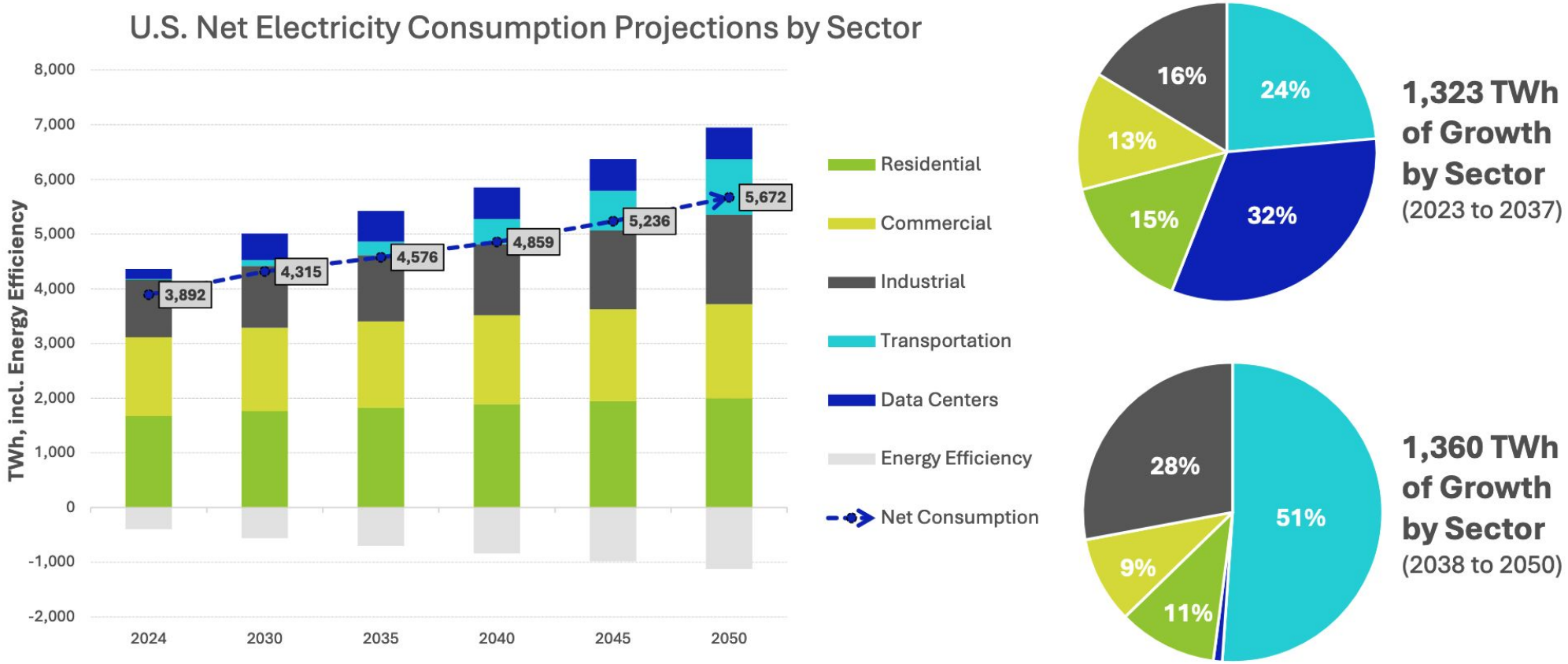
Let's Talk Winter Peaks

Mike Specian, PhD

January 28, 2026

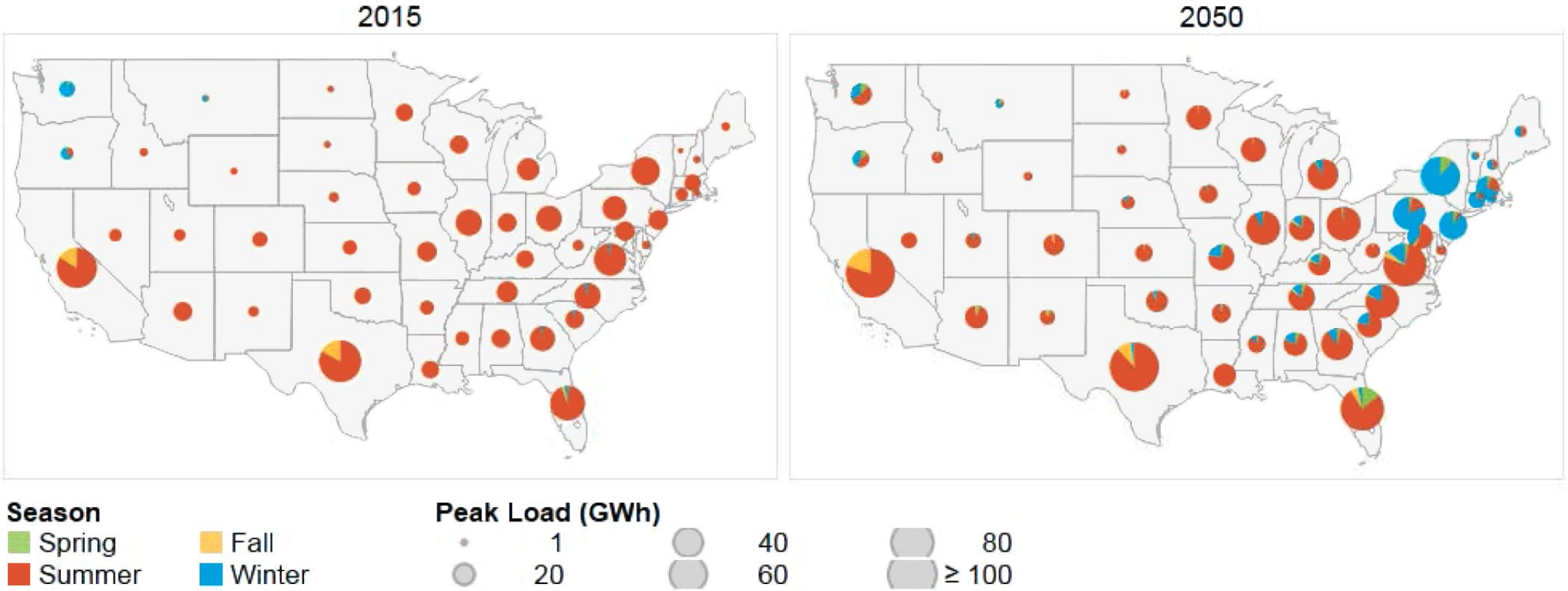
ACEEE
Smart Energy. Clean Planet. Better Lives.

Shift to winter peaking systems occurring in the context of explosive load growth



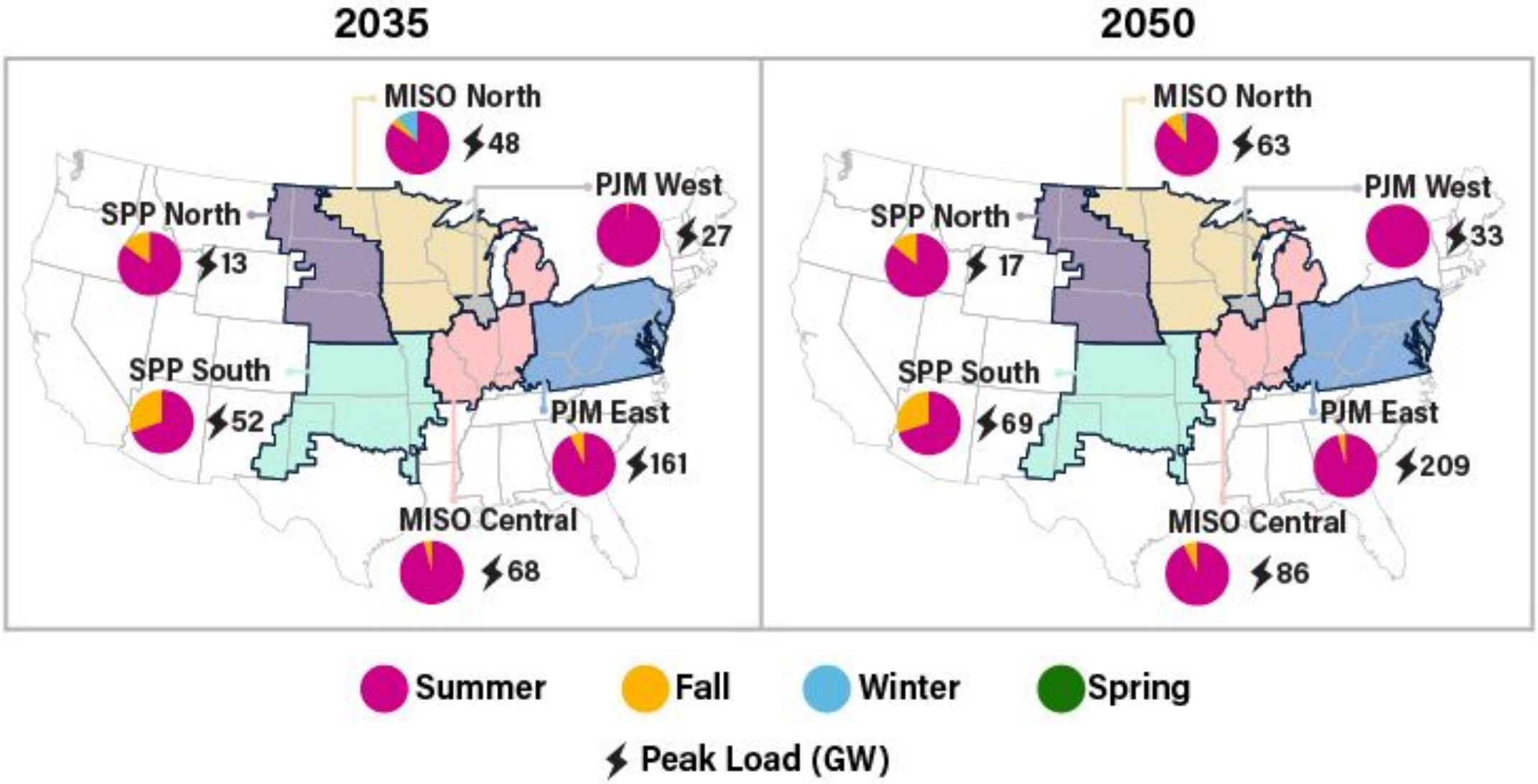
Data and figure sourced from *A Reliable Grid for an Electric Future*. National Electrical Manufacturers Association (2025)

