

How Power System Trends Impact Affordability

Insights from EPRI modeling and analysis



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Load Growth and Affordability: Key Electricity Issues

- **Electricity demand is entering a new period of load growth**
 - *Data centers*
 - *New manufacturing and industrial growth*
 - *Electrification*
- **Electricity prices have increased sharply in nominal terms**
 - *Economy-wide inflation*
 - *Grid modernization and resilience (mostly T&D costs)*
 - *Potentially offsetting impacts of load growth*
- **Energy affordability is a strategic priority for the power sector**
 - *Modeling of cost drivers and future trends is a starting point*

Three Key Ideas

Energy Wallet

Electricity is less than half of average household energy expenditures in all 50 states



2025 White Paper



The Energy Wallet

U.S. and State-Level Household Energy Expenditures, Past, Present, and Future

energywallet.epri.com

Win-Win-Watts

Load growth, including from data centers, drives lower average system costs



2026 White Paper

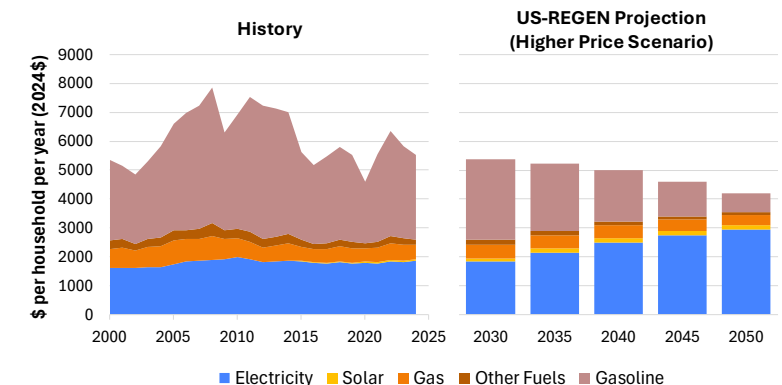
Win-Win Watts:

When Can Data Centers, Efficient Electrification, and New Loads Lower Electricity Prices?

