ILLINOIS POWER AGENCY

IPA Power Hour 2—Load Growth: How is it shaping power markets?

July 11, 2025

Agenda

- Introductions and Housekeeping
- Overview of Load Growth
- Key Drivers and Impacts
- RTO's Role in Addressing Challenges
- Forecasting Load Growth Trends
- Challenges and Opportunities for Utilities
- Illinois Trends, Impacts, and Opportunities
- Q&A

IPA Power Hour Webinars

Today's Power Hour:

- This 60-minute webinar will provide an overview on load growth, explore its key drivers and impacts, and look how Illinois can prepare for the state's rapidly changing energy landscape.

Power Hour is a series of educational and informative presentations on a wide range of clean energy topics and emerging issues.

- Power Hour webinar series started in 2021.
- To-date, the Agency has hosted 36 Power Hour webinars, garnering over 1,300 attendees and over 2,000 post-webinar views on the IPA YouTube channel.
- Invited energy thought leaders and experts locally and nationally.

WEBINAR ARCHIVES: https://ipa.illinois.gov/about-ipa/ipa-events/previous-power-hour-events.html

IPA Power Hour Metrics

IPA Power Hour Webinar Series Statistics

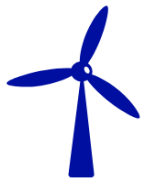
36
Webinars Hosted

1,300+
Attendees from 2023 - 2024 (Zoom)

2,000+
Recording Views from 2023 - 2024 (IPA YouTube)

2,500+
Website Clicks (IPA Events Page)

Popular Power Hour Webinar Topics (2023 - 2024)



The State of Wind Energy

Renewable Energy Financing: Distributed Solar

Clean Energy Future for Public Schools: Challenges and Solutions

The Illinois Power Agency

Vision:
"A clean, reliable, and cost-effective energy future for residents and businesses across Illinois"

- Independent State Agency created in 2007
- Responsible for the development of an annual Electricity Procurement Plan for customers of electric utilities
- Supports the Illinois Renewable Portfolio Standard (RPS) through the development and implementation of:
  - Long-Term Renewable Resources Procurement Plan
  - Competitive procurement for utility-scale projects
  - Solar incentive programs for homes and businesses

The New Load Growth Era

Facts, Drivers, and Impacts

WORLD RESOURCES INSTITUTE

July 11th, 2025

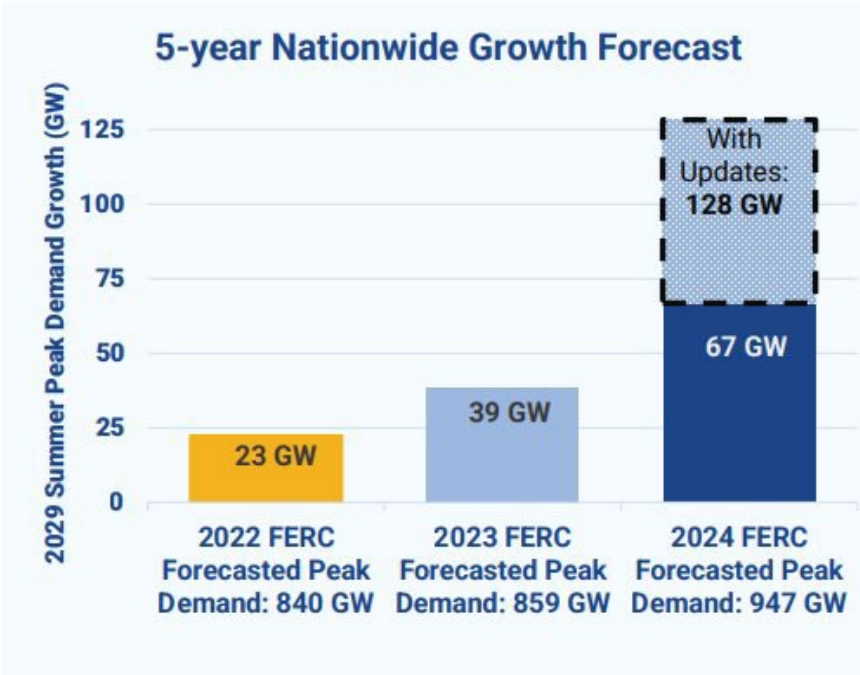
Ian Goldsmith

01

The Current and Future State of Load Growth

The load growth era is here

- 2000s-2020: decades of stable, flat electricity demand
- 2023: Forecast for cumulative 5-year electricity load growth doubled.
- 2024: 5-year load growth forecast increased by 5X
- Electricity demand estimates have only increased since then.



Source: Strategic Industries Surging: Driving US Power Demand.

Load growth is a national, but highly regionalized problem

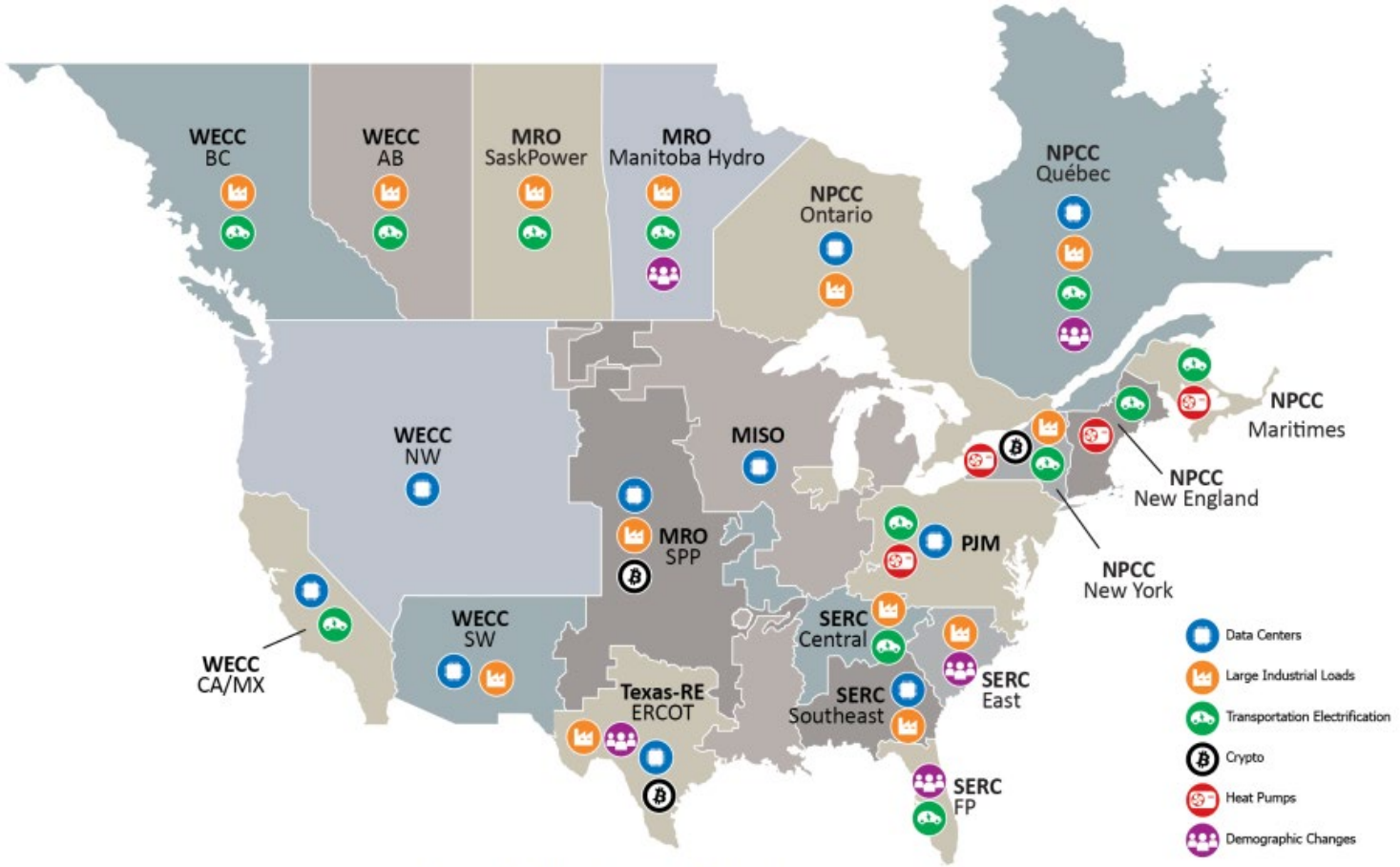


Figure 19: Primary Demand Drivers by Assessment Area

Demand drivers

New Manufacturing	•Southeast •West •Upper Midwest
Building and Transit Electrification	•Northeast •California •New England
Population Growth	•Sun Belt
Data Centers	•Almost everywhere, but most concentrated in Virginia, Texas, and Georgia

Source: 2025 NERC State of Reliability - Overview

Load growth in MISO illustrates regional differences

ND and MN:
- Data centers driven by state incentives
- Electrified space heating
- EV demand in MN due to incentives