Winter peaks now and in the future

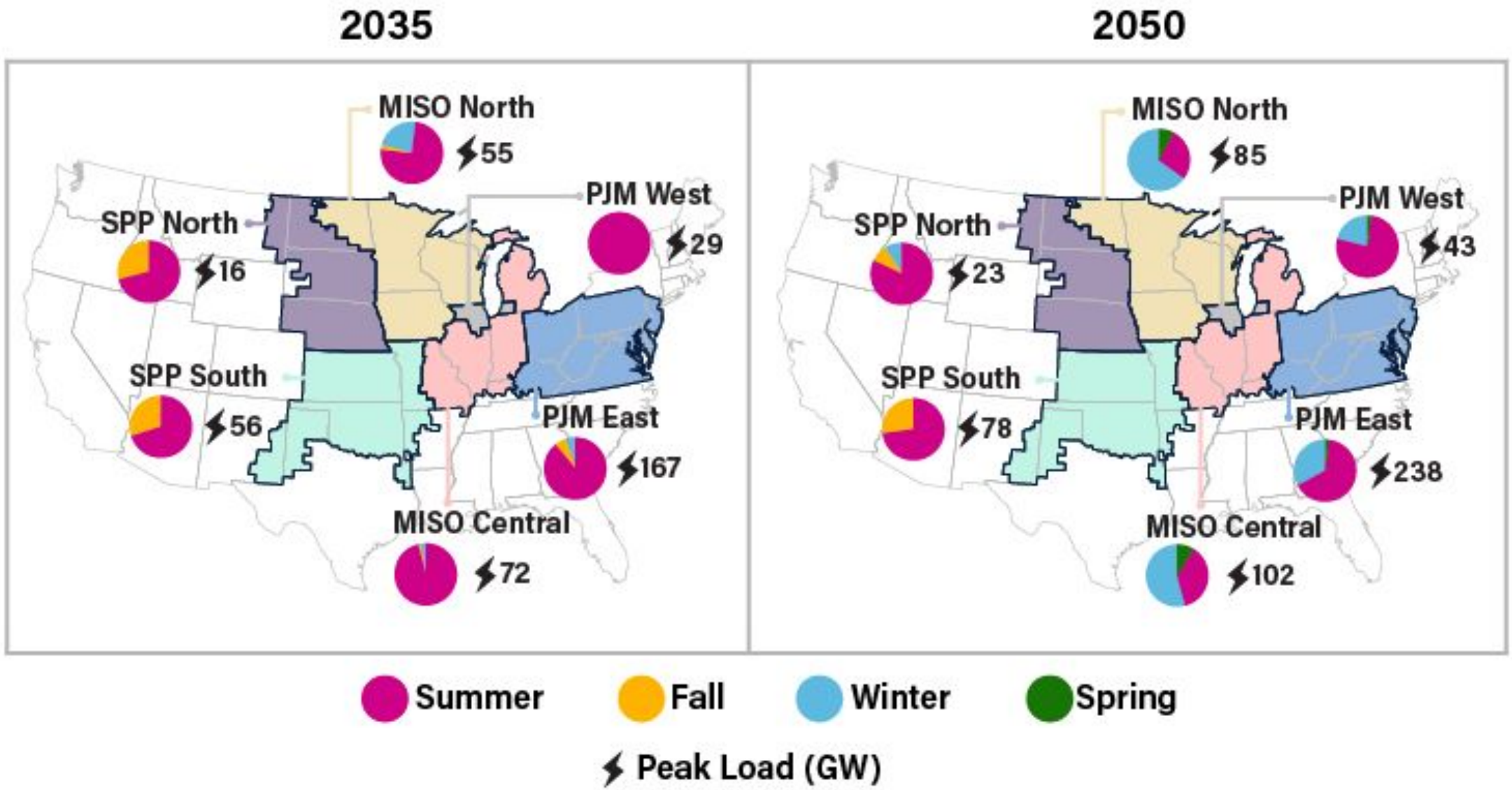


Distribution of top 100 peak load hours from Electrification Futures Study (Mai et al. 2018)