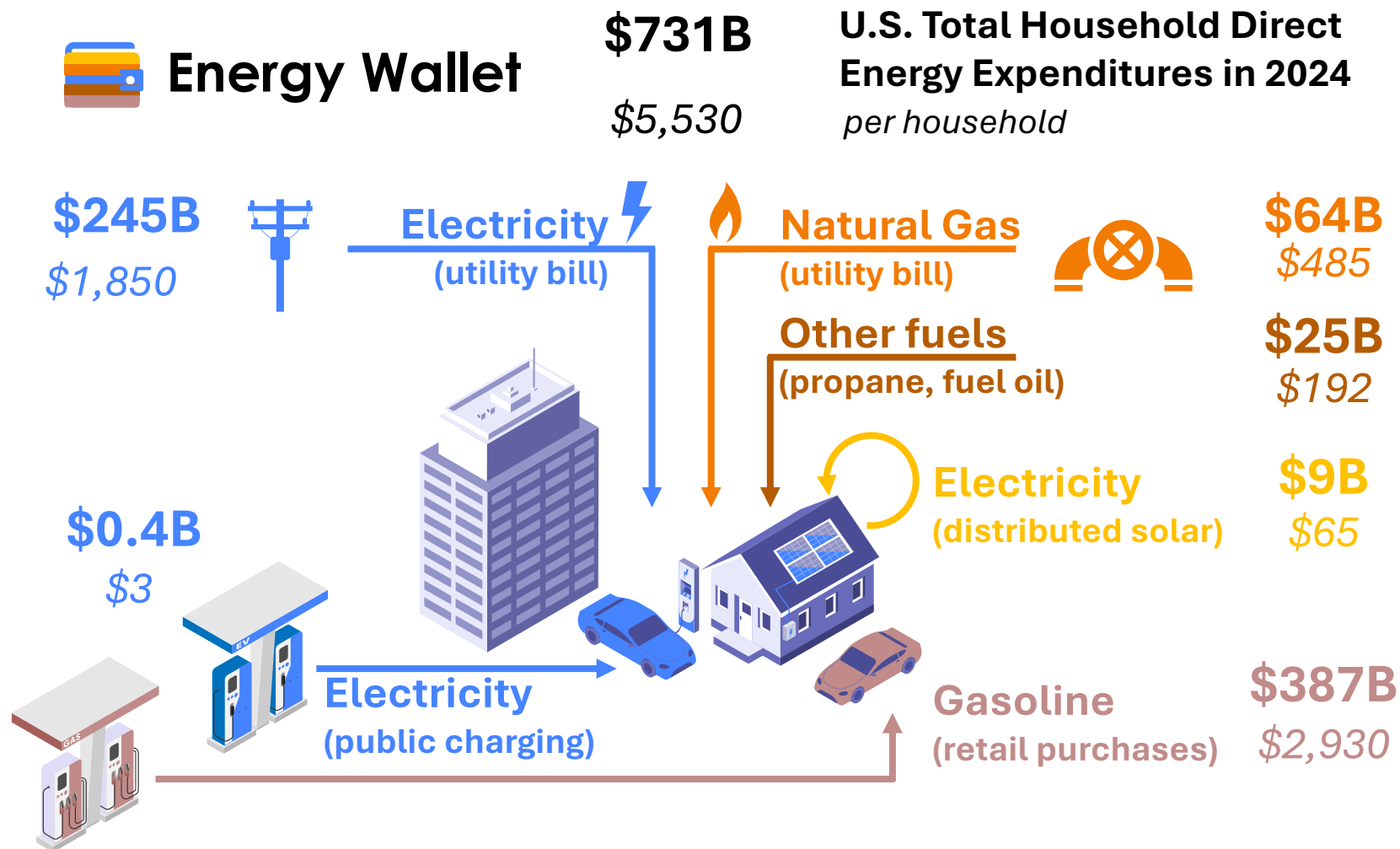
winwin.epri.com

Declining Household Energy Burden

Electrification and efficiency stand to lower future household expenditures, even with higher prices or carbon policy, especially relative to income



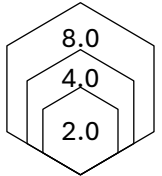
What are current direct household energy expenses?



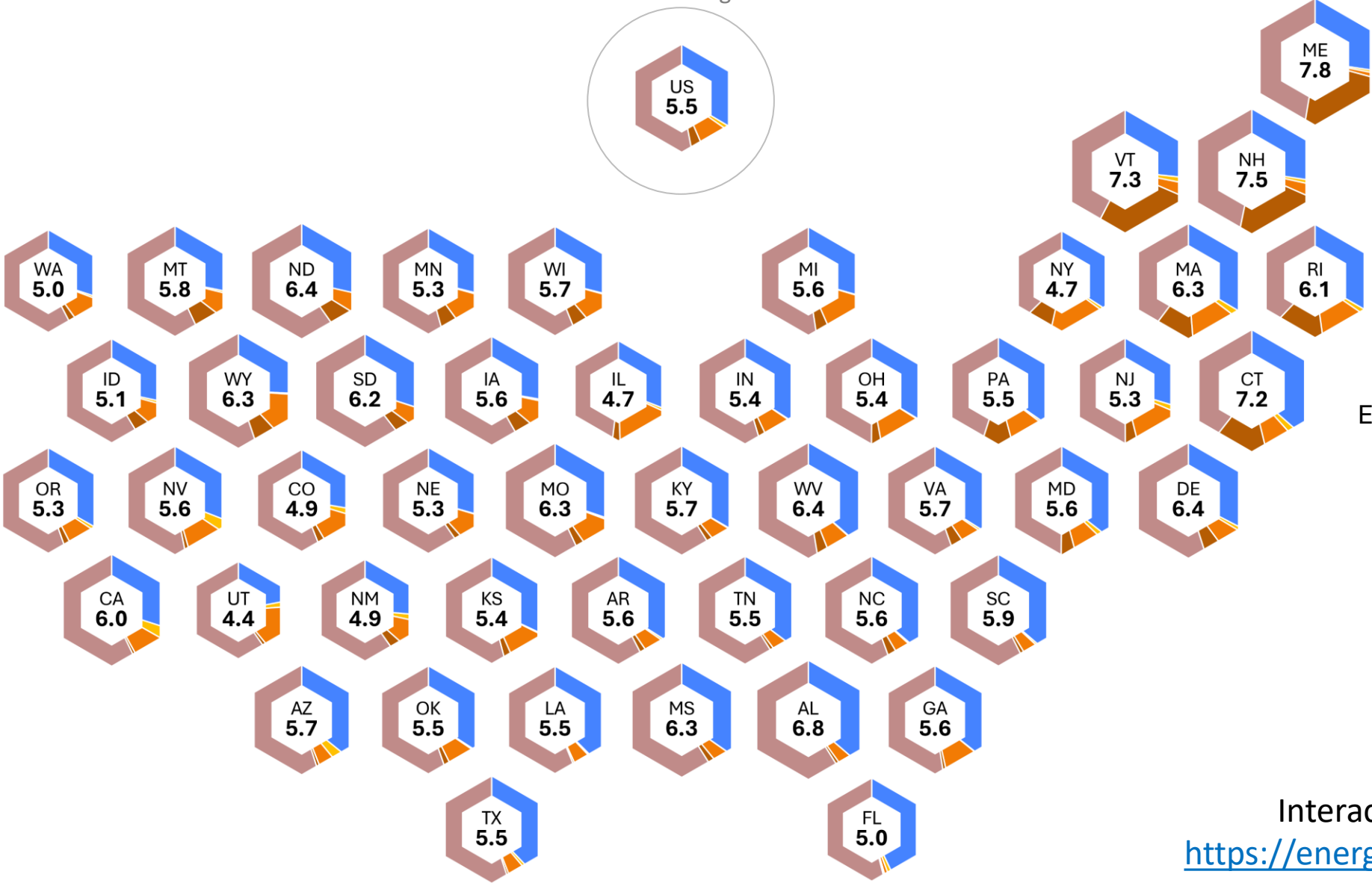
Primary data source: <https://www.eia.gov/state/seds/>

