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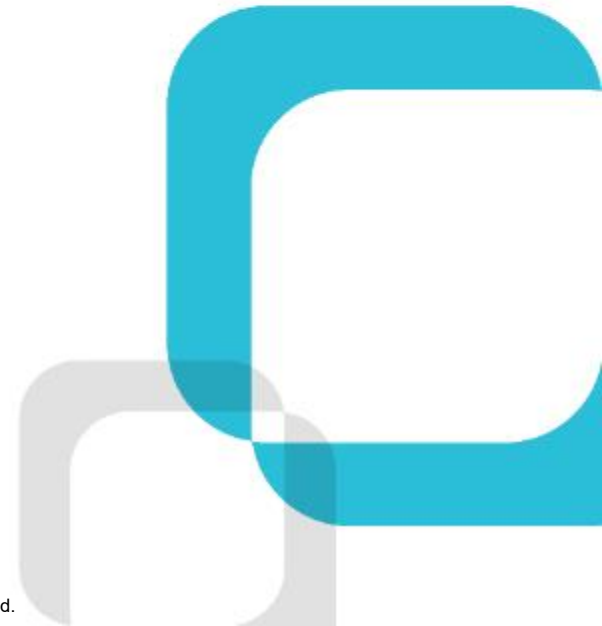


Navigating Uncertainty: Decisions that will Define the Grid

Morgan Schadegg



November 6, 2025



Energy Is Who We Are



GENERATION

We help you with every activity from strategic, capital, and business planning to the management of plant retirements. We can help you **manage cost, benchmark your performance, organize and staff, and improve or turn around your plants.**



GRID EDGE

Our grid edge services include business planning, governance and accountability models, procedure development, process redesign, project management, organization redesign, and regulatory filings. With our deep knowledge and experience in the evolving regulatory arena, we can guide you to **proactively engage with regulators and customers through this transformation.**



NATURAL GAS

We have **deep experience in the gas business** and provide a variety of services, including strategic analysis, business planning, operational and financial performance benchmarking, operations improvement, cost management, organization design and staffing, business process improvement, mergers and acquisitions, and rates and finance strategy.



OPERATIONAL TECHNOLOGY AND AI ENABLEMENT

We help you **transform OT operations** by integrating advanced technologies, streamlining processes, and enhancing efficiency and service delivery. We enable you to transition from compliance-driven frameworks to more **robust and secure operational models.**



RATES & REGULATION

We can assist you **with regulatory strategy and litigation services**, ranging from strategy development to rate design to demand forecasting to expert testimony. We offer economic and financial advisory services and help structure, negotiate, and finalize transactions.



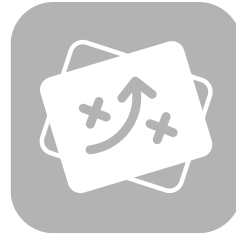
TRANSMISSION & DISTRIBUTION

With our electric and gas transmission and distribution services, we can help you with a wide range of offerings **from strategic and business planning to benchmarking to operational excellence to program design and implementation**, among many others.



ENERGY CORPORATE SERVICES

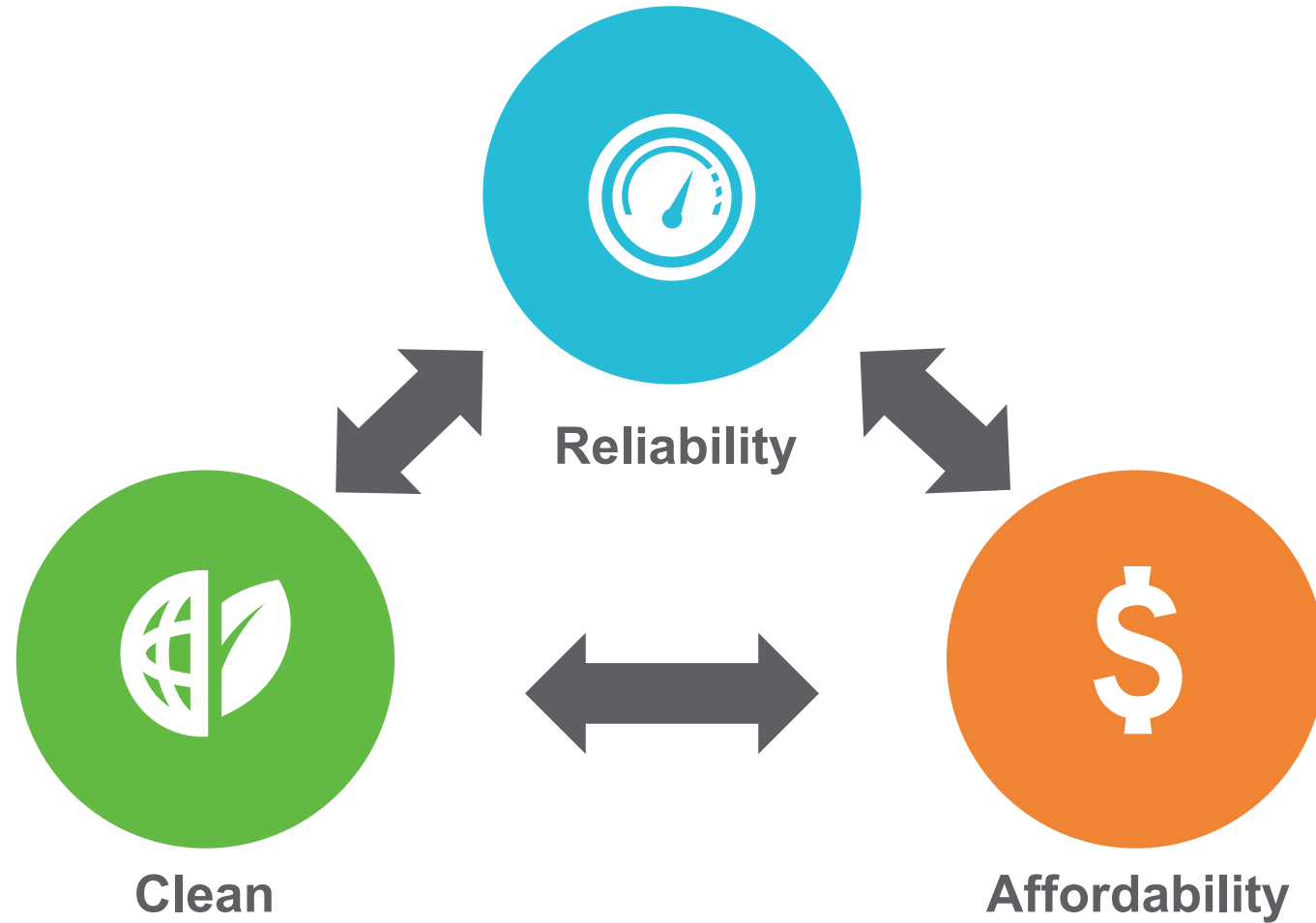
We help you **assess and improve corporate functions** by assisting with governance, operational improvements, technology, organization design, and service delivery design, implementation, and improvement.



