Electricity Price Trends & What We Can Do About Them

PREPARED BY

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PREPARED FOR

Real Estate Roundtable (RER) Sustainability Policy Advisory Committee Meeting

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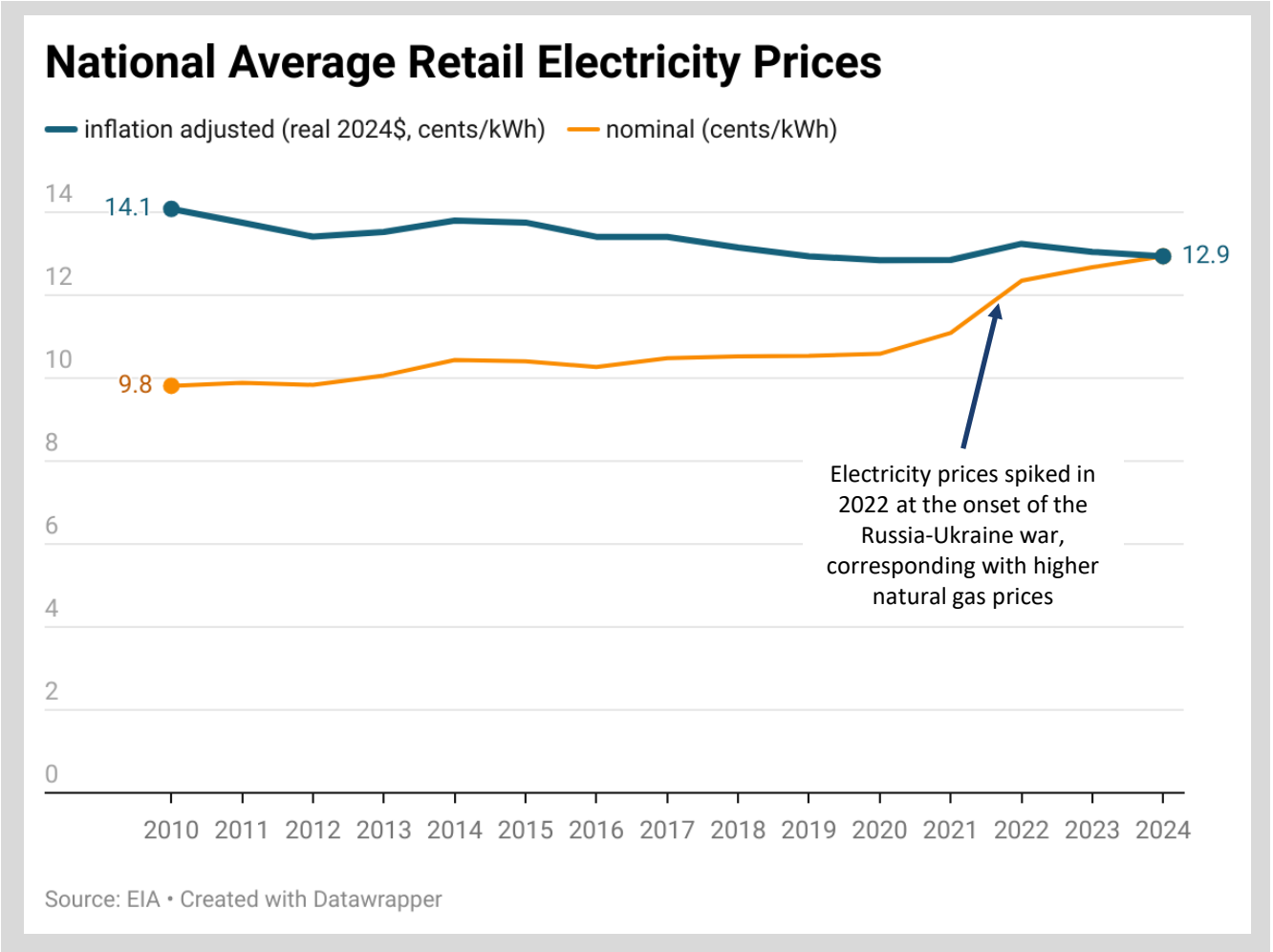
Brattle

Bottom Line Up Front

1. Historical Electricity Price Trends	• **Price Stability:** While national-average nominal retail electricity prices have increased in recent years, the increases have largely tracked inflation • **Geographic Dispersion:** Significant variance in price delta across the U.S., driven by jurisdiction-specific factors
2. Impacts of Large Loads on Rates	• **Historical Salutary Effects**: Integration of large loads provided downward pressure on electricity rates through improved infrastructure utilization and cost-sharing • **Future Risks**: Current burst in electricity demand means this dynamic is no longer a certainty; future impacts are contingent on grid characteristics, market conditions, and regulatory structures
3. Strategic Asset Management & Decarbonization	• **On-Site Asset Deployment**: Building owners can mitigate exposure to rising prices by leveraging behind-the-meter resources and demand-side load flexibility • **Cost & Decarb Co-optimization**: Advanced energy management allows for the simultaneous optimization of capital investments, operational expenditure, and corporate sustainability/decarbonization implementation