Household Energy Wallet by State in 2024

US Average



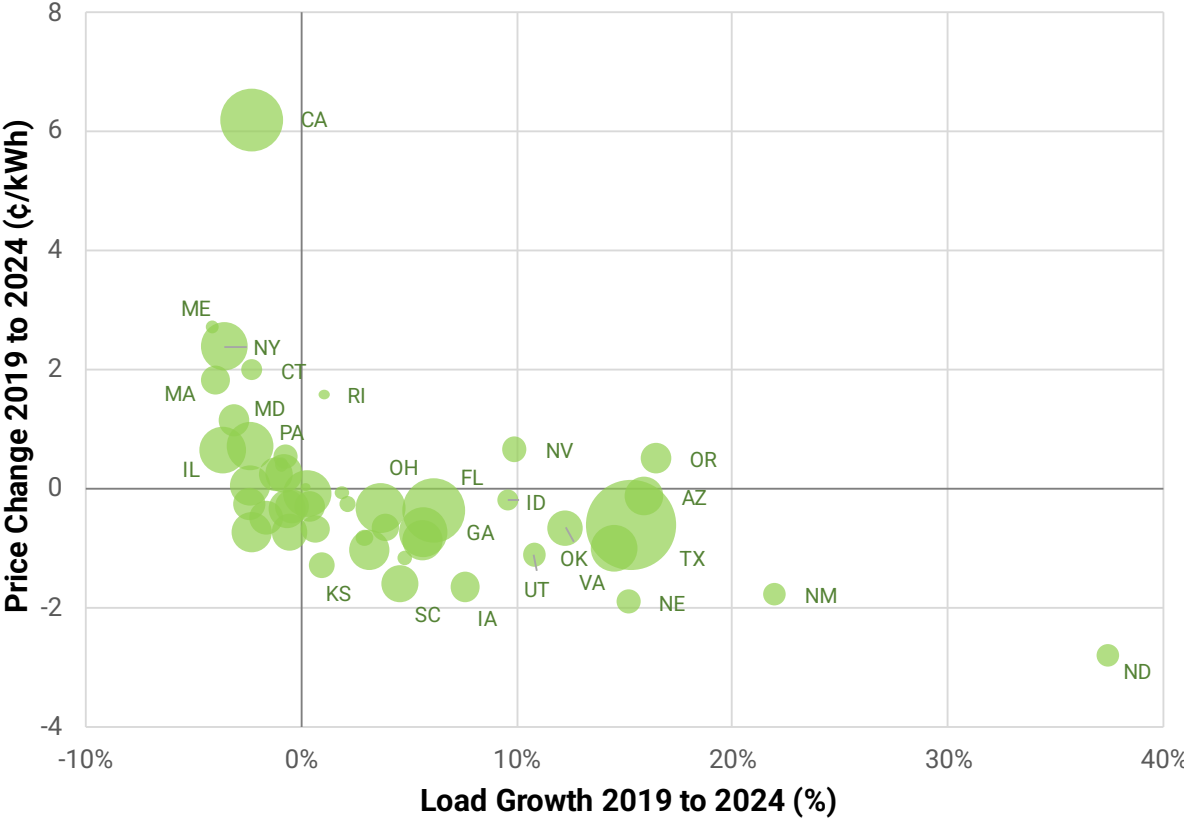
Annual Household Energy Expenditures in 2024\$ (thousands)