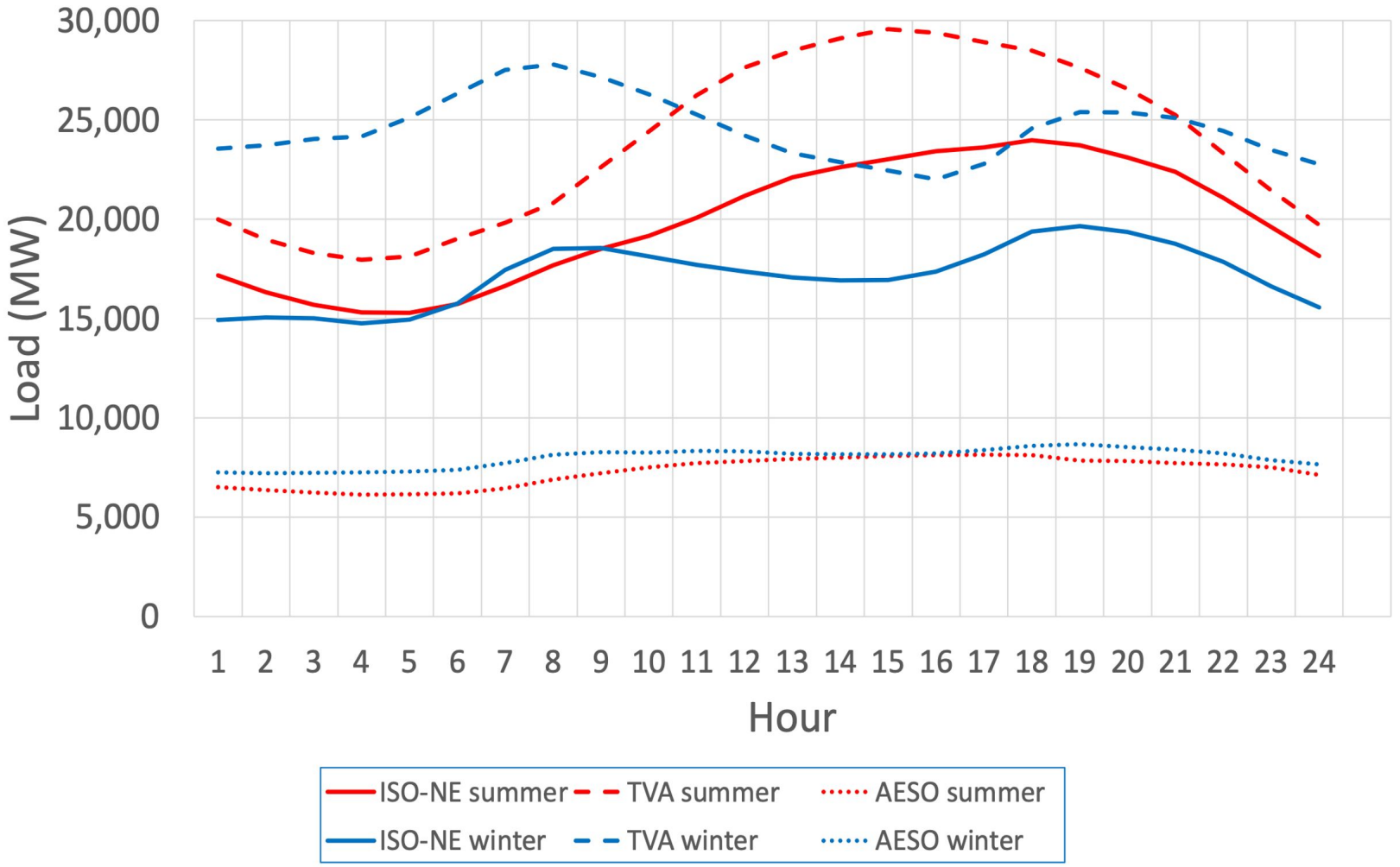
Winter peak under Mid-Case scenario



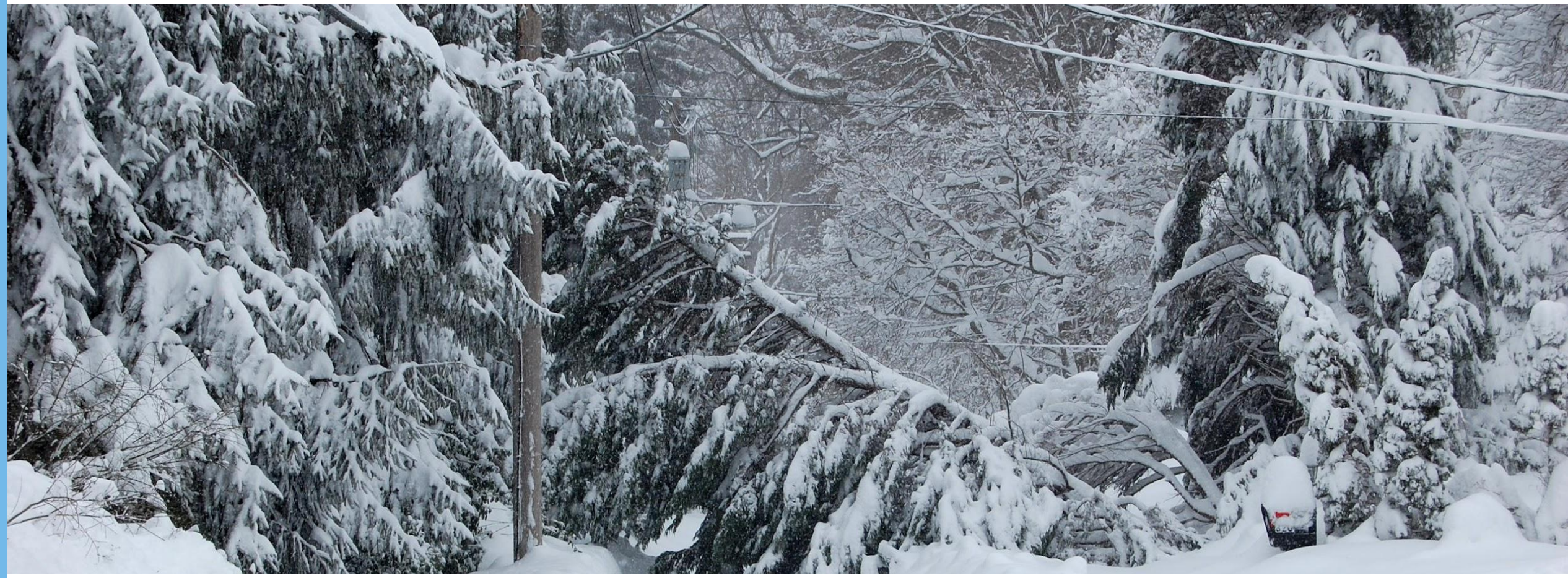
Winter peak under High Load Growth scenario



Winter and summer peaks are distinct — and that matters



Winter peaks can occasionally be of long duration



Traditional solutions underutilize demand-side options

TEXAS LEGISLATURE 2023

A plan for Texas to build its own power plants could cost $7 billion more than expected

The plants would be activated during emergencies. Lawmakers haven't decided whether to pay for them through state funds or higher charges to electricity customers.

BY EMILY FOXHALL APRIL 13, 2023 1 PM CENTRAL SHARE REPUBLISH

TEXAS NEWS

Two years after Uri, Abbott signs bills to bring more power plants to Texas. Will they come?

Abbott signed multiple bills to protect the power grid Wednesday. Are new plan

Texas Senate plan to finance power plants would cost $8 billion more than lawmakers said

KUT 90.5 | By Mose Buchele
Published April 7, 2023 at 6:44 PM CDT

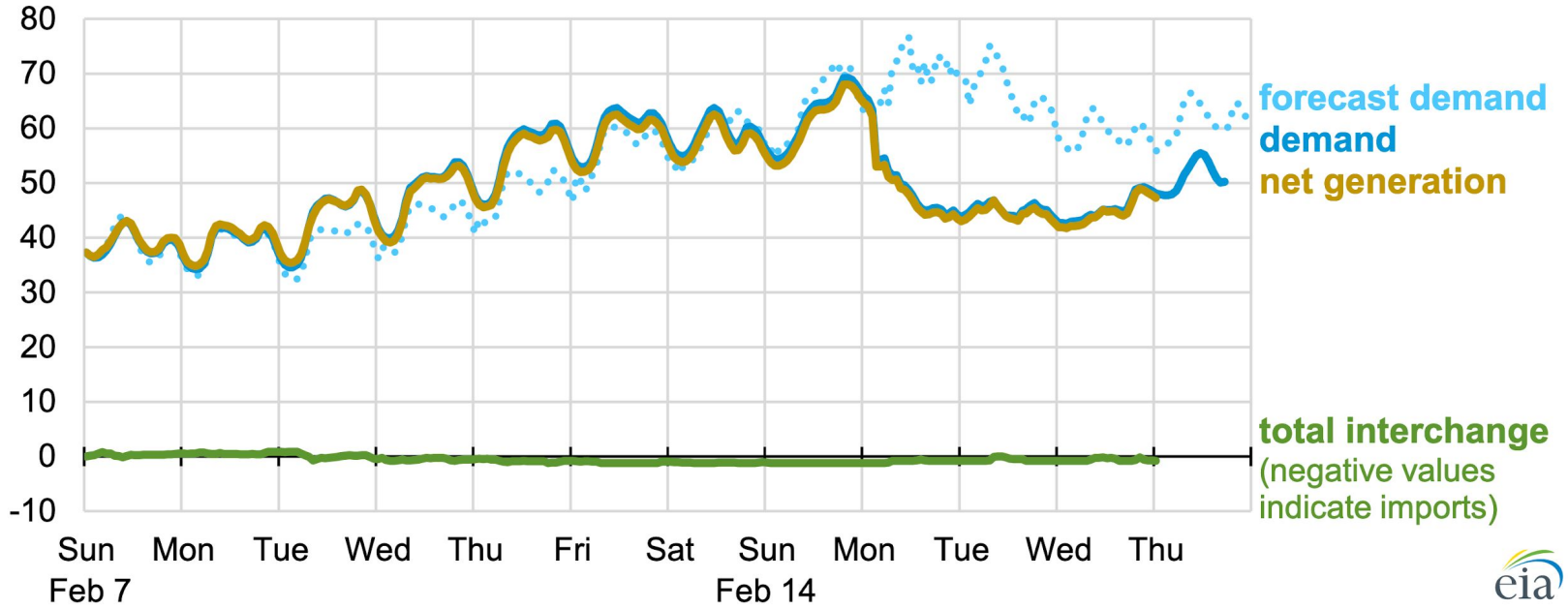
Electrification of transportation, buildings, and industry "has the potential to transform MISO system-wide demand from the traditional summer peak to a winter peak."

"new loss-of-load risks appear"

Source: MISO Electrification Insights

Cold winter weather can impose winter peak-like constraints

Hourly electricity demand, net generation, and total interchange (Feb 7–Feb 18, 2021)
Electric Reliability Council of Texas, Inc (ERCOT)
gigawatts