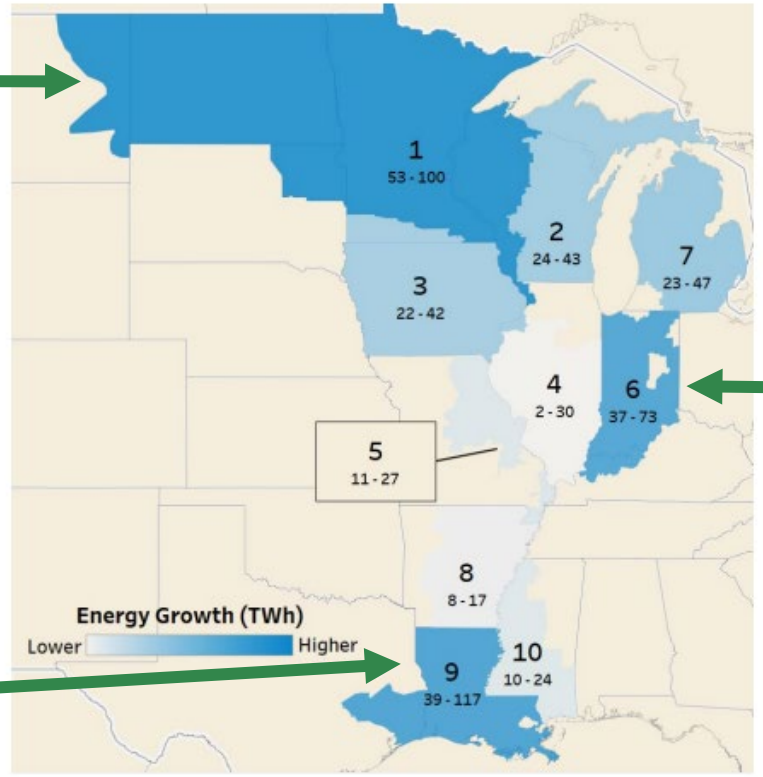


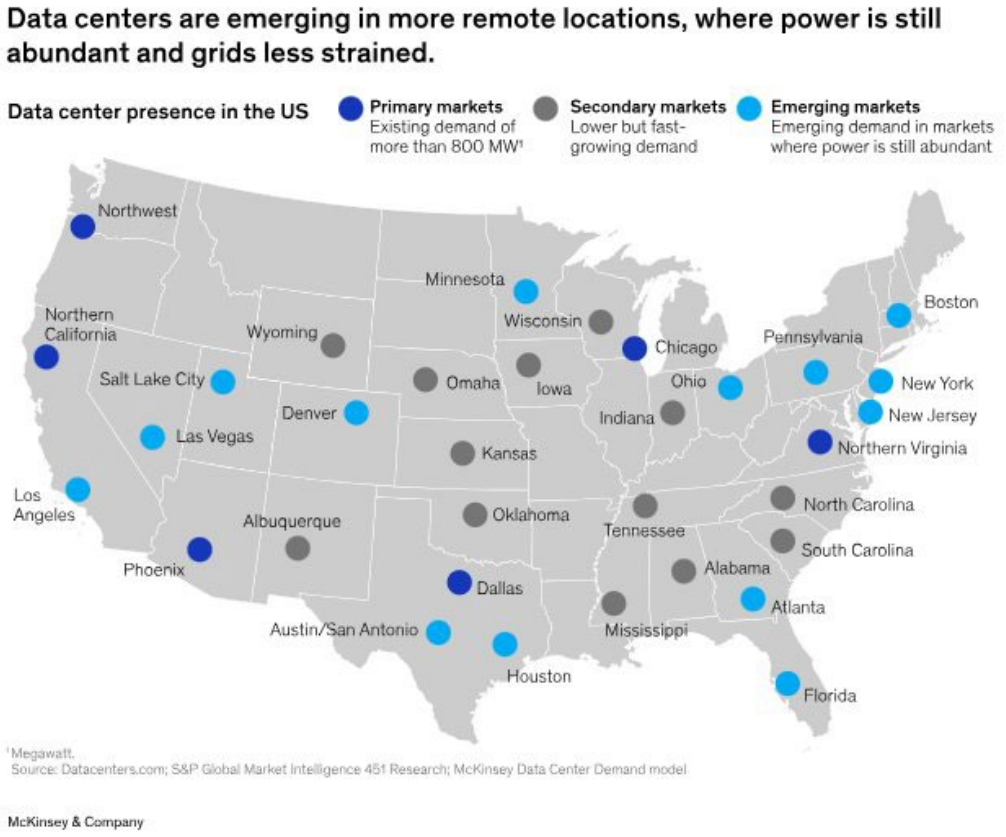
Figure 9: 2024 -2044 Expected Load Growth by MISO Local Resource Zones (LRZs) Low-High Ranges

IN:
- Data centers driven by state incentives
- Steel and aluminum manufacturing

LA and East TX:
- Electrification in oil and gas production
- Green hydrogen
- Some data center growth

Source: MISO Long-Term Load Forecast Whitepaper_December 2024667166.pdf

Data centers are particularly large contributor to the current load growth moment



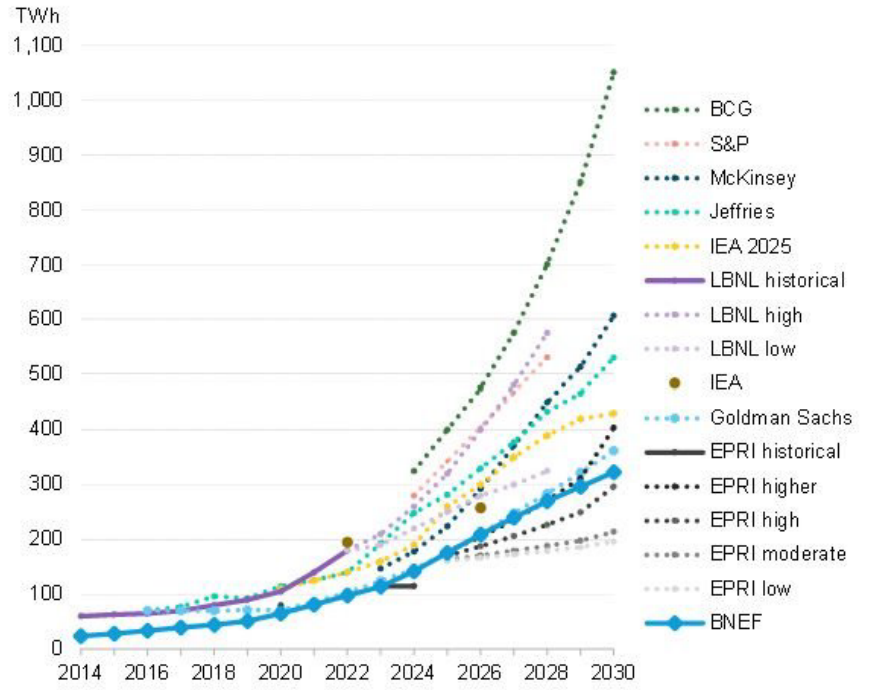
- As of February 2025, over 100 GW of data center development has been announced in the US.
- Data centers are expanding in secondary and tertiary markets.
- More rural development has been announced, particularly for larger AI-focused data centers.

Source: AI data center growth: Meeting the demand | McKinsey.

Load growth is contributing to an uncertain electricity future

- Federal policy changes, geopolitical conflict dynamics, tariffs and market cycles are creating a highly uncertain future for the electricity system.
- In particular, estimates for data centers energy demand vary wildly, from 200 TWh to 1,050 TWh by 2030.
  - This comes from uncertainties in energy efficiency, market growth, and a lack of transparency on interconnection requests.

Figure 9: Comparison of US data-center energy demand forecasts



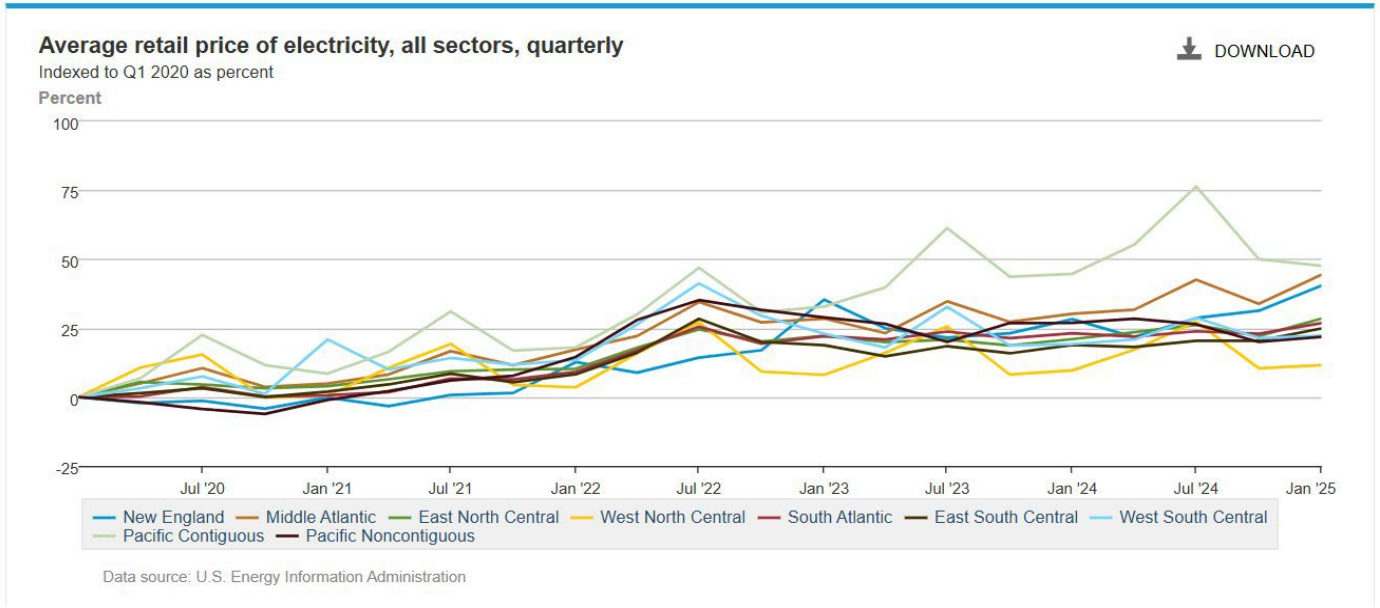
Source: BloombergNEF, Lawrence Berkeley National Lab (LBNL), International Energy Agency (IEA) 2024, Boston Consulting Group (BCG), Electric Power Research Institute (EPRI), Jefferies, Goldman Sachs, McKinsey, S&P, IEA 2025. Note: The data underlying the above forecasts include both published figures and BloombergNEF estimates, derived from visuals in third-party reports using chart extraction software and data interpolation methods. All sources are cited and linked in the report. Derived estimates represent the independent interpretation of BloombergNEF and do not imply endorsement by the original data providers.

Source: Helen Kou, LinkedIn.

02 Load Growth Impacts

Increased demand could push up costs for consumers if not managed well.

- Large load customer growth is creating concerns about expenses being passed onto other consumers, at a time of already high energy bills.
- A recent study from PJM's Market Monitor found that forecast load growth from data centers contributed to a **$9.4 billion** increase in capacity market revenue in 2024, which will be passed on to ratepayers.



Source: Electricity Data Browser, US Energy Information Administration

New demand is spurring interest in renewable and clean firm power...

- Utilities need all the generation they can get to serve new load, spurring investment and development in clean energy.
- Speed to market is becoming a critical factor, which is providing a boost to solar and storage technologies.
- Newer clean firm technologies like small modular nuclear, enhanced geothermal, and long duration storage are also being explored.

In June 2024, Google announced a deal with Fervo Energy to purchase 115 MW of geothermal energy in Nevada. This deal was approved by the Nevada Public Service Commission in June 2025, and the facility is expected to come online in 2027.

Source: Google's new model for clean energy approved in Nevada

...and towards fossil fuels.

In Nebraska, the arrival of new data centers led the Omaha Public Power District to indefinitely delay retirement of two coal-burning generators next to a disadvantaged community.

- An IEEFA report from January 2025 found that Southeastern utilities are planning to build over 20 GW of new natural gas capacity by 2040 because of data center and manufacturing load.
- The Trump administration is supporting delaying coal plant retirements and developing new coal resources for AI data centers.

Source: How Google and Meta data centers are keeping coal alive in Omaha - The Washington Post.