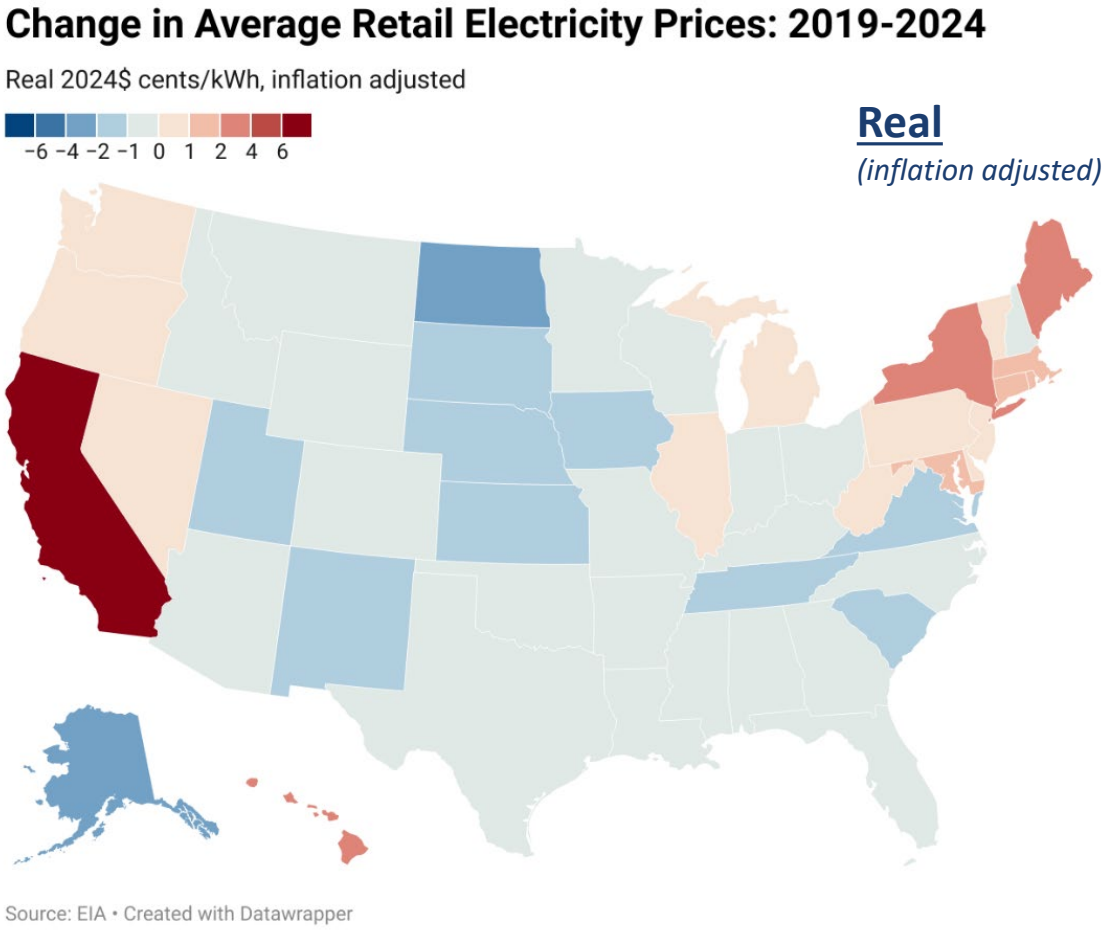
Retail prices at a national level have largely tracked inflation in recent years

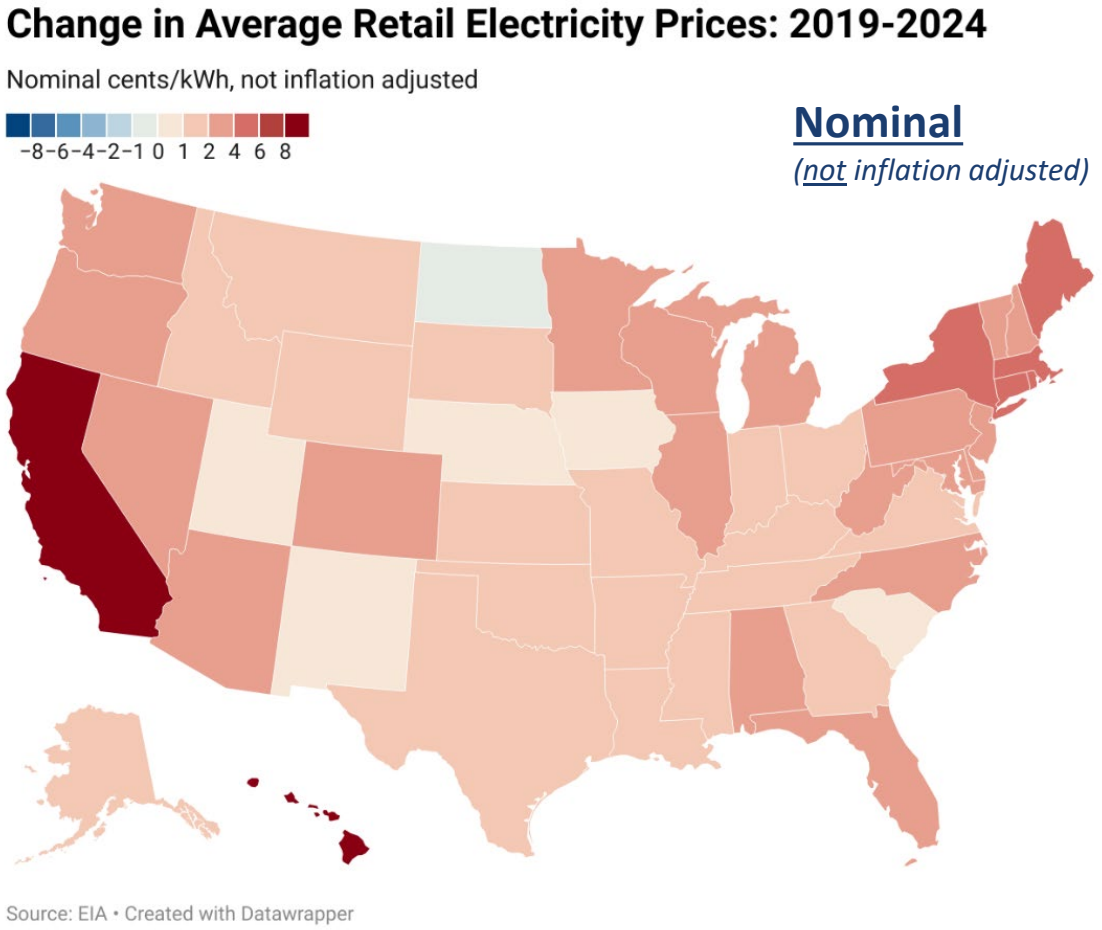
- In nominal terms (i.e., not inflation-adjusted), the average retail electricity price increased by 23% from 2019 to 2024, and 32% since 2010
- When adjusted for inflation, real prices in 2024 were the same as 2019, and 8% lower than 2010
- This is generally consistent with the longer-term trends of declining real electricity prices and reflects the long-term decline in natural gas prices and other generation-related costs