- Electricity
- Solar
- Natural Gas
- Other Fuels
- Gasoline

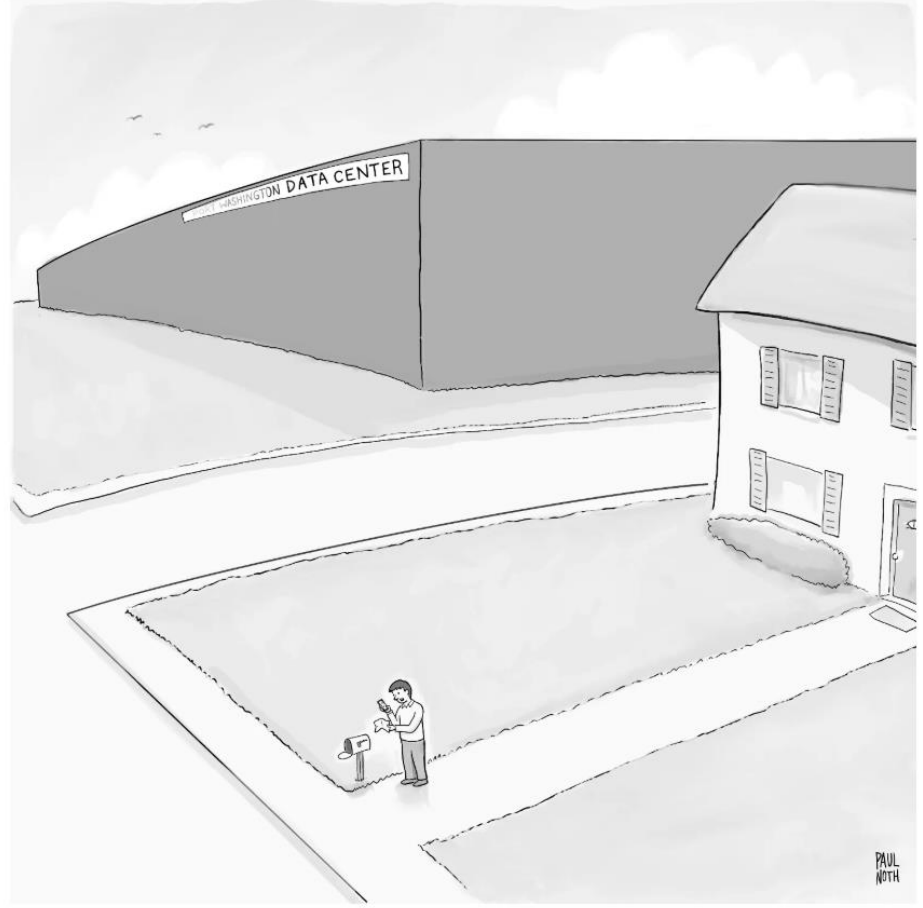
Interactive map at <https://energywallet.epri.com/>

Data Centers and Electricity Prices: Reality vs Perception



Source: Win-Win Watts white paper, based on [LBNL report](#)

States with faster load growth generally experienced smaller electricity price increases, or even price declines

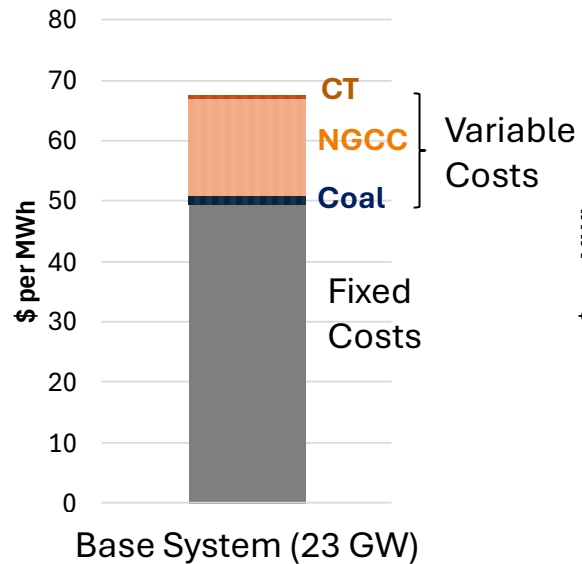


“ChatGPT, why is my electric bill so high?”

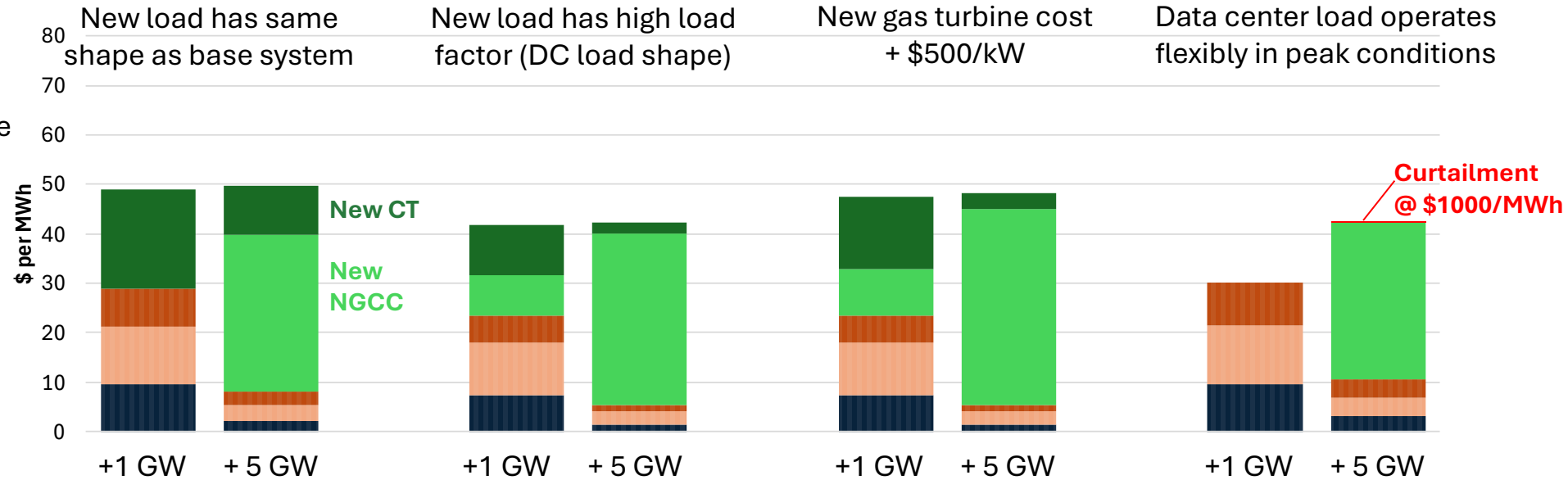
Cartoon by Paul Noth

How load growth drives lower average generation costs

Average Generation Cost
(based on PJM-South)