Reliability could be threatened by increased demand.

In July 2024, an equipment fault in Northern Virginia led to over 1,500 MW of data centers simultaneously switching to back-up power as a precautionary measure. This “load loss” event could have led to a power surge and caused widespread blackouts.

- The U.S. power grid has already experienced significant constraints in recent years, and increasingly severe weather is leading to more frequent power disruptions.
- Data centers present new challenges, since they have strict power quality and "uptime" requirements.

Source: Incident Review: Considering Simultaneous Voltage-Sensitive Load Reductions. NERC, 2025.

Thank You.

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Load Growth: How is it Shaping Power Markets?

IPA Power Hour

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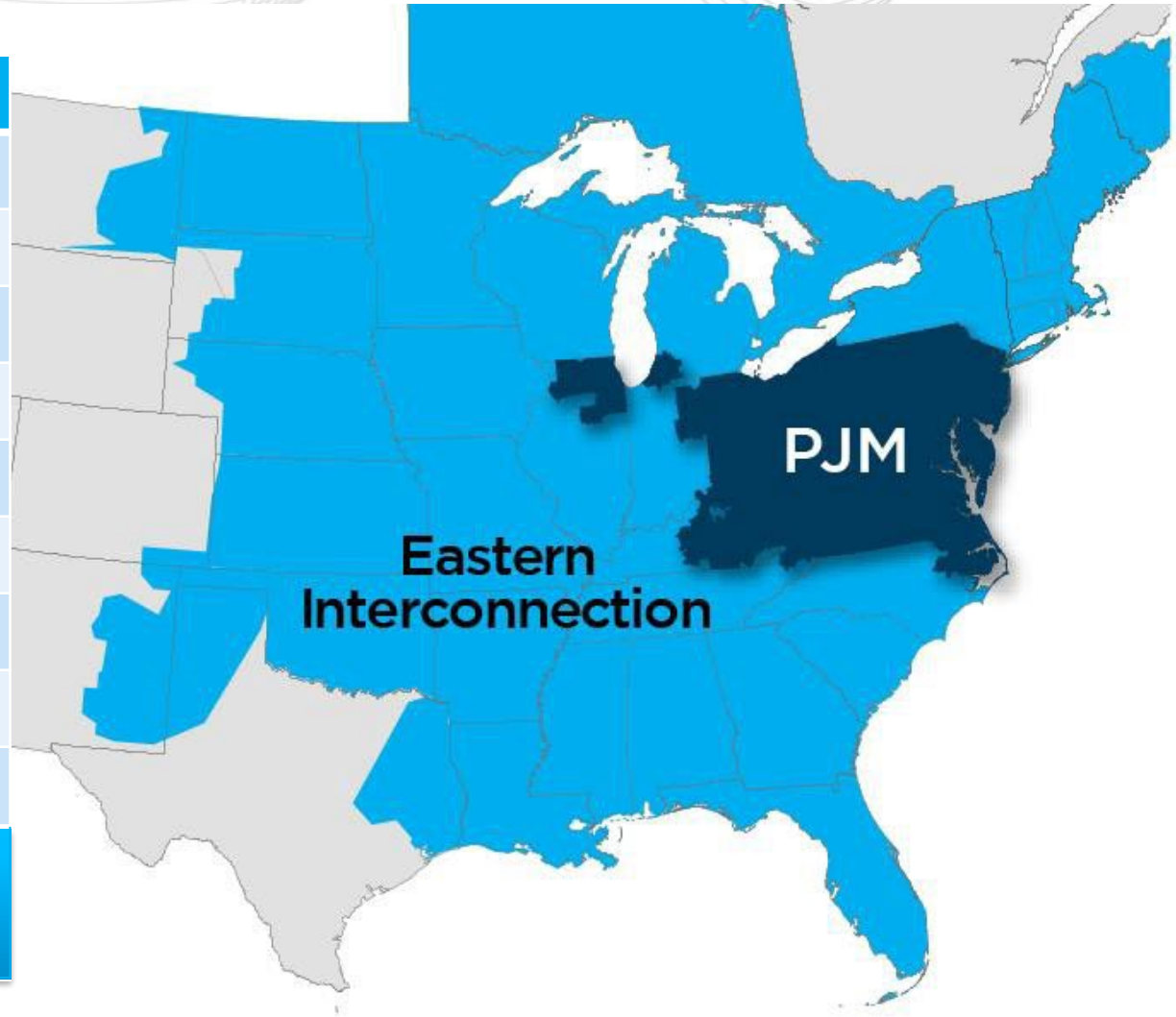
July 11, 2025

PJM as Part of the Eastern Interconnection

Key Statistics	
Member companies	1,110
Millions of people served	67+
Peak load in megawatts	165,563
Megawatts of generating capacity	182,036
Miles of transmission lines (BES)	88,333
Gigawatt hours of annual energy	800,004
Generation sources	1,486
Square miles of territory	369,054
States served	13 + DC

- 27% of generation in Eastern Interconnection
- 24% of load in Eastern Interconnection



As of 2/2025

Load Forecast Process

Peak demand forecast is used in RTEP and the RPM auctions and is submitted to various agencies such as NERC, FERC, state commissions, etc.

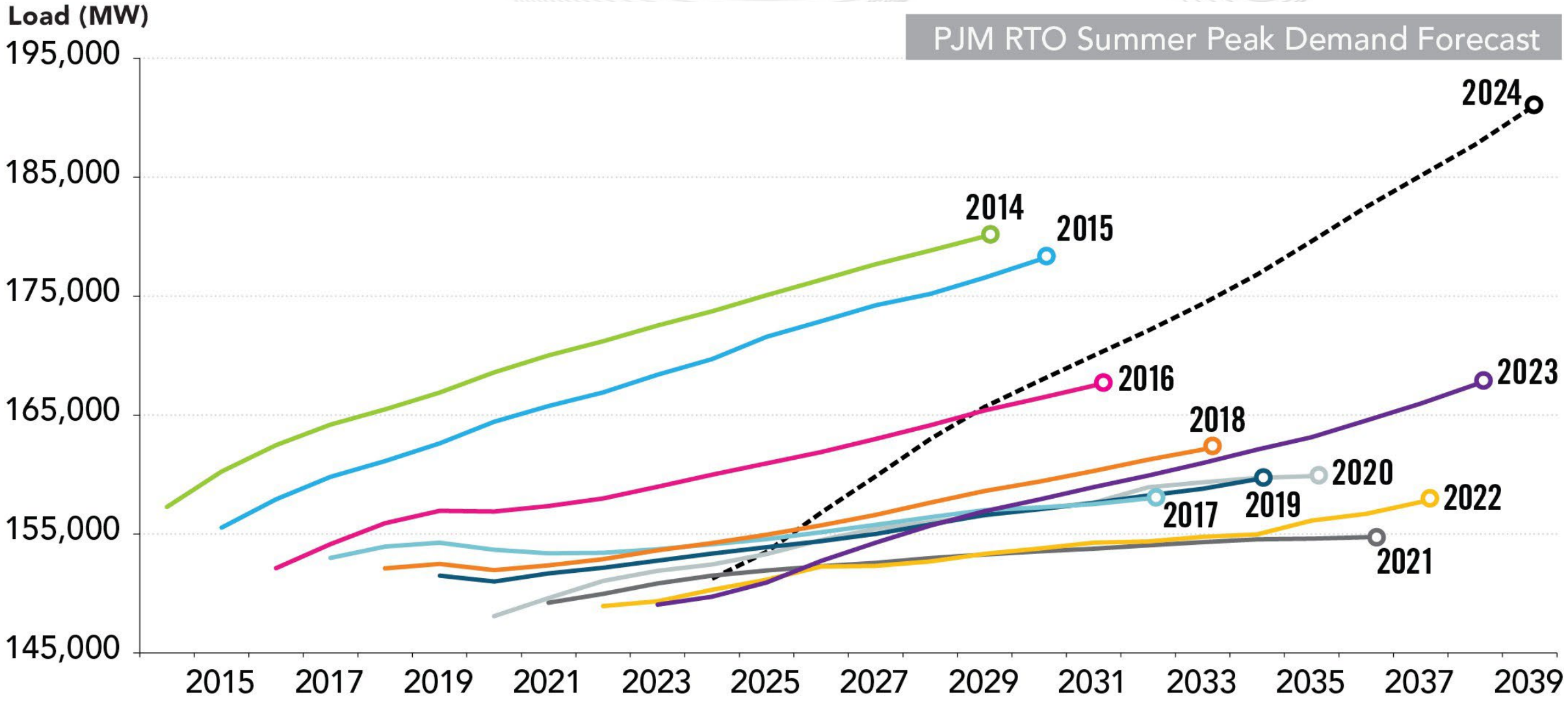
Energy forecast is used in market efficiency planning and for PJM budgeting purposes.

Planning horizon is now 20 years.

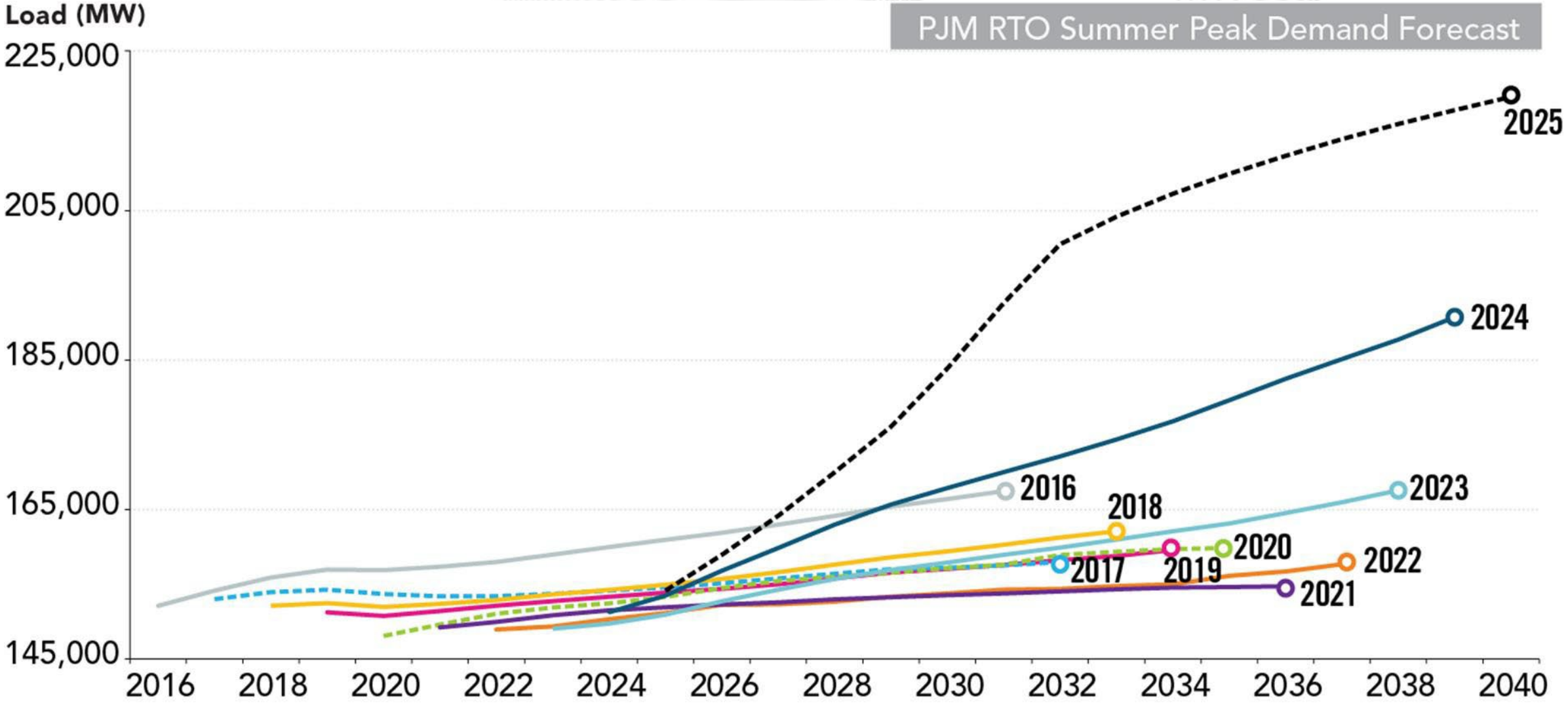
Forecast is based on a multivariable regression model.