Notes: Represents the "all-in" price, equivalent to total customer bills (including volumetric, demand, and fixed charges) divided by total retail electricity sales, and covers all costs associated with the provision of retail service (generation + transmission + distribution)

Regional disparities are substantial, but all nominal prices are up





Key drivers of state-level retail electricity price changes (2019-2024)

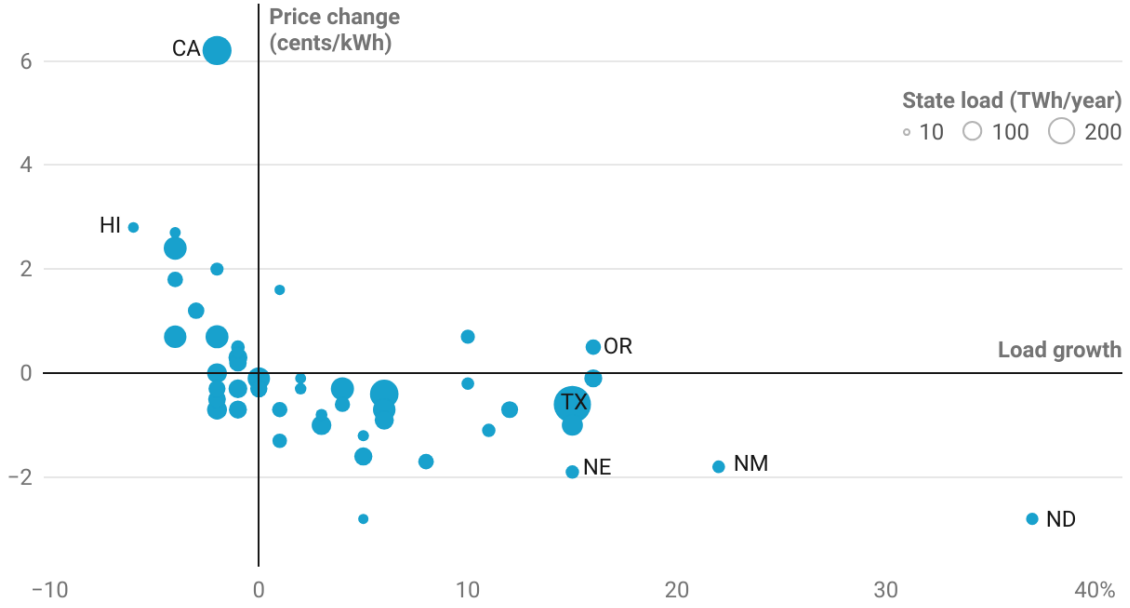
	Maximum Size	Geographic Breadth
Replacement & hardening of aging distribution (and transmission)	medium	Large
Extreme weather & wildfires: recovery and mitigation	larger	Medium
Natural gas price variability	larger	Large
Customer load growth	medium	Medium
Utility-scale wind & solar (market based)	medium	Medium
State Renewable Portfolio Standard policies	medium	Medium
Net energy metered solar	larger	Small

Load growth at the state level has tended to depress retail electricity prices in recent years

- Forecasted load growth from data centers, manufacturing, and other drivers has created concerns that increasing load might place upward pressure on wholesale prices and T&D delivery infrastructure, and thus also retail electricity prices
- Historical data over the last 5 years show counterintuitive results
  - States with the highest load growth generally saw average prices decline in inflation-adjusted terms
  - States with load contraction (via economic trends, energy efficiency, etc.) generally experienced increased prices
- Importantly, this relationship need not always exist

Load Growth vs. Retail Price Changes from 2019 to 2024

Price change in cents/kWh, inflation adjusted to 2024$. Load growth in percentage terms from 2019 to 2024.

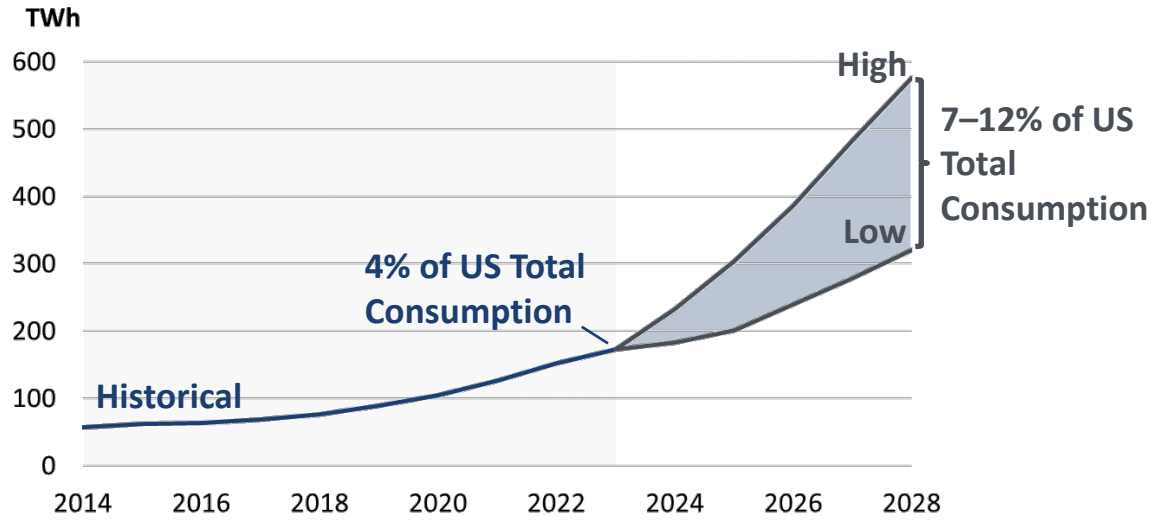


Source: EIA • Created with Datawrapper

Note: Graphic shows prices in real 2024$; relationships are the same if shown in nominal terms

The $1 trillion question: Will large loads offset cost increases?