Modeled Average Incremental Generation Cost with New Load



Incremental generation has lower average costs than existing system:

- Increased utilization
- New capacity (as size of increment increases)

High load factor of data center load allows greater use of lower-cost incremental generation (especially new NGCC)

Lower costs than base system even with escalated new capacity costs

Flexibility of data center load allows some new capacity investment to be deferred, and shifts to lower-cost incremental generation

When load growth can drive higher average costs

Several factors could work against and potentially offset fundamental structural drivers of lower generation costs:



High incremental grid (T&D) costs for interconnection

Current average transmission costs are ~1.7 ¢ / kWh, translates to ~\$136M annual recovery from 1 GW of new data center load, could support 200-400 transmission miles



Escalation of supply chain costs

PPI for power systems equipment up 2-5x vs. CPI since 2019



Inframarginal rents from capacity market (e.g. PJM)

PJM clearing price now reflects an elevated CONE (or lower due to cap), triggering higher payments to existing resources (still only represents ~2 ¢ / kWh of retail sales)



Slow ramp-up or early exits → stranded assets

Rate design can mitigate adverse impacts on other customer classes

Three Levers for “Win-Win” Outcomes



Rate Design and Cost-Shift Protections

Safeguard provisions include minimum contract terms (to better match contract duration with asset lifecycles), minimum monthly billing demand, collateral requirements, exit fees, and capacity reassignment.

Goals: cost recovery, efficiency, alignment, fairness



Demand Flexibility

New flexibility for data centers: computational shifting, use of backup/energy storage, behind-the-meter integration.

Goal: reducing coincident peak and deferring capex in exchange for speed to power