Forecast is reviewed with stakeholders and a final forecast is published in January.

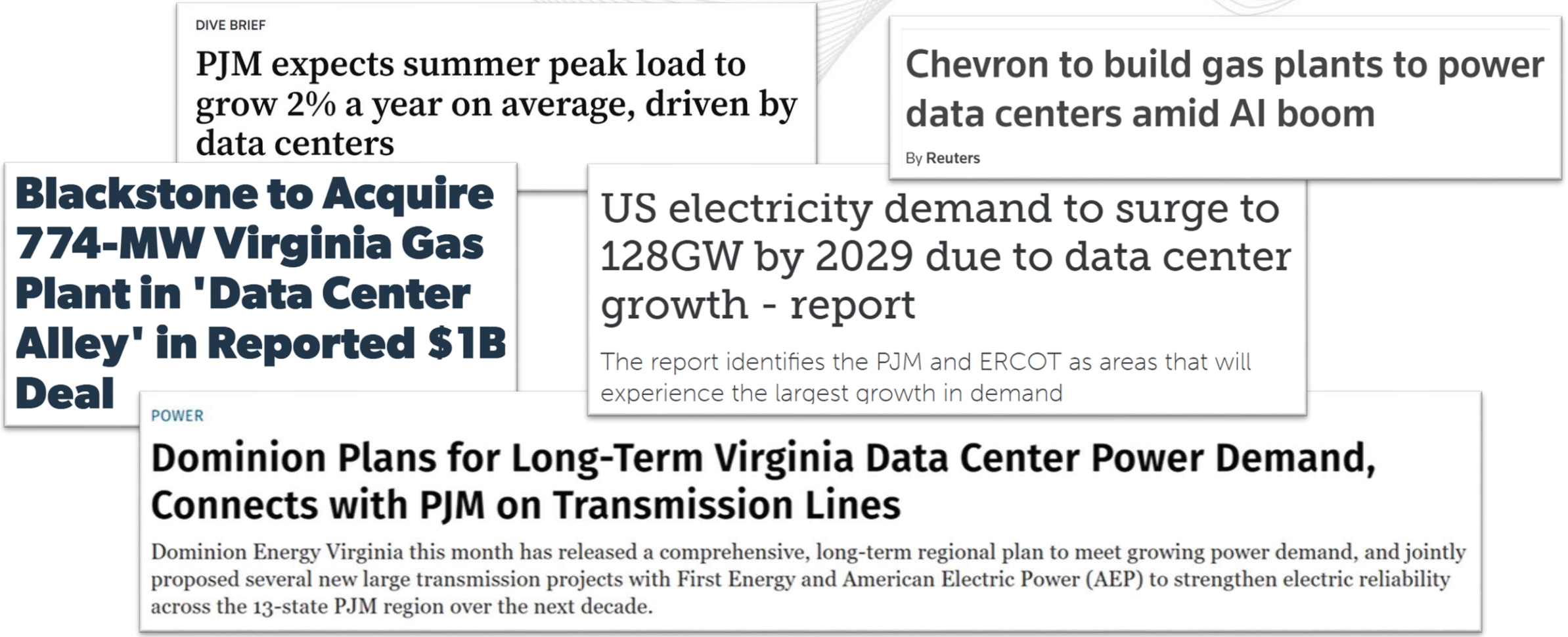
Electricity Demand Growth (2024)



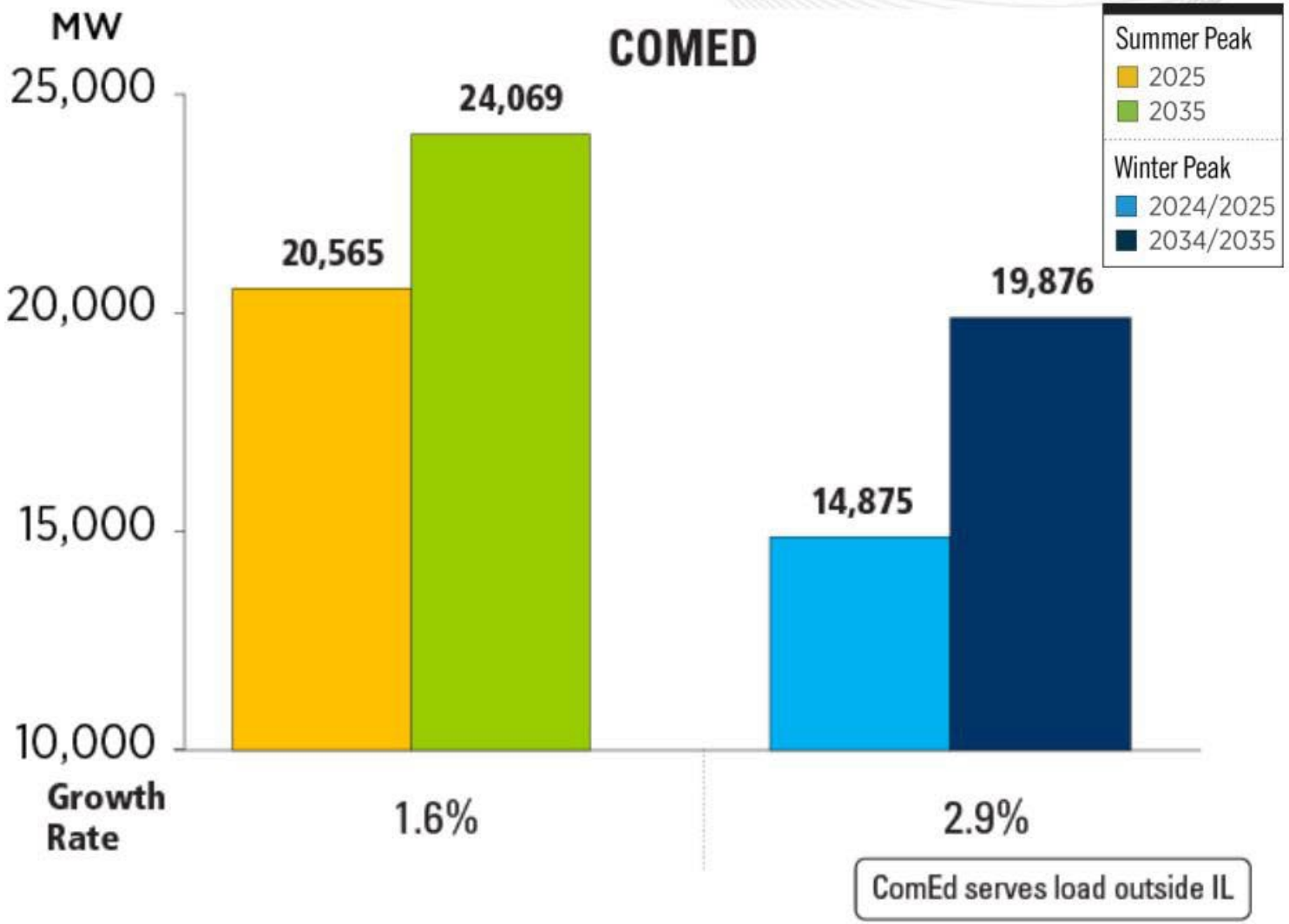
Electricity Demand Growth (2025)



Data Center Proliferation



Illinois – 2025 Load Forecast Report



PJM RTO Summer Peak		PJM RTO Winter Peak	
2025	2035	2024/2025	2034/2035
154,144 MW	209,923 MW	136,127 MW	198,175 MW
Growth Rate 3.1%		Growth Rate 3.8%	

The summer and winter peak megawatt values reflect the estimated amount of forecast load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas over the past five years.