LBNL Forecast Data Center Energy Consumption



Source: LBNL, 2024 United States Data Center Energy Usage Report, 2024.
Additional sources: Power Demand Forecasts Revised Up for Third Year Running, Led by Data Centers, Grid Strategies, 2025

Key Factors Affecting Electricity Rates

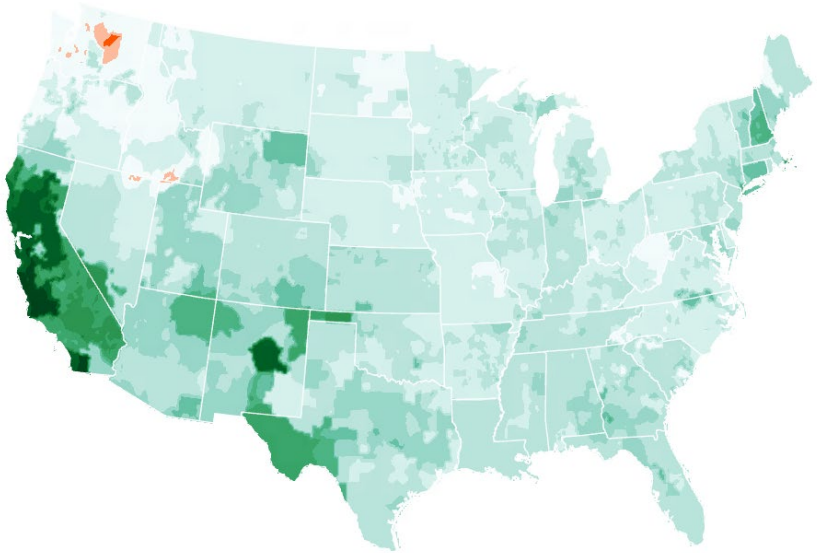
- **Available System Headroom:** Excess capacity can be used to accommodate new load without requiring significant additional infrastructure investment
- **Marginal vs. Average Cost:** If MC < AC, rates for existing customers typically decline (depends on specific rate design)
- **Exposure to Organized Markets:** In a highly exposed system, if load additions drive up capacity and energy market prices, all customers are exposed to the high prices
- **Load Forecast Accuracy**: Lower-than-expected usage can lead to increased costs for other customers
- **Load Growth from Other Customers**: Higher load growth arrests rate increases
- **Load Flexibility**: Unlock more system headroom

Sophisticated strategies for bill management can save money…

A successful strategy will need to account for: the suitability of various on-site (solar, battery, thermal storage, load flexibility) and off-site resources (e.g., power purchase agreement), tariff structure, available market participation pathways, corporate investment thesis, among others

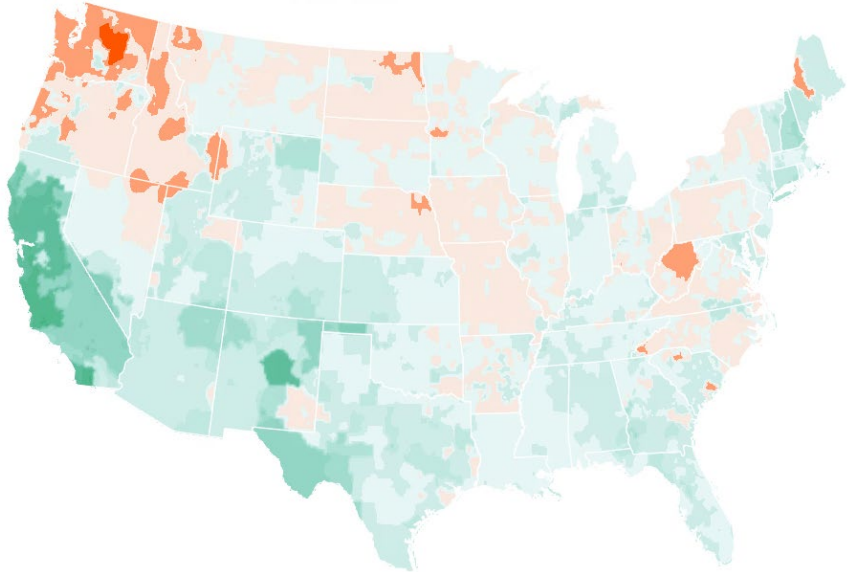
Solar PV: Full Retail Offset

Average Retail Rate × Generation Potential – Levelized Cost



Solar PV: Generation Portion Offset

Average Retail Rate × 55% × Generation Potential – Levelized Cost



Net value ($/yr/100 kW system)