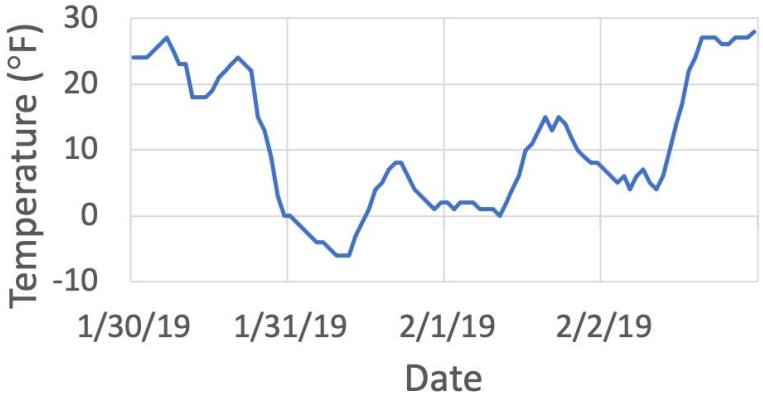


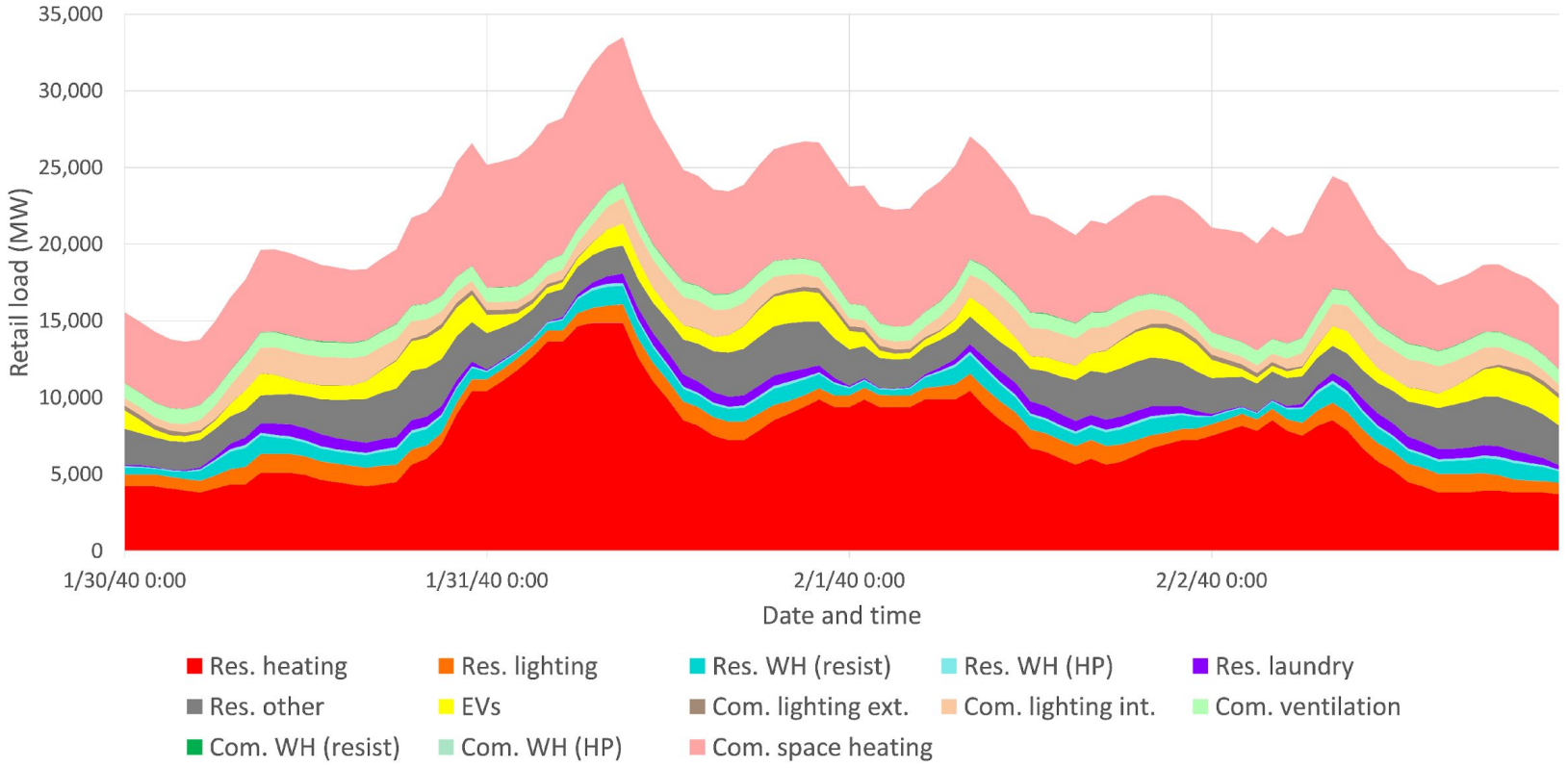
eia

Have you seen the news?

- Monday in Texas, load reached 93% of its all-time winter peak, which was less than one year ago.
- On Sunday, PJM activated pre-emergency demand response customers in parts of the Mid-Atlantic.
- DOE issued waivers that allowed generators to operate at maximum levels “notwithstanding air quality or other permit limitations.”

Example: Weather and Load Profile in Electrified New England in 2040





1.46 million cold climate heat pumps in 5.9 million New England homes. 8% of commercial heat capacity is met with cold climate heat pumps (28% by electric boilers).

Source: https://www.aceee.org/research-report/u2101

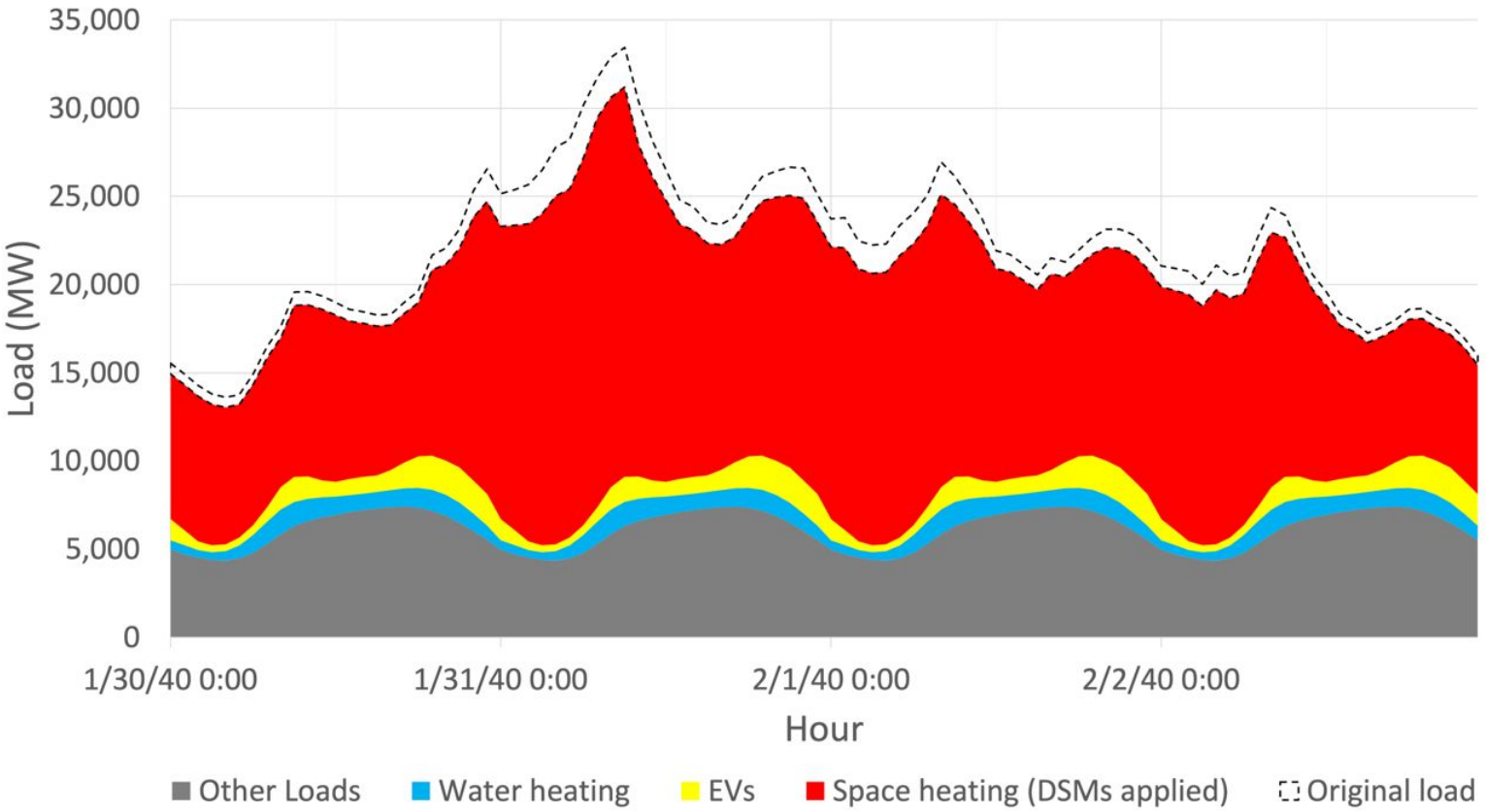
Data from: NREL Electrification Future Study, Synapse New England Electrification Load Forecast, EIA RECS/CBECS, Annual Energy Outlook, EPRI Load Shape Library, Navigant RES 1 Baseline Load Shape Study

Demand-side management packages

Package	Description
Standard	Business-as-usual energy efficiency
Smart	Standard package + GEB measures
Deep	Ambitious but plausible set of EE + DR measures

New England 2040: Results

DSM package	1.46 million HP (EFS) scenario		
	Energy savings (GWh)	**Peak reduction (electric backup)**	**Peak reduction (fossil fuel backup)**
Standard	**1,160**	**6.7%**	25.2%
Smart	1,430	11.9%	27.9%
Deep	4,370	34.2%	40.8%