International Energy Agency (IEA)

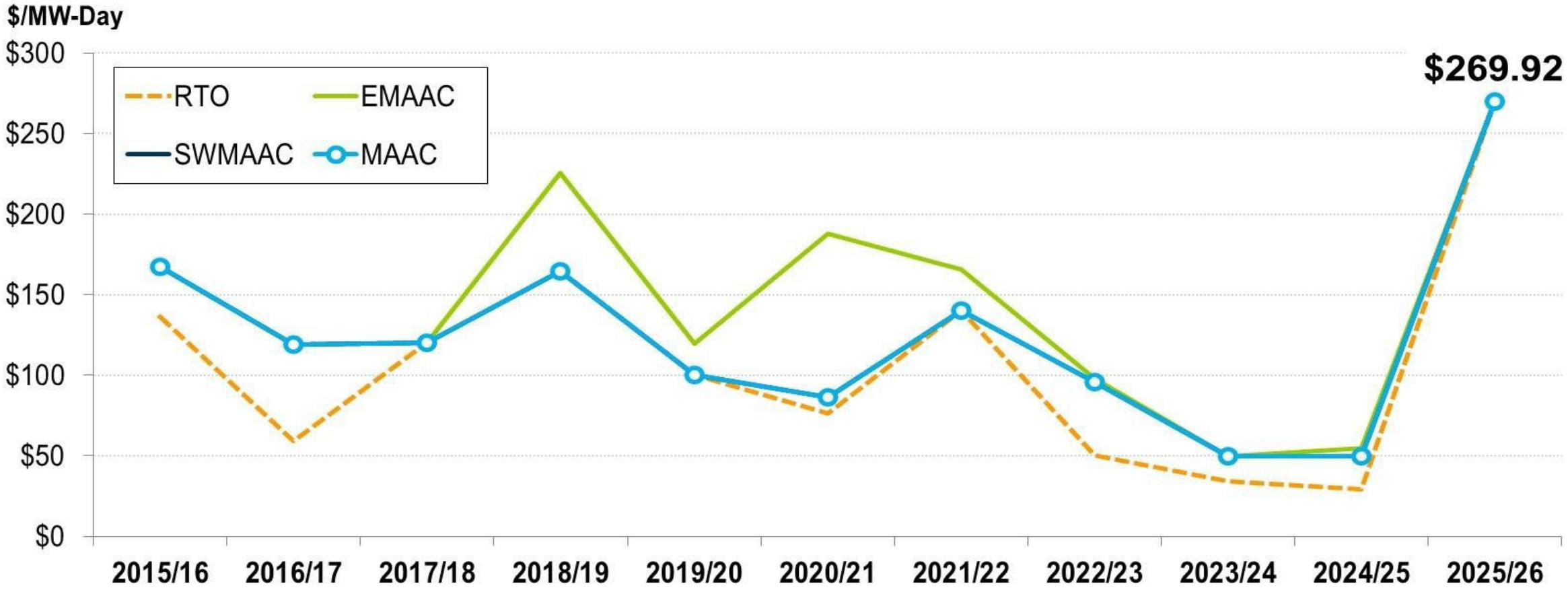
Electricity Mid-Year Update - July 2024

"Over the 2024-2025 forecast period of this report, global electricity consumption is expected to increase at the fastest pace in years, fueled by robust economic growth, intense heatwaves and continued electrification worldwide."

The rise of artificial intelligence (AI) has put the electricity consumption of data centers in focus, making better stocktaking more important than ever.	The 4% growth expected for 2024 is the highest since 2007, with the exceptions of the sharp rebounds in 2010 after the global financial crisis and in 2021 following the Covid-induced demand collapse. We expect this demand trend to continue in 2025, with growth also at 4%. In both 2024 and 2025, the rise in the world's electricity use is projected to be significantly higher than global GDP growth of 3.2%. In 2022 and 2023, electricity demand grew more slowly than GDP.

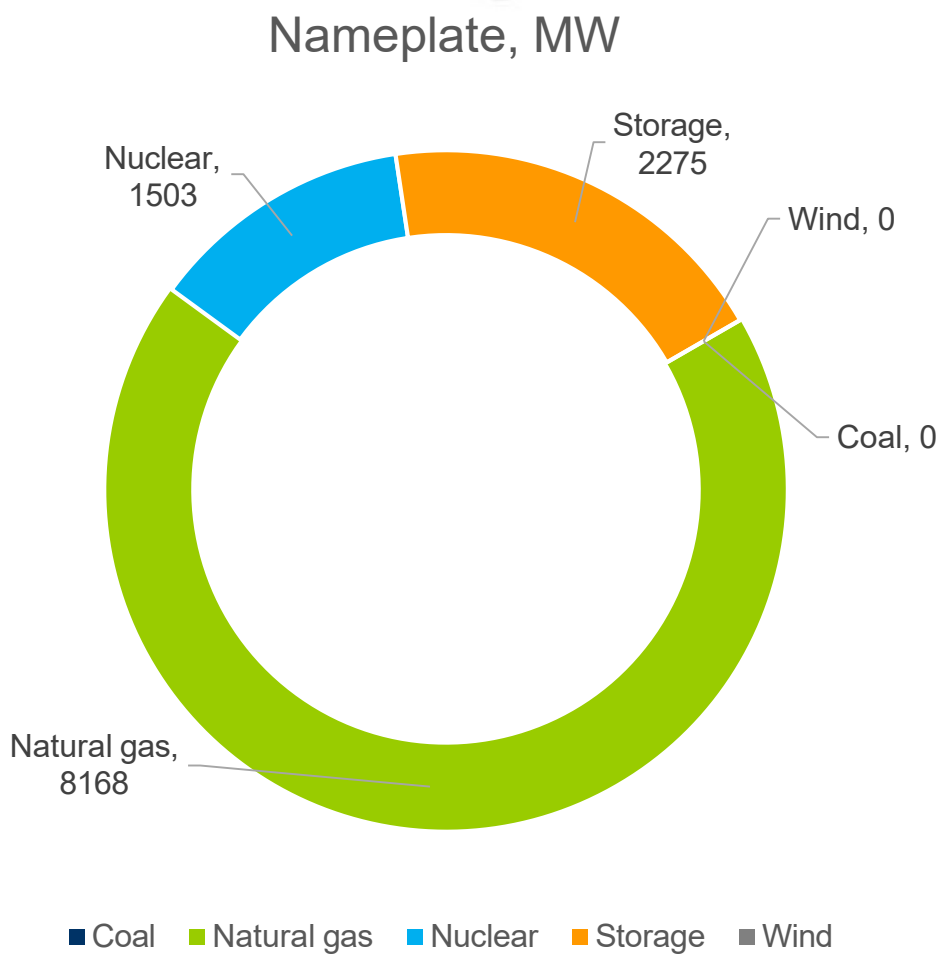
https://www.iea.org/reports/electricity-mid-year-update-july-2024

Historical BRA Pricing in RTO



RRI: All Projects by State

	Number	Nameplate	CIR
Delaware			
Illinois	4	398	313
Indiana			
Kentucky	1	786	759
Maryland	2	554	548
Michigan			
North Carolina			
New Jersey	5	550	607
Ohio	9	3,363	3,242
Pennsylvania	7	1,201	1,293
Tennessee			
Virginia	22	5,095	5,309
West Virginia	1	0	14
Total	**51**	**11,945**	**12,085**



Policy Takeaways

- **States should avoid policies intended to push generation resources off of the system until an adequate quantity of replacement generation is online and has been shown to be operating**

- **States should address state and local challenges in the deployment of new generation resources and electricity infrastructure, and enact policy to facilitate greater/quicker construction**

- **States should help to bring new resources onto the system as soon as possible**

Utility Strategies to Manage Accelerating Load Growth

PRESENTED BY

Akhilesh Ramakrishnan

IPA POWER HOUR WEBINAR

JULY 11, 2025

Brattle

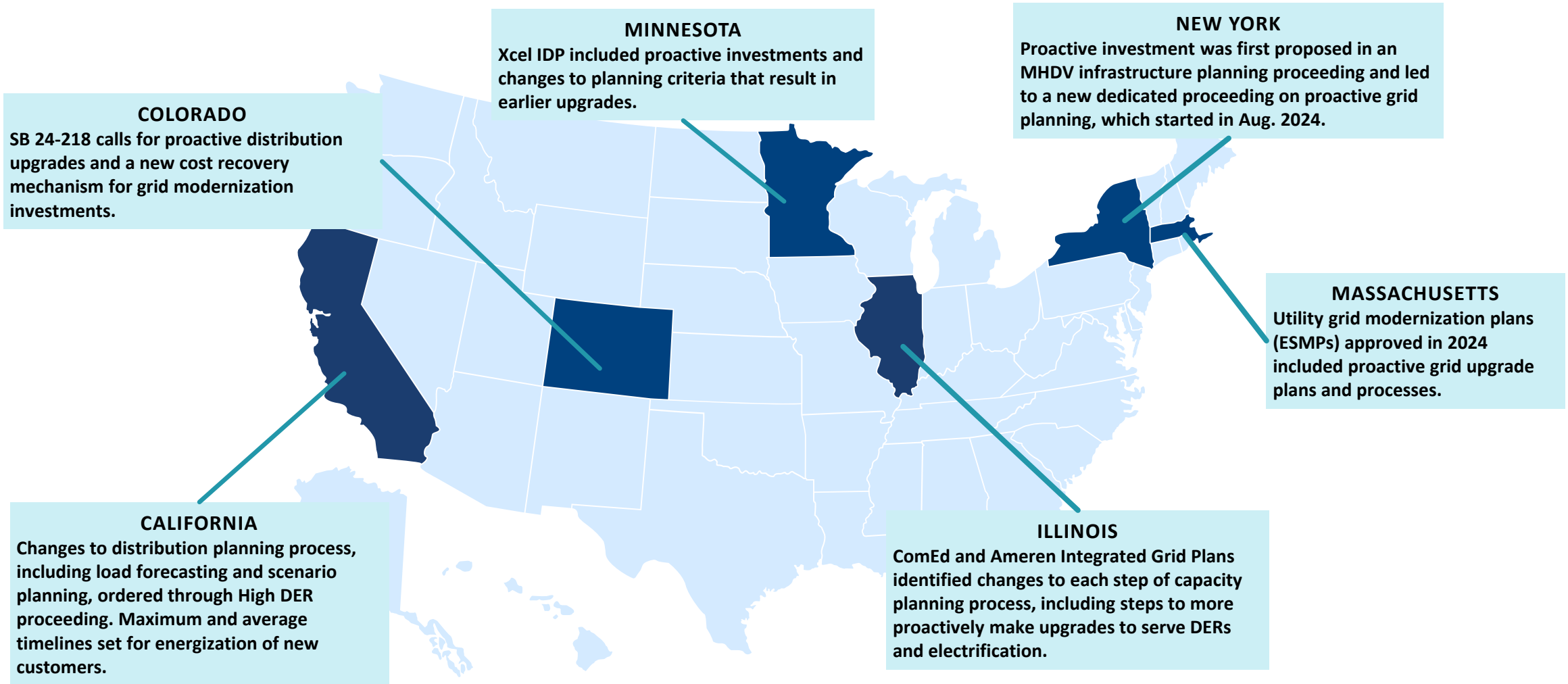
Strategy 1: Improve Distribution System Planning Processes

1

Improve Distribution System Planning Processes

- **Improve demand forecasting** with more spatial granularity and longer time horizons; incorporate data from other sources (e.g., municipal permitting data, earlier engagement with new large loads)
- **Implement scenario planning** to develop multiple capacity expansion plans and select the least regrets option across various scenarios
- **Implement multi-value planning** to build once for multiple drivers (e.g., load growth and increased DER hosting capacity)
- **Incorporate DERs** into planning to expand the suite of solutions available to meet grid needs

States with Proactive Distribution Grid Planning Initiatives



MINNESOTA
Xcel IDP included proactive investments and changes to planning criteria that result in earlier upgrades.

NEW YORK
Proactive investment was first proposed in an MHDV infrastructure planning proceeding and led to a new dedicated proceeding on proactive grid planning, which started in Aug. 2024.

COLORADO
SB 24-218 calls for proactive distribution upgrades and a new cost recovery mechanism for grid modernization investments.