EPRI DCFlex

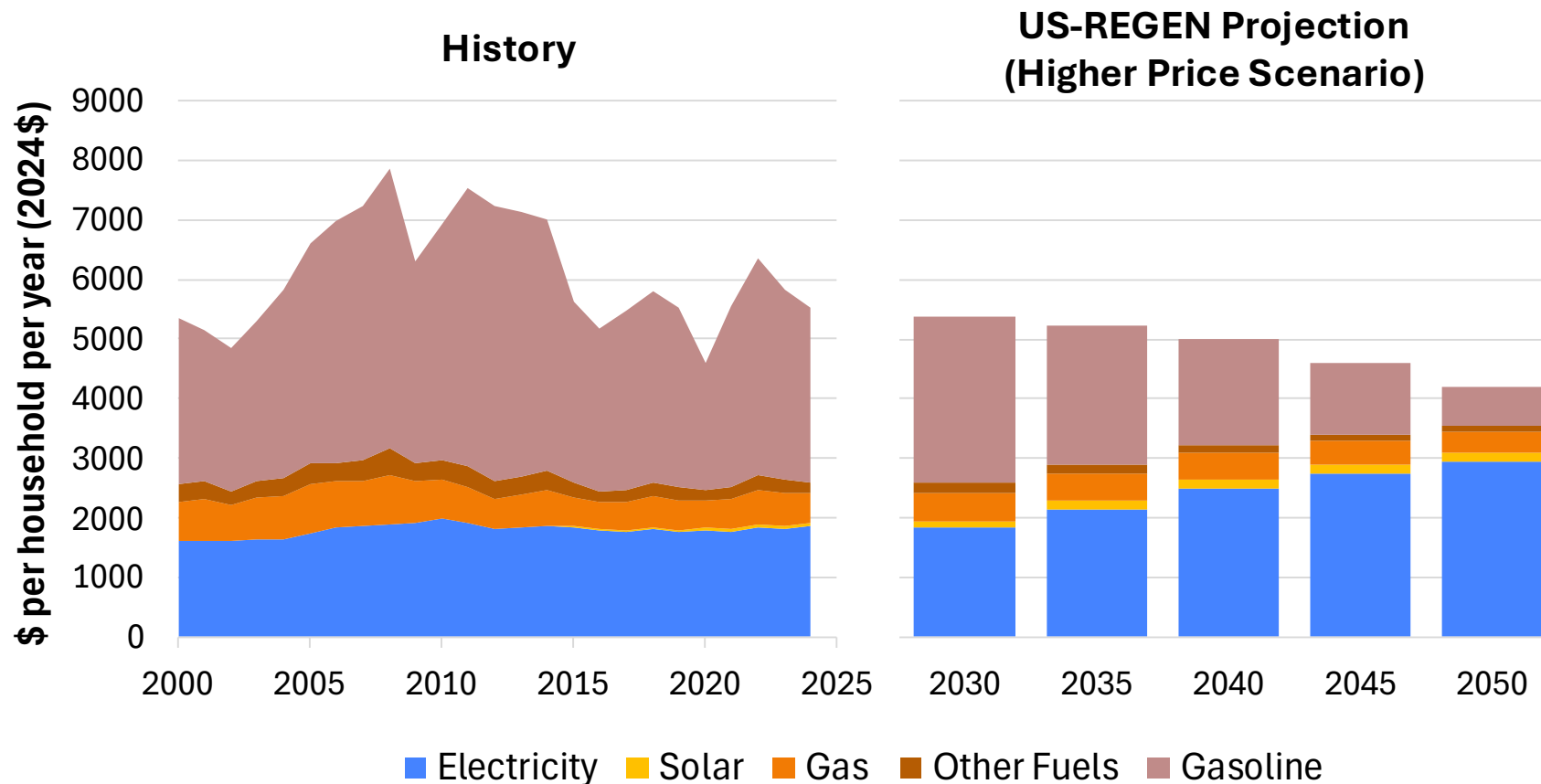


Proactive Planning

Load forecast → interconnection & T&D plan → resource plan → tariffs & flexibility requirements

Goal: proactive planning to reduce system costs

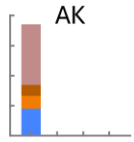
How Could Energy Wallet Spending Change Over Time?



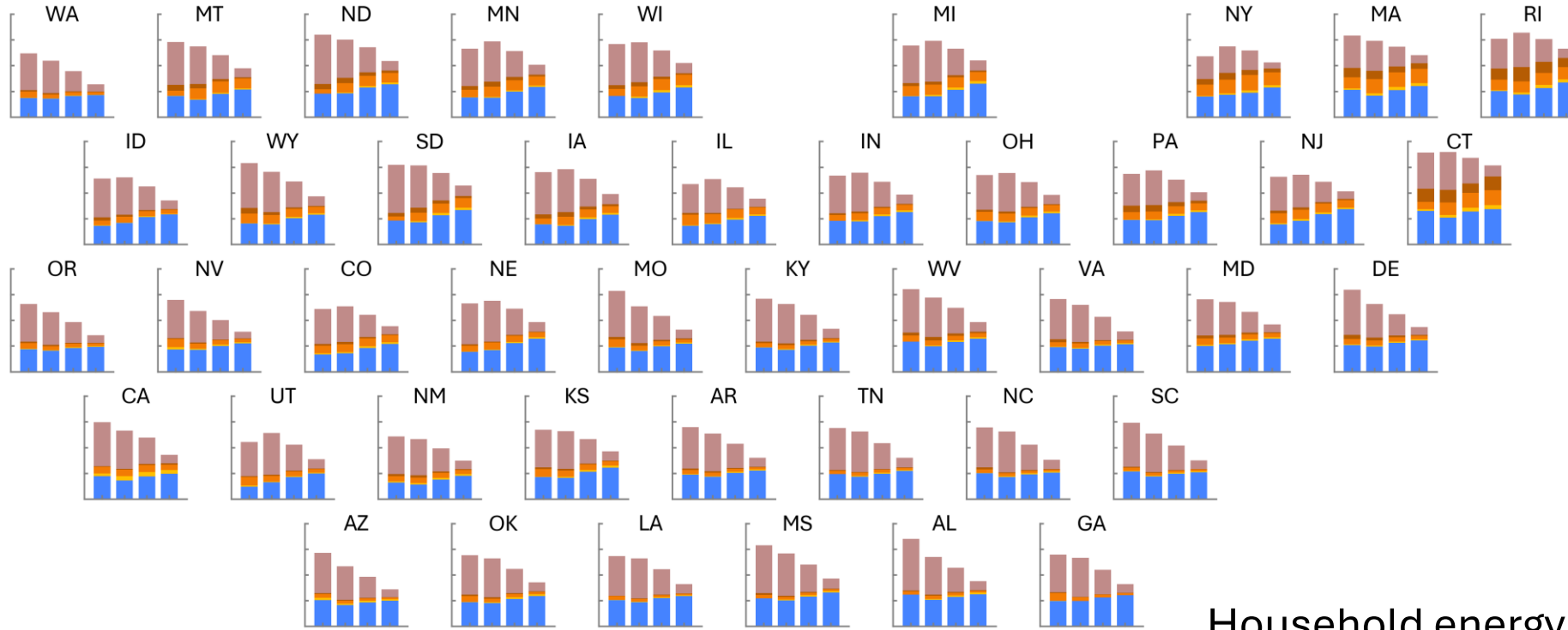
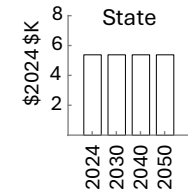
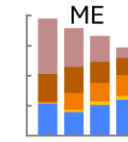
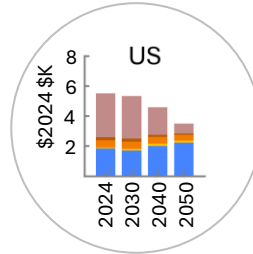
- Use EPRI's [US-REGEN](#) energy systems model to evaluate household energy consumption and expenditures in future
- Higher Price scenario phases out IRA subsidies and includes higher fuel prices
- Electrification of heating and personal vehicles is driven by economic adoption
 - Energy for EV per mile is ~1/3 for gasoline, which drives cost savings
 - 2035: Half new vehicle sales EVs