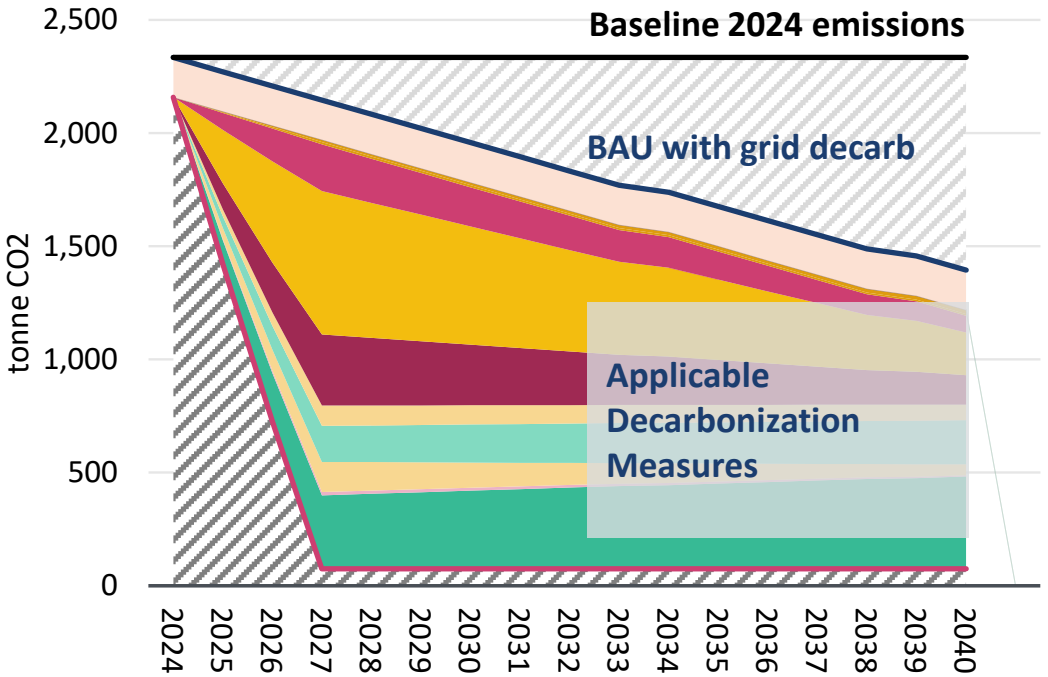
- < -$5,000/yr
- -$5,000 – $0/yr
- $0 – $5,000/yr
- $5,000 – $10,000/yr
- $10,000 – $15,000/yr
- $15,000 – $20,000/yr
- $20,000 – $25,000/yr
- $25,000 – $30,000/yr
- $30,000 – $35,000/yr
- $35,000 – $40,000/yr
- $40,000 – $45,000/yr
- $45,000 – $50,000/yr
- $50,000 – $55,000/yr
- $55,000 – $60,000/yr

Sources and notes: from 2023 NREL Solar Supply Curve data, EIA Electric Sales, Revenue, and Average Price Table 7 for 2022 average retail electricity prices, and 2023 NREL ATB technology costs for distributed commercial PV, scaled by locational cost multipliers from the January 2024 EIA Capital Costs for Utility-Scale Technologies report. Revenue is calculated by multiplying annual expected generation by 11.5km x 11.5km solar tract with annual average retail prices by utility to get anticipated annual cost offset. Generation portion of the retail rate was estimated to be around 55% of the overall bundled rate based on 2022 EIA 861 data for states with retail electricity choice. Cost offset assumes full net energy metering, a volumetric all-in $/kWh rate, and does not account for tax credits.

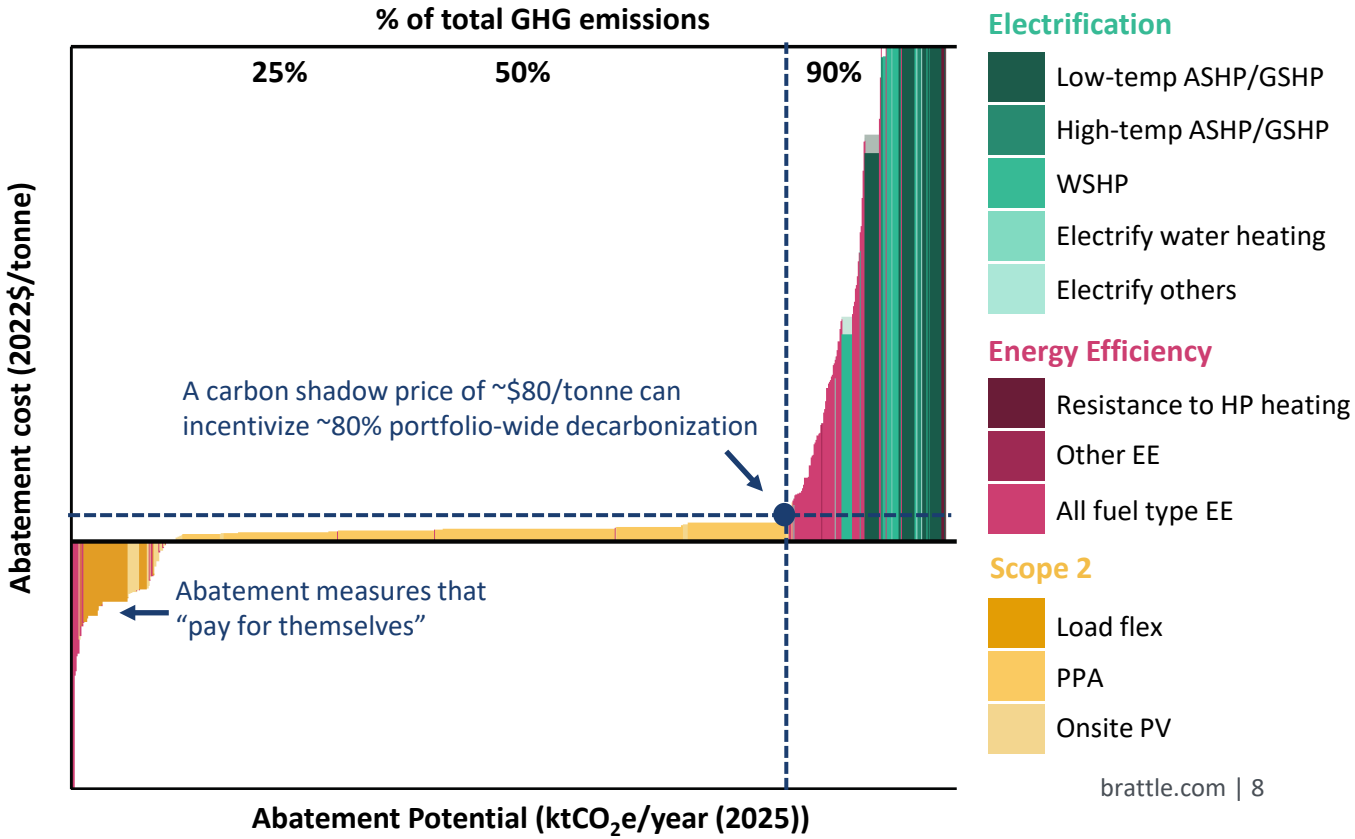
… And help achieve corporate sustainability & decarb goals