MASSACHUSETTS
Utility grid modernization plans (ESMPs) approved in 2024 included proactive grid upgrade plans and processes.

CALIFORNIA
Changes to distribution planning process, including load forecasting and scenario planning, ordered through High DER proceeding. Maximum and average timelines set for energization of new customers.

ILLINOIS
ComEd and Ameren Integrated Grid Plans identified changes to each step of capacity planning process, including steps to more proactively make upgrades to serve DERs and electrification.

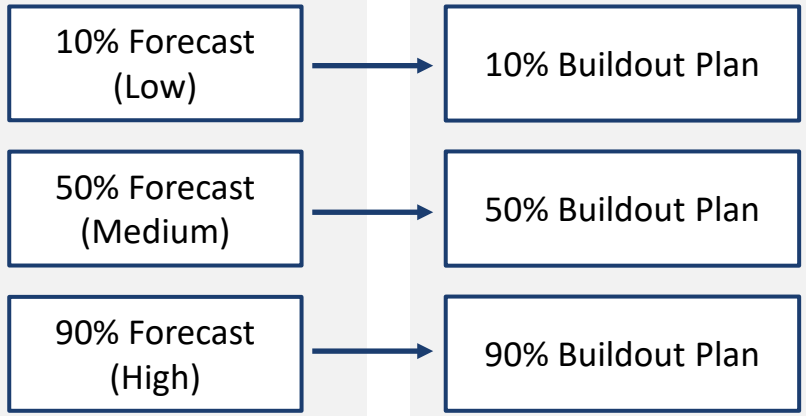
Key Elements of Proactive Planning

Planning Element	Description
Load Forecasting	Proactive planning requires changes to traditional load forecasting practices. Potential changes can include increasing geographical granularity, extending forecasting periods, incorporating new sources of information, and developing multiple scenarios.
Scenario Planning	Traditional grid planning is typically based on one scenario. To deal with additional uncertainty, one approach is to develop multiple capacity expansion plans aimed at different load scenarios, with on and off ramps that indicate when the effective plan should be changed to an alternative plan.
Cost Recovery	Proactive planning may include changes to the timing and extent of allowed cost recovery for proactive investments. The cost recovery framework should consider how much of the risk of early/late and under/over investment should be borne by utilities and customers.
Cost Allocation/Equity	Proactive planning may include alternative cost allocation frameworks that determine who pays for PGB. E.g., some large customers may be willing to pay to reserve capacity.
Incorporate DERs	DERs can impact each of the planning elements above and should be considered at each stage of proactive planning.

Scenario Planning Approach for Distribution System Planning

Moving from a deterministic planning approach to a probabilistic approach necessitates a framework to develop multiple buildout plans and then select an optimal plan based on well-defined decision metrics.

Probabilistic demand forecasting



Develop **forecasts with probability weightings** as the basis to develop and evaluate buildout plans

Generate multiple buildout plans

Use rules-based model to generate preliminary versions of a **buildout plan for each forecast**

Evaluate build plans

Estimate performance of each build plan in each scenario. **Potential evaluation metrics** to quantify:

- Societal cost of delayed grid connection
- Net cost of buildout plan to existing ratepayers (incremental cost of new buildout minus incremental revenue from new load)

Select best plan

Use predetermined **decision criteria** to select a plan that is optimal across the range of scenarios. Decision criteria may consider:

- Trade-offs between net buildout costs and delayed connection costs
- Risks, e.g., probability of much higher costs in case of over/under-build

Investment-grade plan

Develop investment-grade buildout plan and detailed project scoping

Strategy 2: Deploy and Utilize DERs

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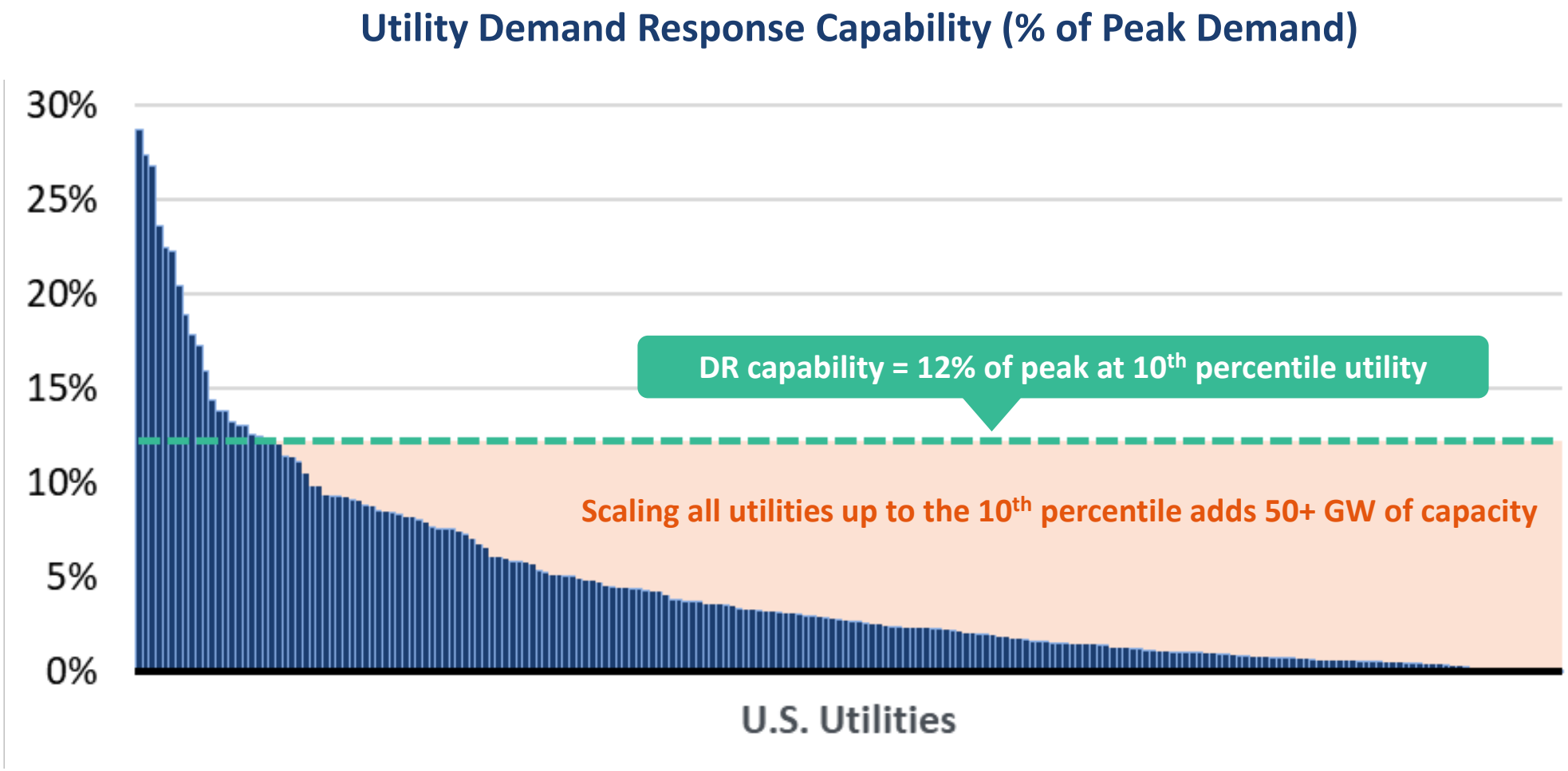
- **Harmonize customer programs across grid services** to simplify compensation and eligibility rules
- **Implement a seamless enrollment process** for VPP, DR, and EE programs to scale participation

The new VPP opportunity: Addressing dramatic load growth

	Challenges of large new loads	The opportunity for VPPs
Affordability	• Concerns about a cost shift • Will market prices increase?	• Leverages underutilized on-site assets • VPPs cost only 40-60% of the alternatives
Environmental Impacts	• Driver of new large scale gas generation • Potential for delayed coal retirements	• Reduces need for other capacity additions • Can drive alternatives to diesel backup
Fairness	• Crowds out housing? Manufacturing? • Who decides “beneficial” load?	• Pays *customers* for grid services • Data centers could support VPP market expansion
Reliability	• Supply struggling to keep up with demand • Equipment shortages, interconnection delays	• Not constrained by interconnection queue • Can scale as new load materializes • Can be a bridge to transmission expansion

The opportunity to scale VPPs



Source: Brattle analysis of data from Form EIA-861 2022. The 50+ GW opportunity to scale is estimated as the additional capacity that would result from all analyzed utilities scaling capability to 12% of their peak load. The analysis includes the 214 utilities that: (i) reported DR capability to EIA in 2022, (ii) reported peak demand of at least 100 MW, and (iii) are investor-owned, municipal, cooperative, state, or federal utilities. 12 utilities are excluded due to data anomalies.

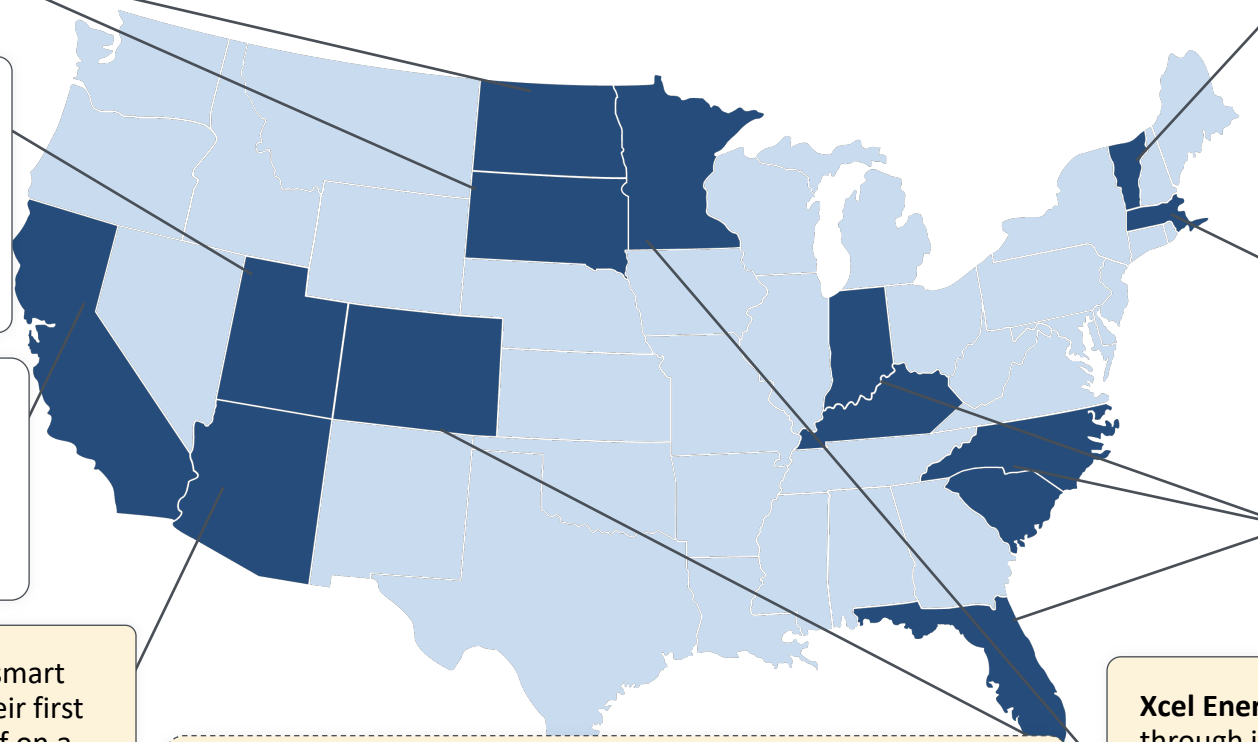
Examples of VPPs at scale

OtterTail Power's total DR capability is over 15% of its system peak demand.

