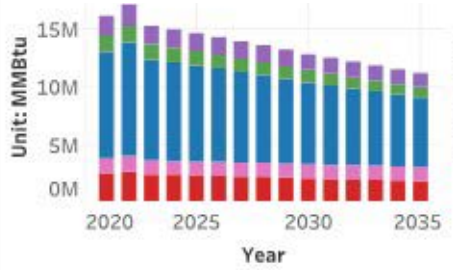


Light-Duty Vehicle Stock

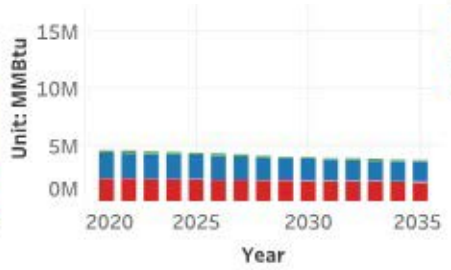


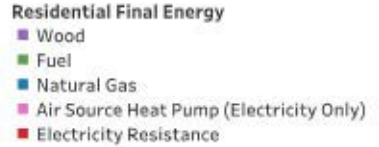


Residential Space Heating Demand

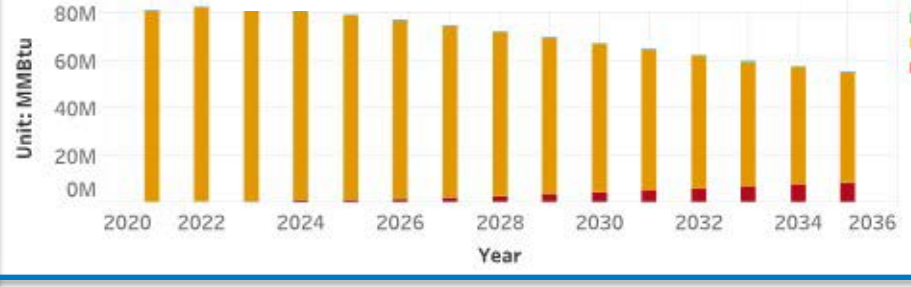


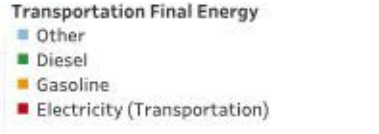
Residential Water Heating Demand



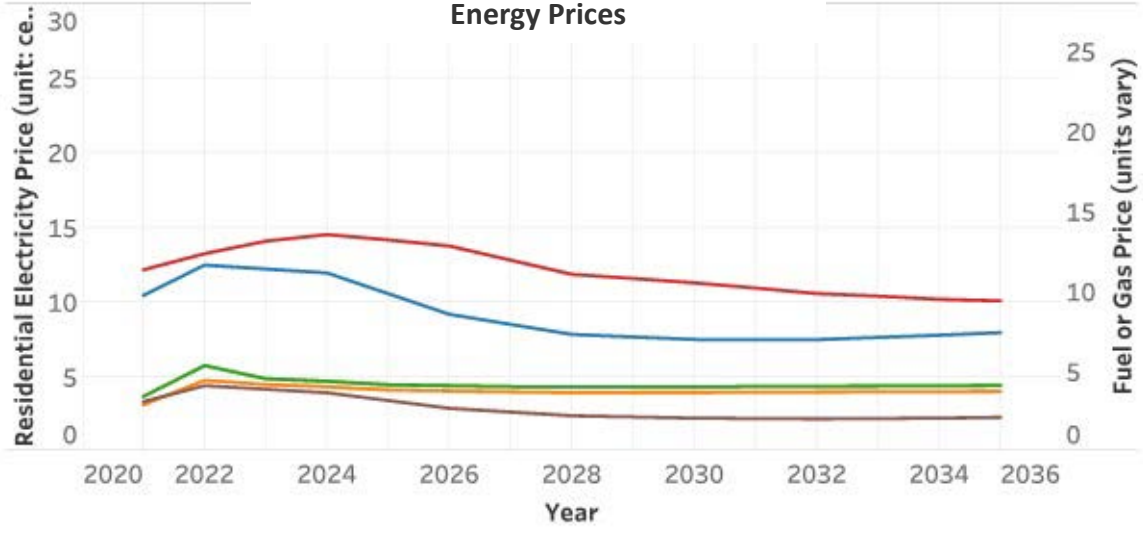


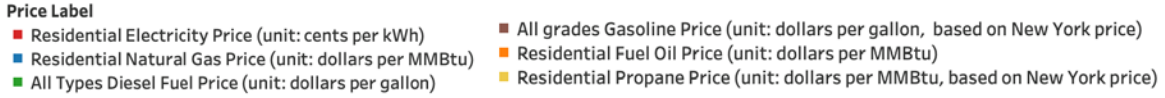
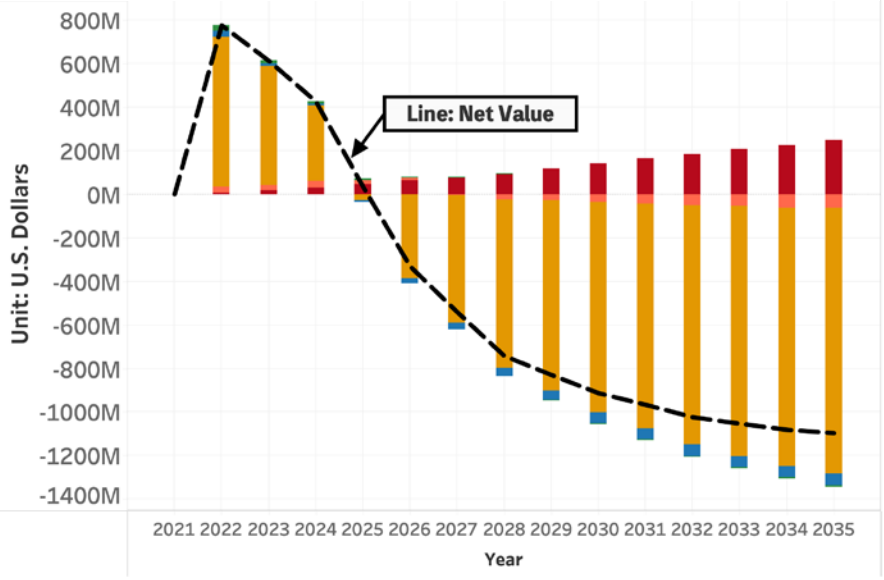
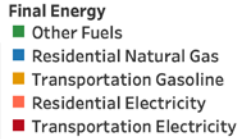
Light-Duty Vehicle Demand





Energy Prices





Difference in Space Heating, Water Heating, and LDV Expenditures (Compared to 2021)