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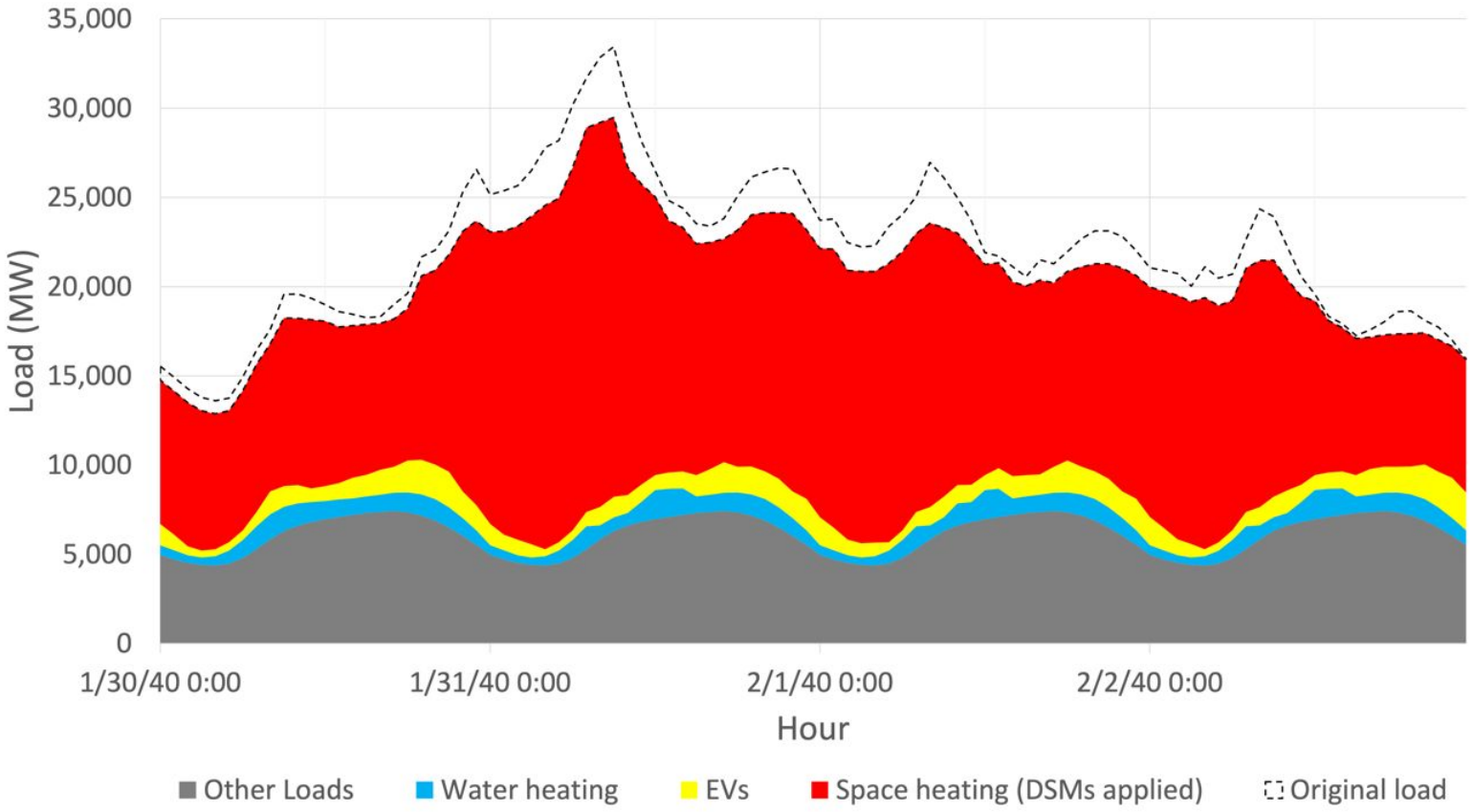

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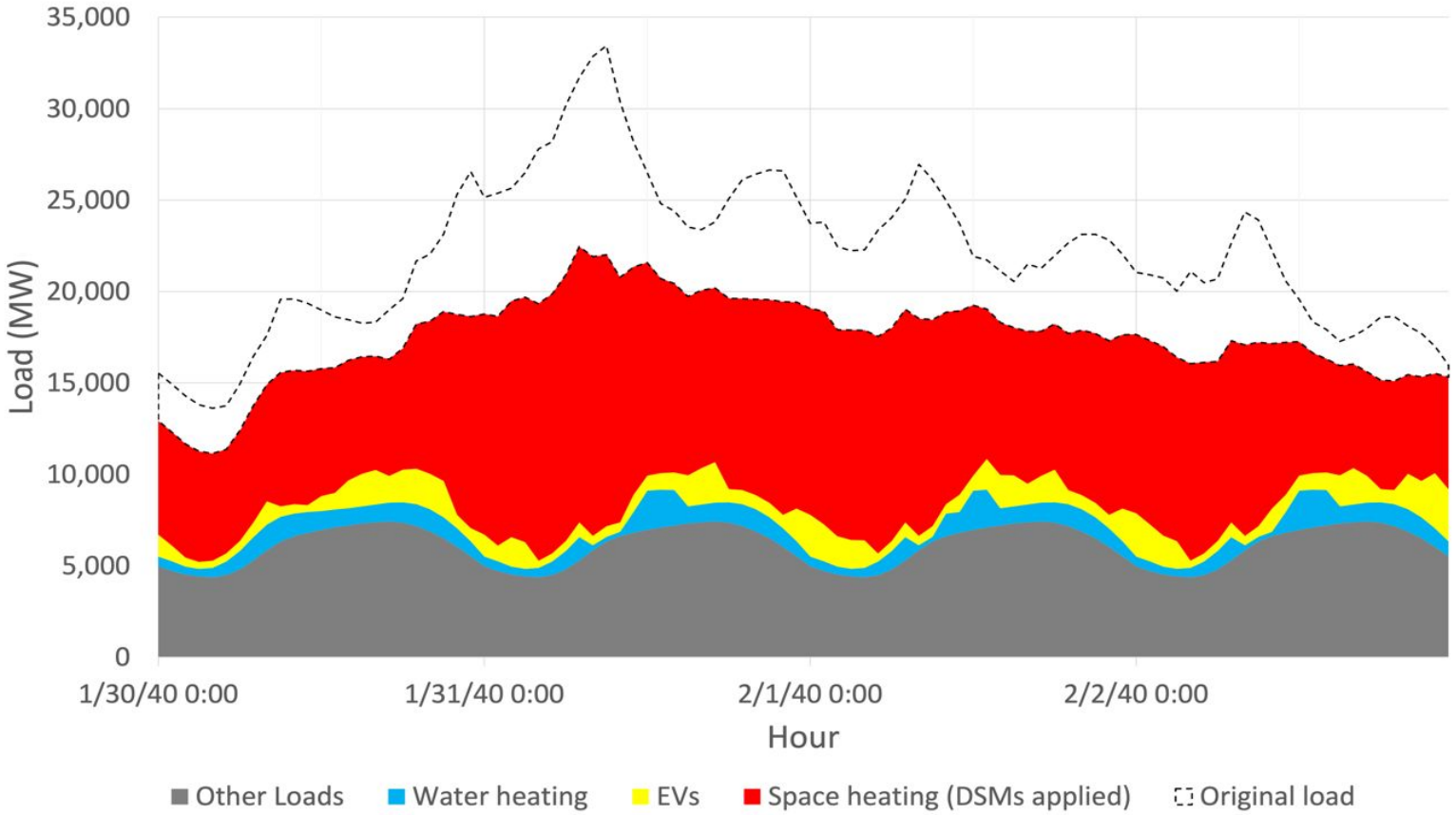
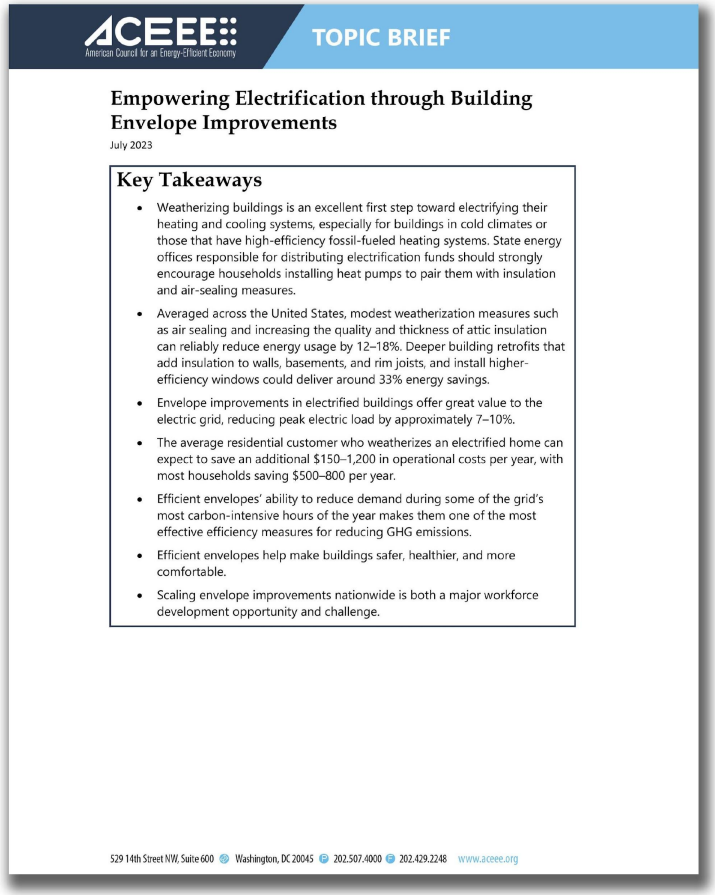