Rocky Mountain Power has 560 MW of peak demand reduction capability, and 20% enrollment among all residential customers. Its battery VPP program had 27 MW enrolled as of 2024.

PG&E currently operates 20 MW of smart AC load control switches, 10 MW in a Bring Your Own Device VPP program, and 19 MW in its Emergency Load Reduction Program.

Arizona Public Service built a 150 MW smart thermostat VPP in 5 years and called their first locational event in 2024 to provide relief on a few constrained feeders.



Aggregator examples

- Voltus, CPower, and Uplight each control over 7 GW of load
- EnergyHub enrolled 100,000 customers (90 GW) in 6 months
- RenewHome partnering with NRG to build 1 GW VPP in TX
- ev.energy has >200,000 EVs under management

Green Mountain Power has about 70 MW enrolled in its VPP program, making it Vermont's largest single peaking power source.

National Grid had over 2,000 residential customers (~24 MW) enrolled in the Connected Solutions battery program in MA as of the end of 2023.

Duke Energy has 16% of residential customers enrolled in A/C load control, with over 1,500 MW of capacity.

Xcel Energy has 390 MW of DR capability in MN through its A/C control programs, with over half of all eligible residential customers enrolled. Their utilities in both MN and CO are in the top 10% of IOUs by DR capability.

30 Strategies to Scale Enrollment

Marketing

1. Concise messaging about program benefits
2. Multiple motivators for participation
3. Top-of-funnel marketing
4. In-person promotional events

Enrollment Process

5. Create a seamless enrollment process
6. Pre-enroll devices sold on utility marketplaces
7. Point-of-sale enrollment at retailers
8. Offer easy enrollment in multiple programs
9. Integrate value-add services into programs
10. Provide referral incentives

Ecosystem Partners

11. Harmonized messaging from utilities and OEMs
12. Engage customers through trusted entity
13. Partner with local installers
14. Exchange learnings with other utilities

Incentive Design

15. Maximize the financial incentive
16. Ensure customer pays a portion of device cost
17. Offer ongoing participation payments
18. Bundle device financing options with programs
19. Align price signals
20. Offer active and passive control models

Engagement and Retention

21. Improve program design over time
22. Regularly remind customers of their rewards
23. Compensate through channels customer will notice
24. Communicate societal impact of participation
25. Call regular testing events
26. Offer easy unenrollment
27. Offer flexibility to opt out of events
28. Limit event notifications in automated programs
29. Allow customers to set control range
30. Offer technology choice where available

30 Strategies: Impact and Ease of Implementation

Based on perspectives of VPP solutions providers

Source: Distributed Energy, Utility Scale: 30 Strategies to Increase VPP Enrollment, prepared by The Brattle Group for LBNL, 2024.

Strategy 3: Make Foundational Investments to Orchestrate DERs

1

Improve Distribution System Planning Processes

- **Improve demand forecasting** with more spatial granularity and longer time horizons; incorporate data from other sources (e.g., municipal permitting data, earlier engagement with new large loads)
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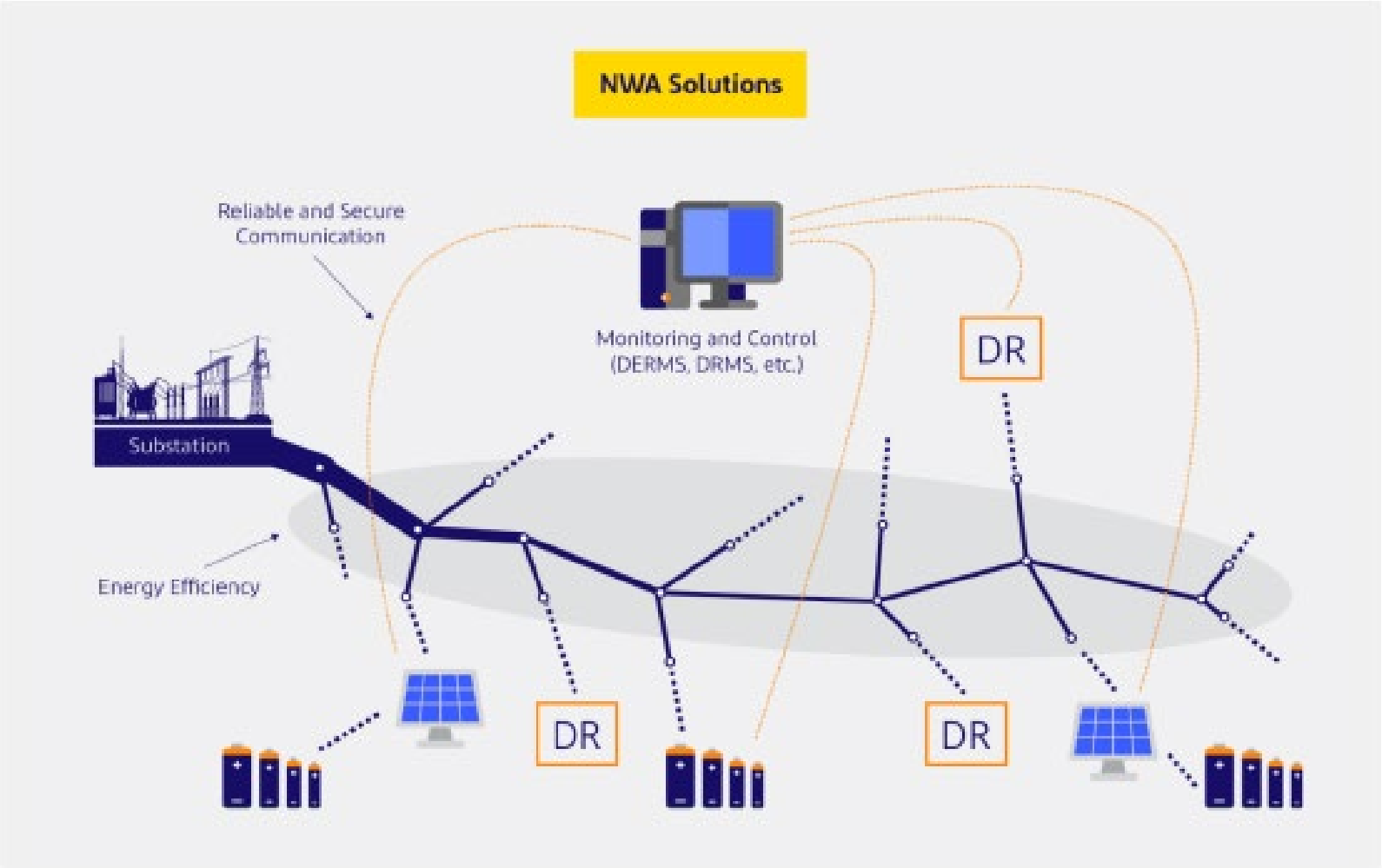
Make Foundational Investments to Orchestrate DERs

- **AMI:** For improved visibility and planning
- **Grid DERMS:** To interface with distribution system OT and identify where DER operation is needed
- **Edge DERMS:** To interface with and operate BTM assets

Investments to Monitor and Control DERs and the Grid



Source: ComEd's Integrated Grid Plan, filed February 2025.

Utility Strategies to Manage Accelerating Load Growth

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Mr. Ramakrishnan specializes in planning and policy matters related to electrification, distributed energy resources (DERs), and the electric distribution system.

He has consulted for a range of clients – including utilities, regulators, and technology companies – in efforts to evaluate the electric grid impacts of electrification and DER adoption. Mr. Ramakrishnan has worked with utilities to conduct cost-benefit analyses of electrification programs, design compensation mechanisms for customers with emerging technologies, and modernize system planning to integrate and utilize DERs. He has also assisted technology companies and developers in illustrating the value of DERs and demand flexibility to the electric system.

IPA
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IPA's Focus on Load Growth

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Areas of Load Growth

Consistent areas of Load Growth over the past 5-15 years

- Increased reliance on electric devices
- Electrification (e.g. transportation, gas to electric conversion, etc.)
- Economic development
- Population movements and/or growth

"New" and expanding Load Growth

- Data centers & artificial intelligence
- New/expanding industrial and manufacturing

Load Growth Touches All Areas

Regional - RTO

- **Grid Balance Energy** (generation imports & exports, generation retirements, transmission build, etc.)
- **Reliability & Resiliency** (e.g. capacity, outage management)
- **Cost Recovery & Balancing**
- **Regulated vs. Deregulated Markets**

Illinois-Specific

- **Keystone to mid-western energy supply** (energy production and links between PJM & MISO)
- **Meeting IL RPS and clean energy targets**
- **Maintaining a reliable and cost-conscious system for customers**

IPA Focus

- **Impact on default service supply needs**
- **Impact on RPS and clean energy goals (RECs) & project development targets**
- **Broader Resource Adequacy needs** (e.g. generation build vs. retirements, transmission build, etc.)