Household energy wallet projected to decline, despite increased electricity expenditure

Annual Expenditures 2024-2050 | Higher Price Scenario



US Average



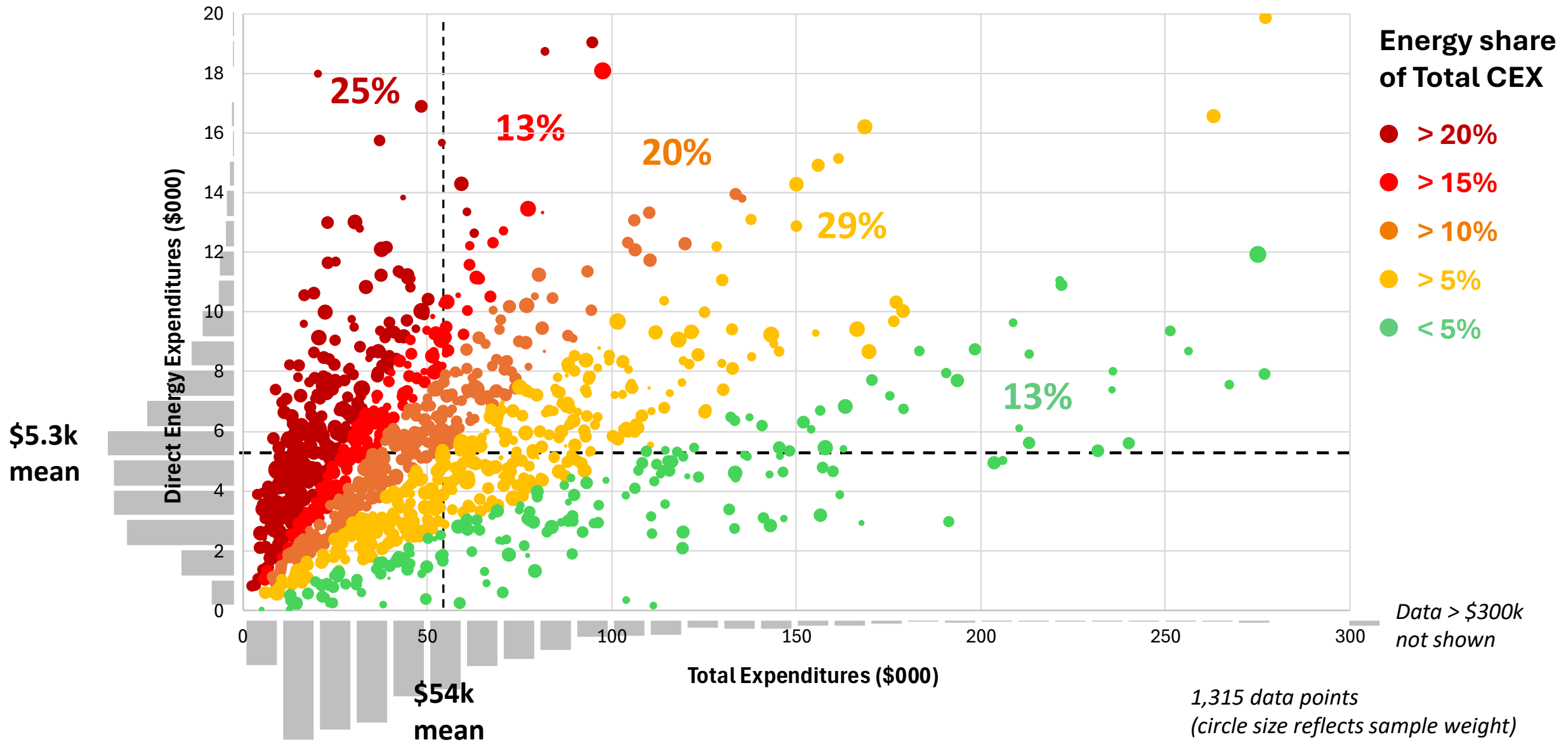
Annual Household Energy Expenditures in 2024\$ (thousands)

- Electricity
- Solar
- Natural Gas
- Other Fuels
- Gasoline

Household energy wallet declines by 10-50% across states, even with higher electricity prices