Empowering electrification through building envelope improvements

Benefits

- Energy savings
- Peak load reduction
- Utility bill savings
- Other non-energy benefits



ACEEE American Council for an Energy-Efficient Economy — TOPIC BRIEF

Empowering Electrification through Building Envelope Improvements

July 2023

Key Takeaways

- Weatherizing buildings is an excellent first step toward electrifying their heating and cooling systems, especially for buildings in cold climates or those that have high-efficiency fossil-fueled heating systems. State energy offices responsible for distributing electrification funds should strongly encourage households installing heat pumps to pair them with insulation and air-sealing measures.
- Averaged across the United States, modest weatherization measures such as air sealing and increasing the quality and thickness of attic insulation can reliably reduce energy usage by 12–18%. Deeper building retrofits that add insulation to walls, basements, and rim joists, and install higher-efficiency windows could deliver around 33% energy savings.
- Envelope improvements in electrified buildings offer great value to the electric grid, reducing peak electric load by approximately 7–10%.
- The average residential customer who weatherizes an electrified home can expect to save an additional $150–1,200 in operational costs per year, with most households saving $500–800 per year.
- Efficient envelopes' ability to reduce demand during some of the grid's most carbon-intensive hours of the year makes them one of the most effective efficiency measures for reducing GHG emissions.
- Efficient envelopes help make buildings safer, healthier, and more comfortable.
- Scaling envelope improvements nationwide is both a major workforce development opportunity and challenge.

529 14th Street NW, Suite 600 Washington, DC 20045 202.507.4000 202.429.2248 www.aceee.org

Source: https://www.aceee.org/topic-brief/2023/07/empowering-electrification-through-building-envelope-improvements

Empowering electrification through building envelope improvements: energy savings

On average, modest weatherization measures can reliably reduce annual energy usage by 12%–18%.

Deeper retrofits can reduce energy usage 11%–47%, depending on the state.

Weatherization measures are most effective in:

- Buildings with inefficient building envelopes
- Building in climates with significant heating or cooling demand

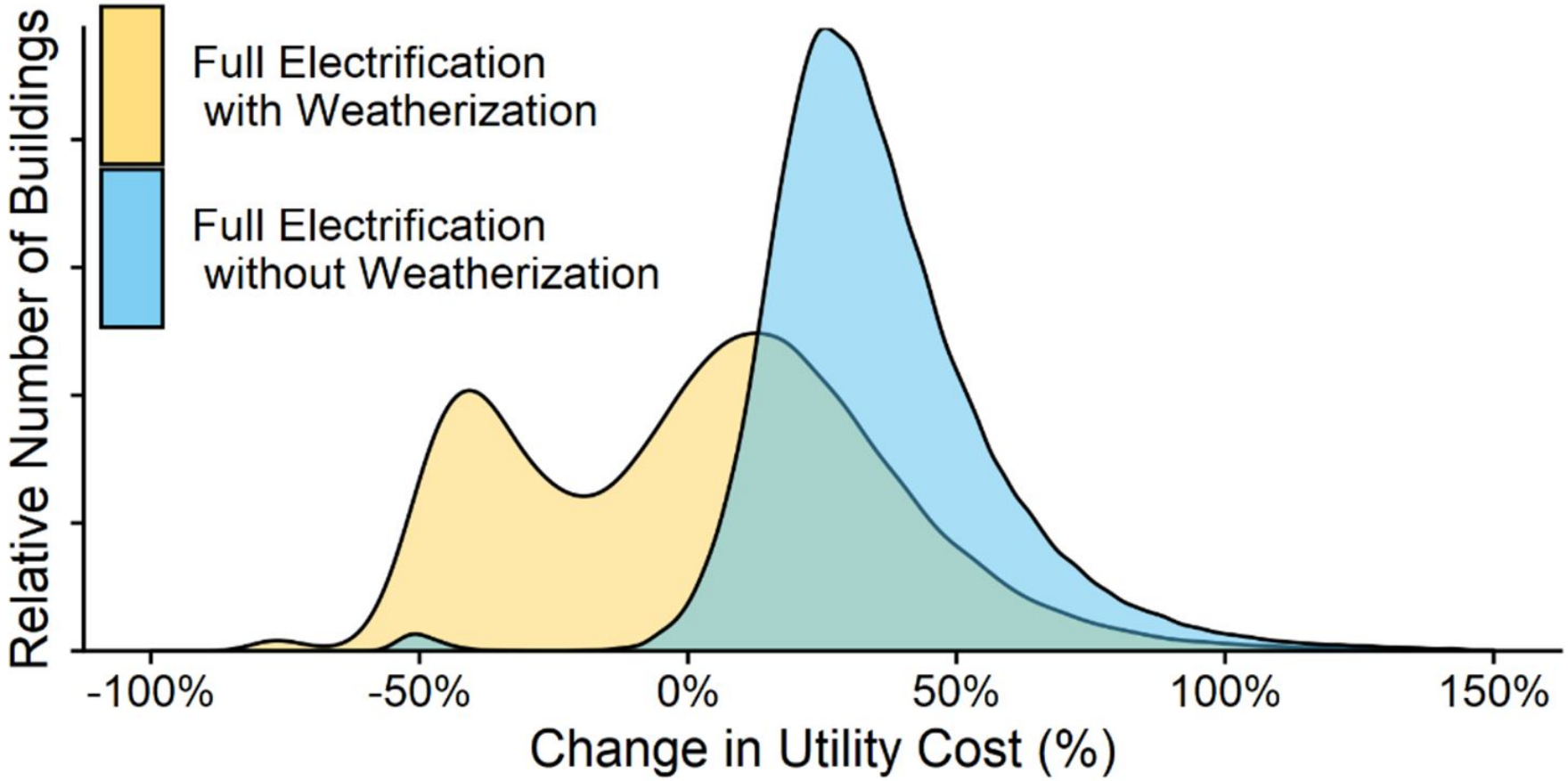
Empowering electrification through building envelope improvements: peak demand reduction

On average, residential envelope improvements can reduce peak electric load by approximately 7%–10%, with only slightly smaller reductions seen in the commercial sector.

Empowering electrification through building envelope improvements: utility bill savings

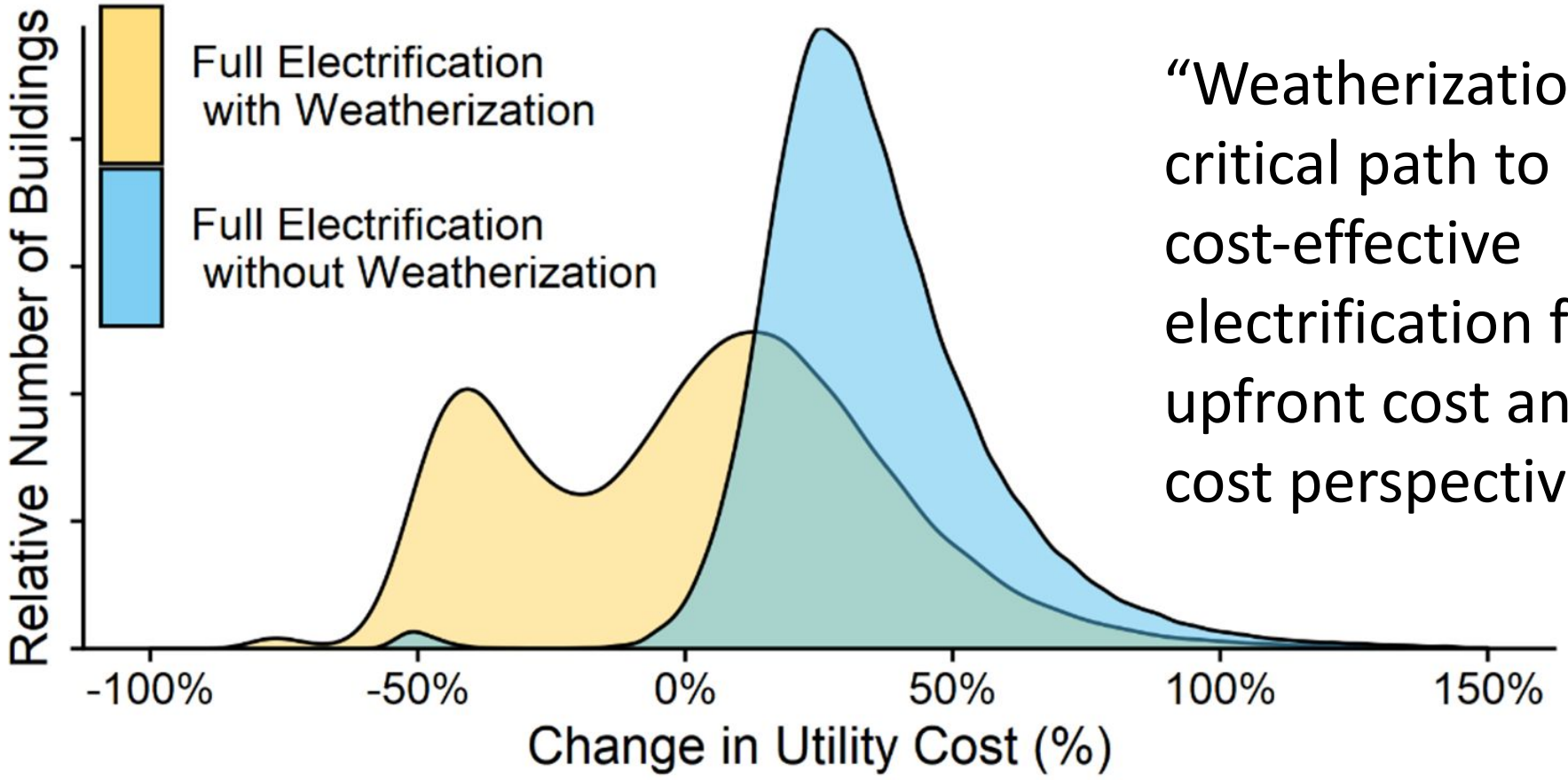
The average residential customer who weatherizes an electrified home can expect to save an additional $150–$1200/year in operational costs, with most households savings between $500 and $800 per year.