Portfolio-level analysis enables owners to chart least-cost decarbonization pathways and prioritize cost-effective abatement measures while optimizing investment timing, balancing grid reliance against self-investment, and developing contingency measures in the face of policy and rule changes (e.g., GHG Protocol Scope 2 revisions)

Example Decarb Pathway for A Residential Building

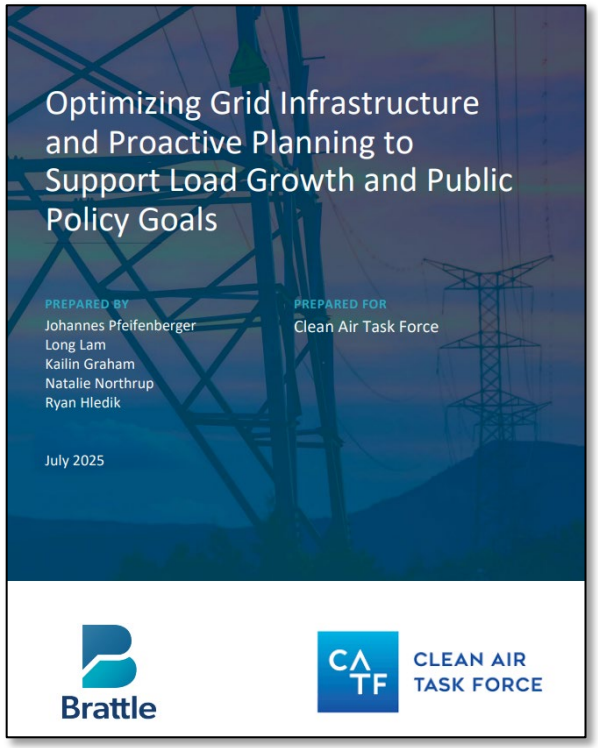


Example Abatement Cost Curve



Further Readings

Report link



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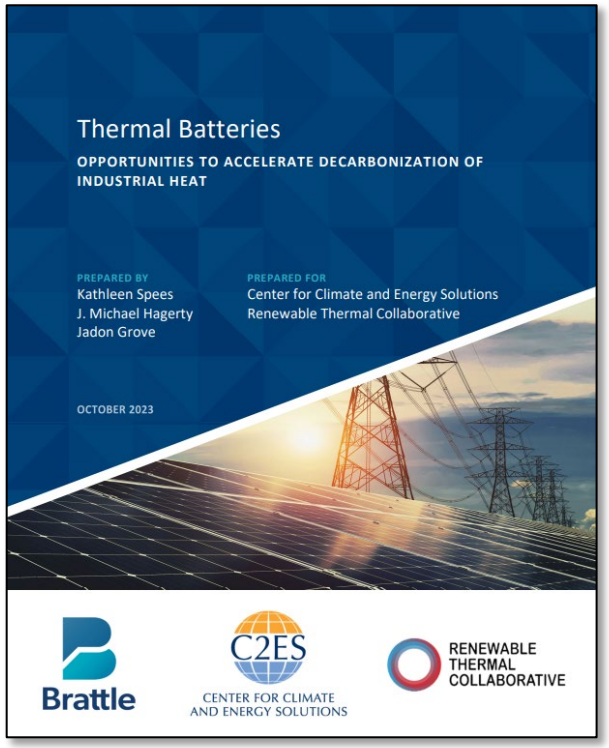

Report Link

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Dr. Long Lam is an expert in the development and implementation of decarbonization strategies and in the design and analysis of clean energy policy.

His work for large companies and governments with net-zero commitments and for regulated utilities, market operators, and regulators focuses on several areas, including:

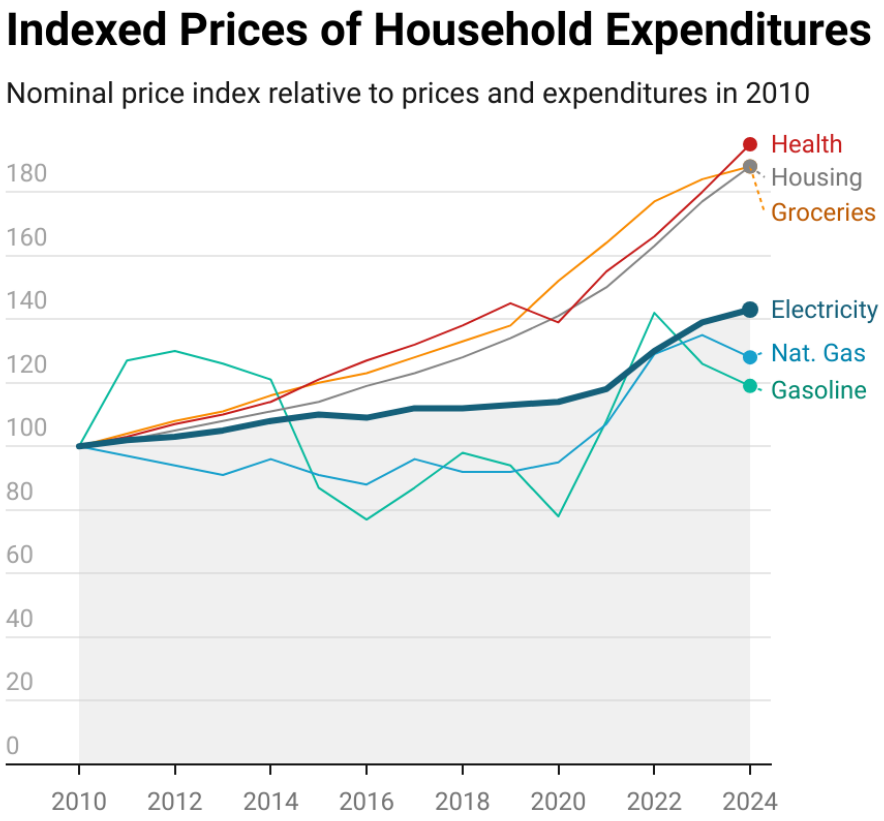
- Emissions reduction strategies and implementation program development for entities pursuing large-scale decarbonization
- Granular accounting of Scope 2 emissions and clean energy procurement, including defining future-ready contractual arrangements and policies
- The design and evaluation of smart rates, distributed energy resources, and load flexibility programs