Affordability challenges arise from distributional impacts

Per Household Expenditures in 2023 Consumer Expenditure Survey





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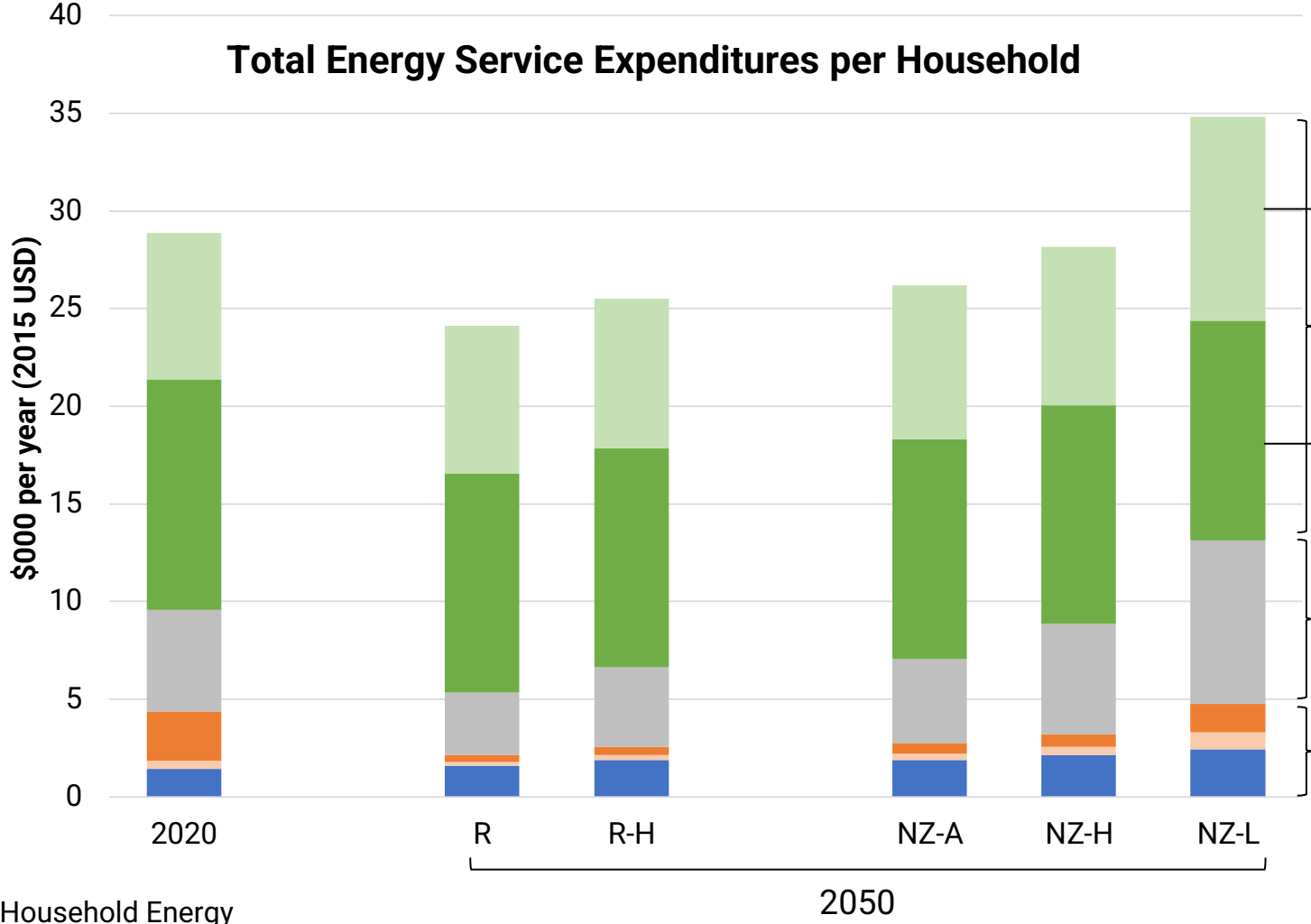
Real per household costs can decline even with Net-Zero

From LCRI Net-Zero 2050 study (published 2022)

lcri-netzero.epri.com



Total Energy Service Expenditures per Household



Indirect by firms

Non-energy expenditures related to energy end-use
(vehicles, appliances, charging, end-use O&M)

Direct by households

Indirect energy expenditures by firms
(commercial buildings and transportation, industrial)

Direct energy expenditures by households
(residential buildings and light-duty vehicles)
Currently ~\$4,400, falls to ~\$2,100 in Reference,
~\$2,800 - \$4,800 in Net-Zero Scenarios

Household Energy

- Electricity
- Pipeline Gas
- Liquids/Other
- Non-Household Energy
- Household Non-Energy
- Non-Household Non-Energy

- R** Reference
- R-H** Reference (+ higher fuel costs)
- NZ-A** Net-Zero All Options
- NZ-H** Net-Zero Higher Fuel Cost
- NZ-L** Net-Zero Limited Options