Empowering electrification through building envelope improvements: utility bill savings



Source: Jones, K., R. Olson, A. Otalora-Fadner, and J. Quinnell. 2023. *Minneapolis 1–4 Unit Residential Weatherization and Electrification Roadmap*. Minneapolis: Minnesota CEE (Center for Energy and Environment). www.mncee.org/minneapolis-1-4-unit-residential-weatherization-and-electrification-roadmap-pdf.

Empowering electrification through building envelope improvements: utility bill savings

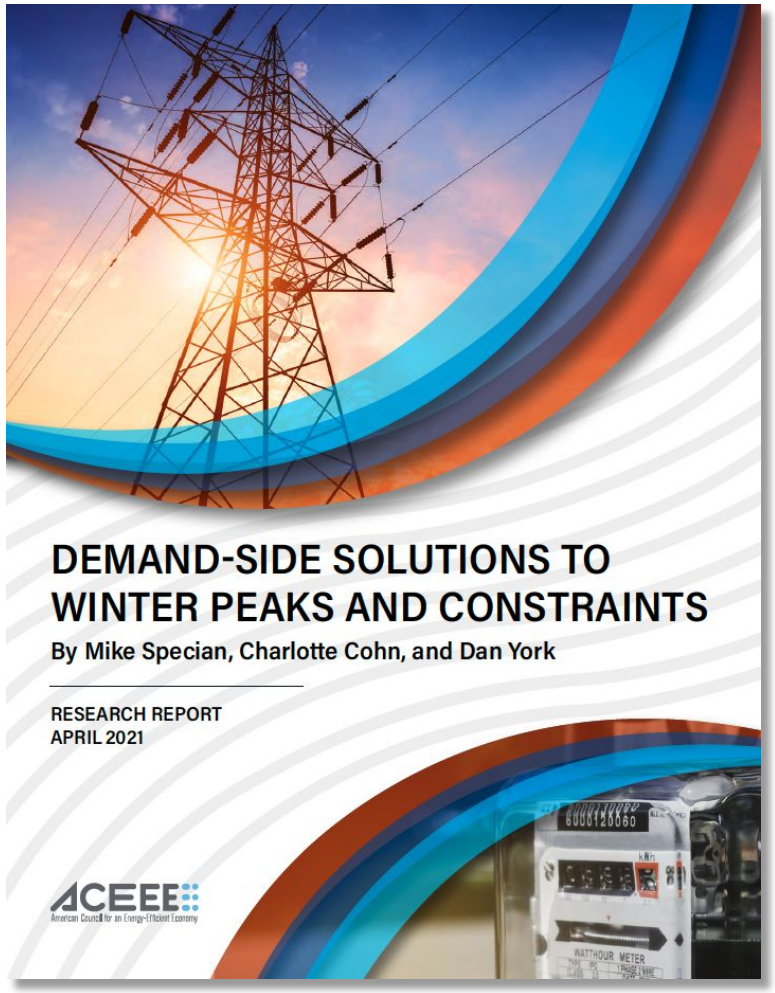


"Weatherization is the critical path to cost-effective electrification from an upfront cost and utility bill cost perspective."

Source: Jones, K., R. Olson, A. Otalora-Fadner, and J. Quinnell. 2023. *Minneapolis 1–4 Unit Residential Weatherization and Electrification Roadmap*. Minneapolis: Minnesota CEE (Center for Energy and Environment). www.mncee.org/minneapolis-1-4-unit-residential-weatherization-and-electrification-roadmap-pdf.

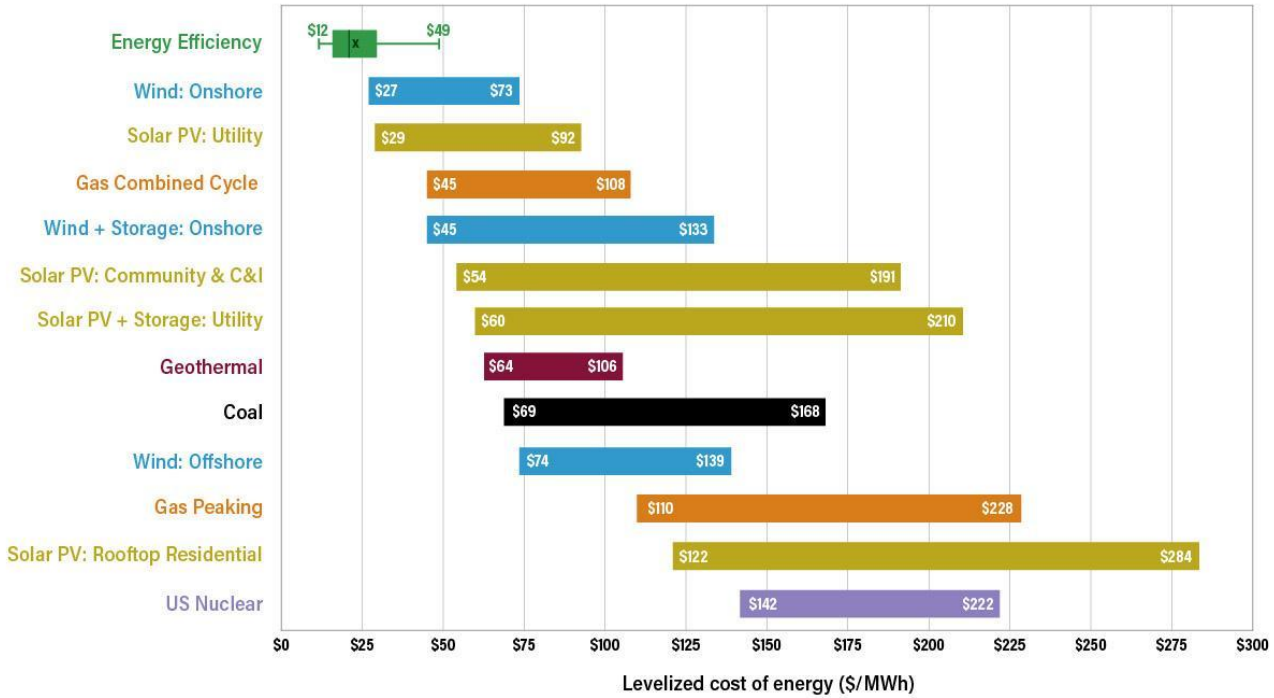
Examples of utility programs that can be used to mitigate winter peaks

https://www.aceee.org/research-report/u2101



Demand-side measures are faster to deploy and less expensive than supply-side alternatives

Our analysis of the nation's largest utility programs shows that energy efficiency (~$21/MWh) and load flexibility (<$40/kW-year) are currently the lowest-cost resources for reducing electricity consumption and peak demand, even before accounting for distribution system savings.