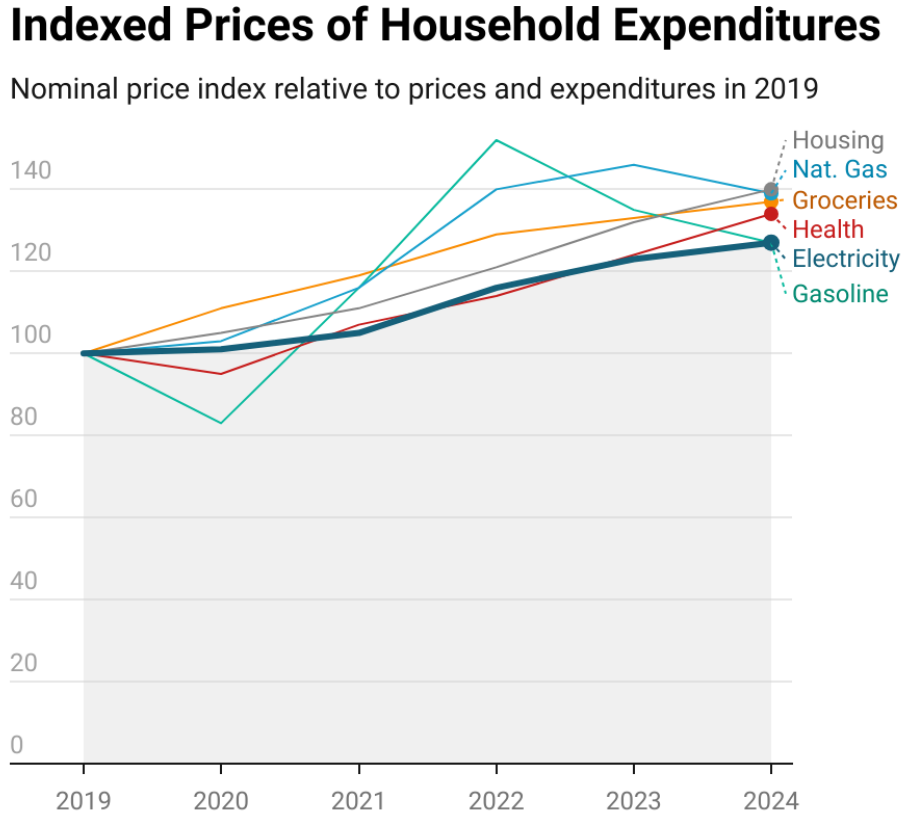
Dr. Lam has led projects to develop greenhouse gas abatement cost curves and abatement measure prioritization, analyze programs to effectively integrate clean energy resources, and evaluate the economic benefits of grid modernization and transportation electrification programs.

Appendix

Residential price increases have been significant, but lower than many other household expenditures, less volatile than gasoline and natural gas prices

Indexed residential electric prices vs. other household expenditures [not inflation adjusted]: since 2010 (*left, longer term*) and 2019 (*right, shorter term*)

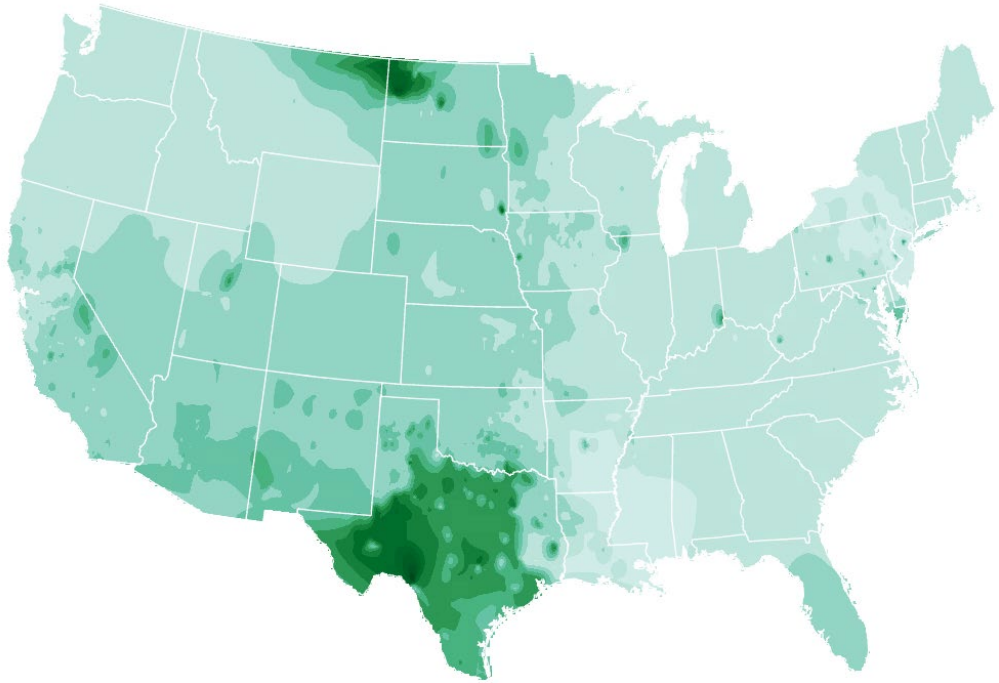




Battery Energy Storage as Another Bill Management Option

Wholesale Market Value

Sum of daily difference between average top 4 LMP hours and average bottom 4 LMP hours