All IPA Activities Are Impacted

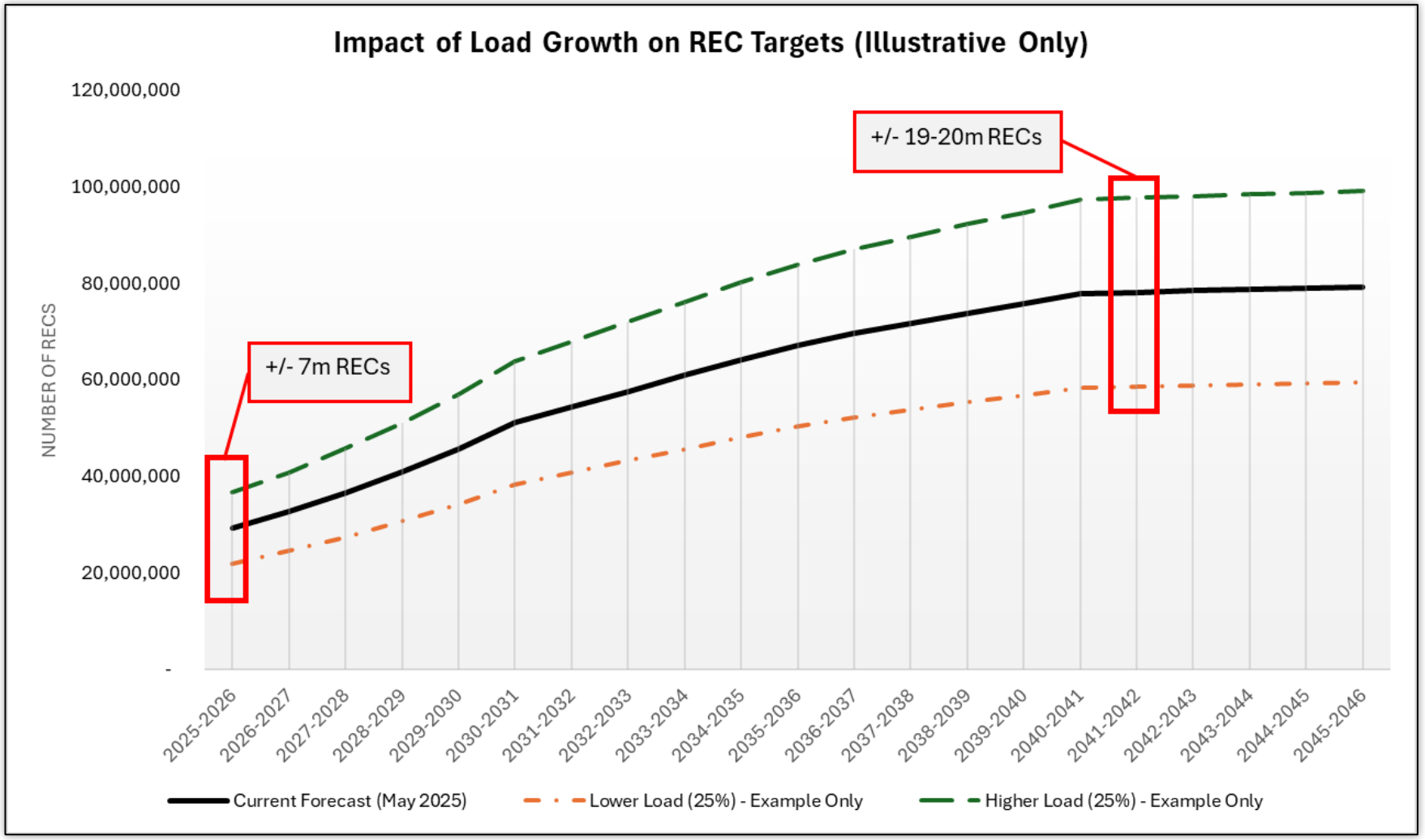
Electricity Procurement Plan (EPP)

- Focuses on Utility Default Service supply procurements – Ameren IL, ComEd, and MidAmerican
- Procuring block energy (peak and off-peak) for each utility, and also procuring capacity hedges for Ameren customers.
- **As default service customer load increases (residential & small business), procurement strategies require updates to meet the changing need**

Long-Term Renewable Resource Procurement Plan (Long-Term Plan or LTP)

- Includes a series of foundational elements: (1) utility-scale renewable energy resource procurements (solar, brownfield solar, wind, and hydro), (2) customer Programs including Illinois Shines (Adjustable Block Program) and Illinois Solar for All, (3) evaluation criteria for adjacent state resource procurement considerations, and (4) a Self-direct Program aimed to recognize large-customer bilateral renewable energy contracting.
- Each activity drives to meet Illinois RPS and Clean Energy goals through renewable energy resource project development.
- As load growth occurs, REC targets increase, requiring additional renewable energy resource supply contracts

Graph – RPS Target Changes



A flat *25% load increase* in 2025-26 could translate to:

- 2.25 GW of new wind; or,
- 4.2 GW of new solar

(rough translation given current capacity factors)

A *decrease* in load by a flat 25% could result in a similar but opposite decline in RECs needed to meet RPS targets

Future Opportunities

- **Energy Storage**
  - A unique resource that is expected to play a pivotal role in the wholesale and retail energy markets going forward – can be paired with generating resources, provide firm (and dynamic) capacity, and has multiple sizing options (MWs and duration) to meet market needs
  - Was a major focus of the IPA Policy Study, ICC workshops (Spring 2025), and legislative discussions in Spring 2025 session.

- **Transmission**
  - In-state build ("traditional" planning)
  - High Voltage Direct Current (HVDC) transmission – within and between RTOs
  - Transmit decentralized generation to load centers; connect RTOs

- **New/Emerging Technologies**
  - Provide new opportunities for generation supply diversity, customer-owned generation, and to support broader resource adequacy needs (e.g. modular nuclear, green hydrogen, renewable natural gas, etc.)

A View Into Illinois System Needs

- **EPA Act, Section 9.15(o)**
  - Charges the IPA, IEPA, and ICC with competing a resource adequacy study every 5 years, starting in 2025
  - Focuses on evaluating the state's current progress to renewable energy goals, status of CO2e and co-pollutant emissions reductions, current state and progress towards developing & implementing green hydrogen technologies, and the current and projected status of electric resource adequacy and reliability throughout the state. The evaluation is also expected to include proposed solutions to alleviate any findings identified.

IN BRIEF: If a resource shortfall identified through the study, then the IPA and IEPA to develop a plan to alleviate the shortfall while meeting IL policy goals and maintaining reliability and resource adequacy

- **The Agencies held a kick-off workshop June 16th, with the primary substantive feedback received from stakeholders being on the *importance of the load forecast*** (including assumptions behind load growth and policy activities to manage said growth)

Building On These Elements

- **During Spring 2025 Legislative Cycle – legislators considered enhancements on nearly all elements discussed previously, such as:**
  - Driving need for energy storage development through IPA-lead procurements
  - A need for Illinois-focused Integrated Resource Planning (informed by the RA Study and additional analysis)
  - Developing solutions to manage the expected impact of new large load customer growth in the State
  - Providing the IPA with various tools to meet increased RPS targets (building upon the passage of 103-1066 in January 2025)
  - Providing additional Program enhancements (IL Shines and IL Solar for All)

While there was a temporary set-back in the Omnibus Bill's passage, the scope and breath of topics considered highlights their recognized importance; all linked to and/or influence by, in part, to load growth.

While Load Growth itself is not the sole driver behind the need for market and planning changes, it is a key driver that touches nearly every aspect of the IPA's efforts and activities.

Key Illinois RA Study Drivers & Policies

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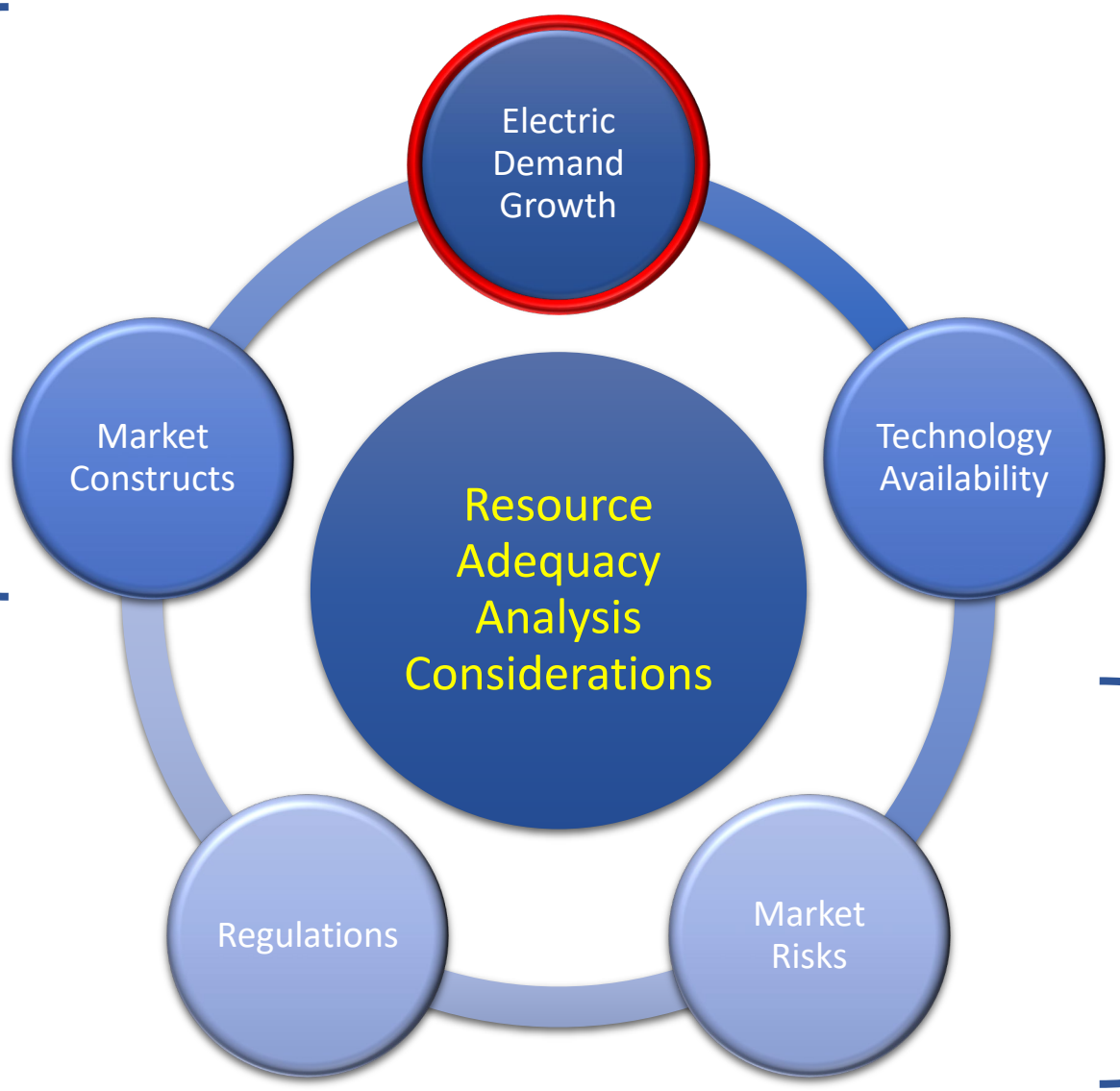
External Forces & Processes



Policy Decisions

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Q&A

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