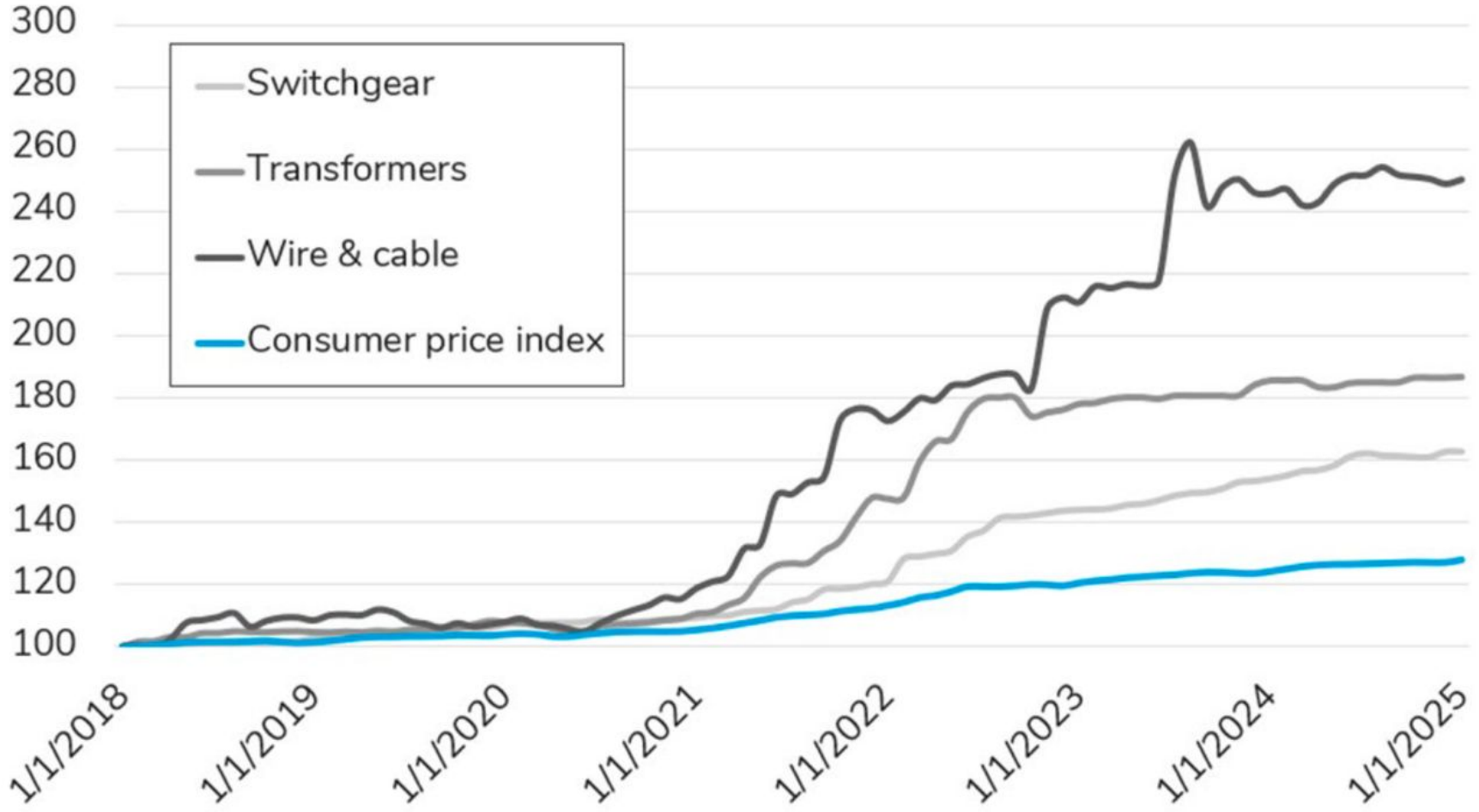


The fastest-growing utility EE programs have achieved 43% annual growth over a 3-year period. Virtual power plants (VPPs) can be deployed in <6 months. New supply-side resources face:

- 5–7 years for gas turbines
- 5+ years to connect solar/wind
- 10+ years for new transmission

DSM is a clean, "no regrets" option that helps protect ratepayers against bill increases.

Power equipment costs are rising



Data from St. Louis Federal Reserve FRED database, indexed to January 1, 2018. Supporting data and figure credit to Lubershane (2025). The price of power grids. *Steel For Fuel*.

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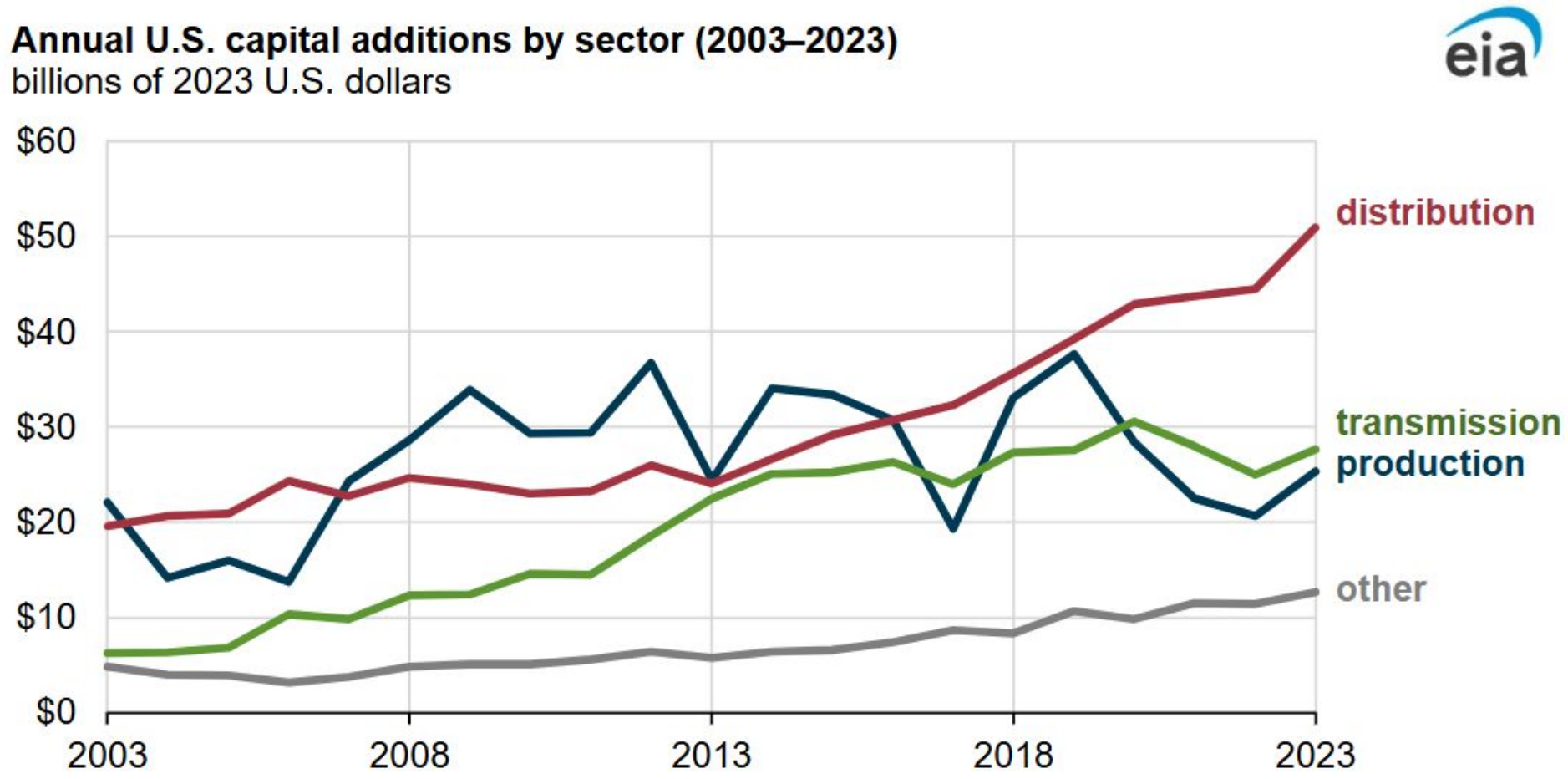

Data source: U.S. Energy Information Administration and Federal Energy Regulatory Commission (FERC) financial reports, as accessed by Ventyx Velocity Suite

Recommendations for Legislators and Regulators

- Require utilities to consider demand-side solutions when analyzing options to meet winter peak demands
- Create requirements for utilities to establish goals for winter peak demand reductions, where appropriate
- Ensure that screening of DSM programs and technologies accurately and fully values the benefits of reducing winter peak demand
- Encourage and approve rate structures and pricing for electricity that incentivize customers to reduce winter peak demand
- Support utility research and demonstration of demand-side solutions to winter peak problems
- Leverage reliability (gas for heating displaces generation)

Recommendations for utilities and program administrators

- Understand the regional drivers of winter peaks
- Explore regions' economics for unique winter DSM opportunities (e.g., delayed building start-ups, snowmaking, streetlighting)
- Adapt existing DSM programs
- Understand how winter GEB measures are likely to impact your customer base

- Bundle GEB offerings with space heating measures (e.g., weatherization, HVAC upgrades, replacing electric resistance heating) to provide more streamlined customer experience
- Marketing, outreach, and communication to inform and educate customers about the value and importance of taking actions and investing in solutions that reduce winter peak demand. Do this now!

Key Takeaways

- Winter peaks are coming, demand-side management programs can help, and focusing on measures that reduce spacing heating demand is the priority
- Pairing envelope improvements with electrification is an excellent approach, especially for mitigating utility bill impacts
- Messaging should include that DSM is faster, safer, and less risky to ratepayers than supply-side solutions
- Don’t neglect DSM’s benefit to distribution system costs

Contact

Mike Specian: mspecian@aceee.org

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New England 2040: Fossil backup results

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