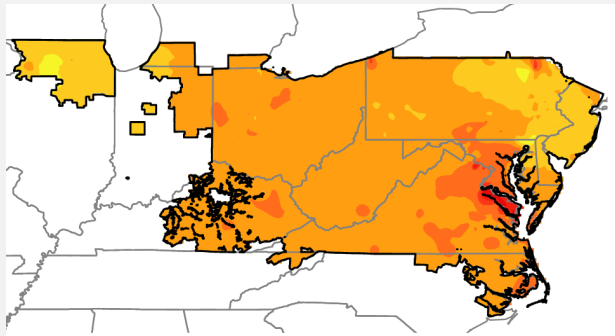
Gross battery value ($/yr/100 kW system)

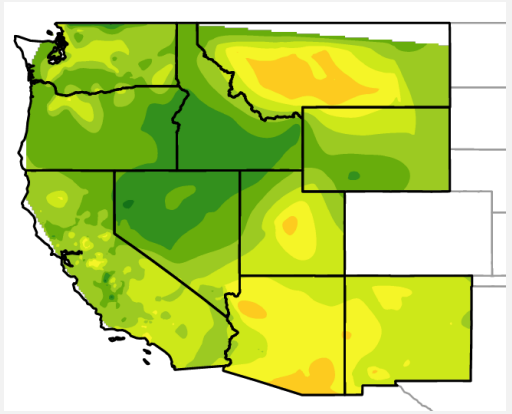
- < $3,000/yr
- $3,000 – $6,000/yr
- $6,000 – $9,000/yr
- $9,000 – $12,000/yr
- $12,000 – $15,000/yr
- $15,000 – $18,000/yr
- $18,000 – $21,000/yr
- $21,000 – $24,000/yr
- $24,000 – $27,000/yr
- $27,000 – $30,000/yr
- $30,000 – $33,000/yr
- $33,000 – 36,000/yr
- $36,000 – $39,000/yr

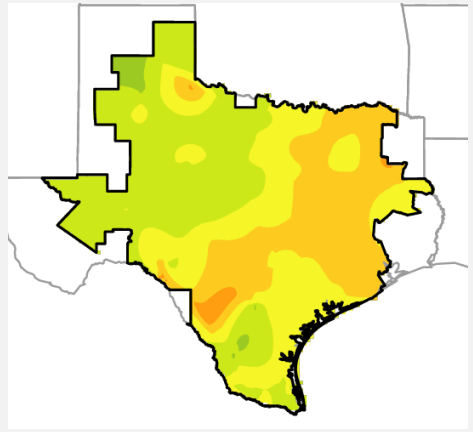
Source and notes: From Hitachi Energy Velocity Suite for hourly RT LMPs at ~30,000 nodes across the US. Battery system assumed to be 4-hour duration, 100 kW battery. Battery value calculated as daily energy arbitrage value – sum of average delta between the top 4 nonconsecutive wholesale energy price hours and bottom 4 nonconsecutive wholesale energy price hours per day over whole year

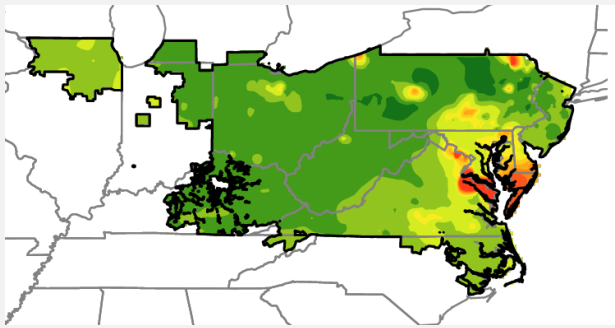
Where do renewables & batteries displace the most GHG?

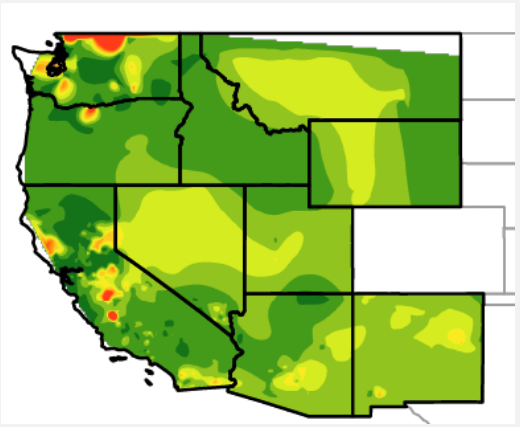
	PJM	West	ERCOT
Where to locate renewables? **Profile**: Flat production (can be renewable-profile adjusted)	Average MW Profile	Average MW Profile	Average MW Profile
Where to locate batteries? **Profile:** Charge in lowest 4 LME hours daily (discharge in highest 4 LME hours)	4-Hour Battery Profile	4-Hour Battery Profile	4-Hour Battery Profile

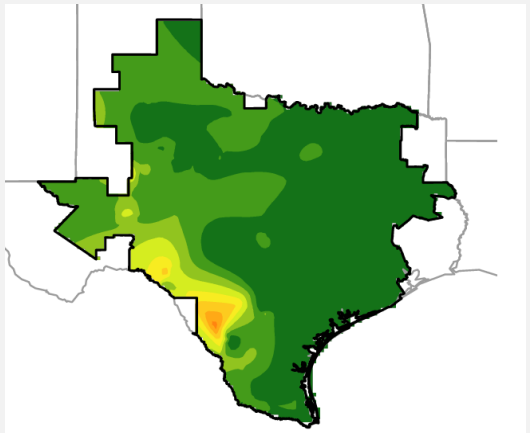












(kg CO_2/MWh)

< 200
201 - 250
251 - 300
301 - 350
351 - 400
401 - 450
451 - 500
501 - 550
551 - 600
601 - 650
651 - 700
> 700

(kg CO_2/MWh)

< 300
301 - 350
351 - 400
401 - 450
451 - 500
501 - 550
551 - 600
601 - 650
651 - 700
> 700

Note: Hourly LME data not modified to account for renewable output profiles. Data from REsurety LME data product, year 2022 data.