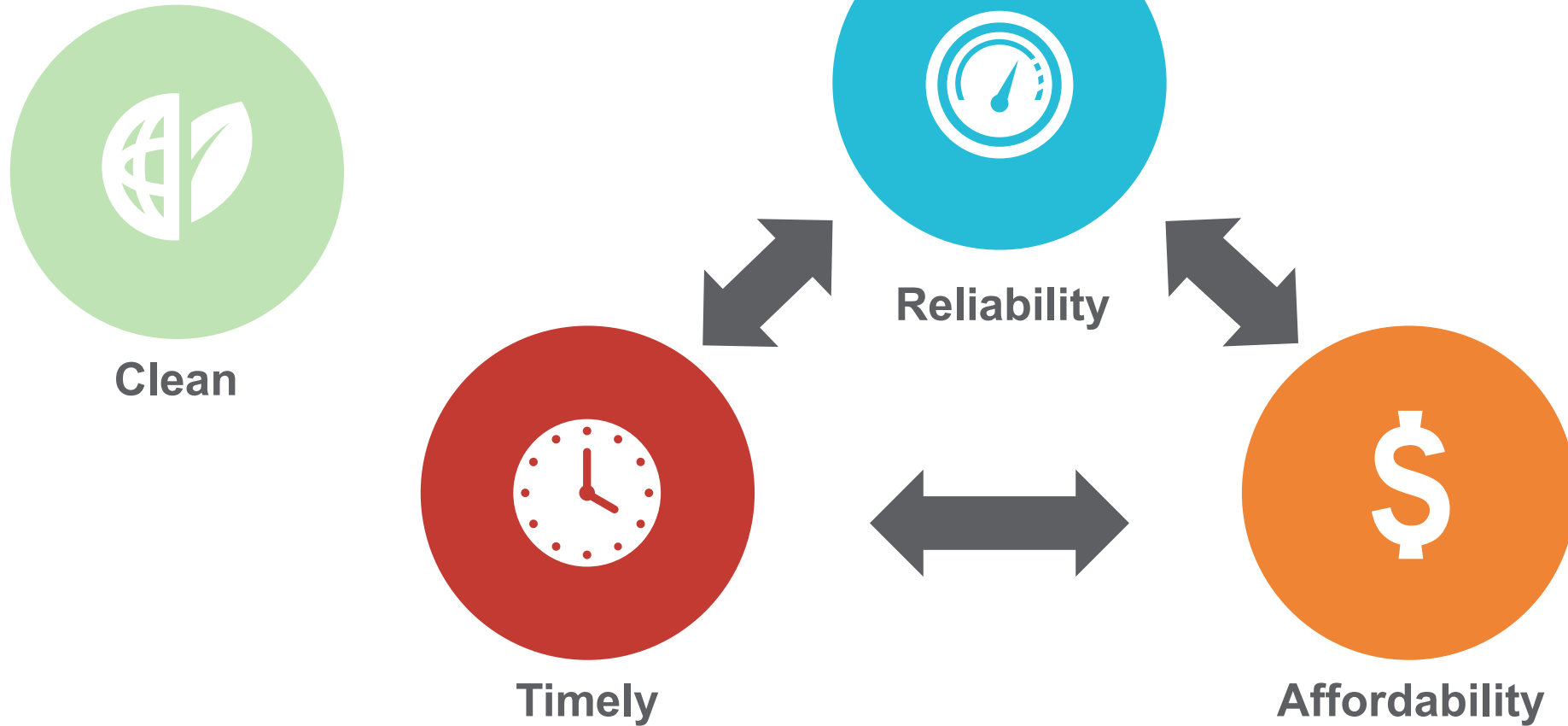
Navigating Uncertainty



Balancing Objectives in 2024



Balancing Objectives in 2025



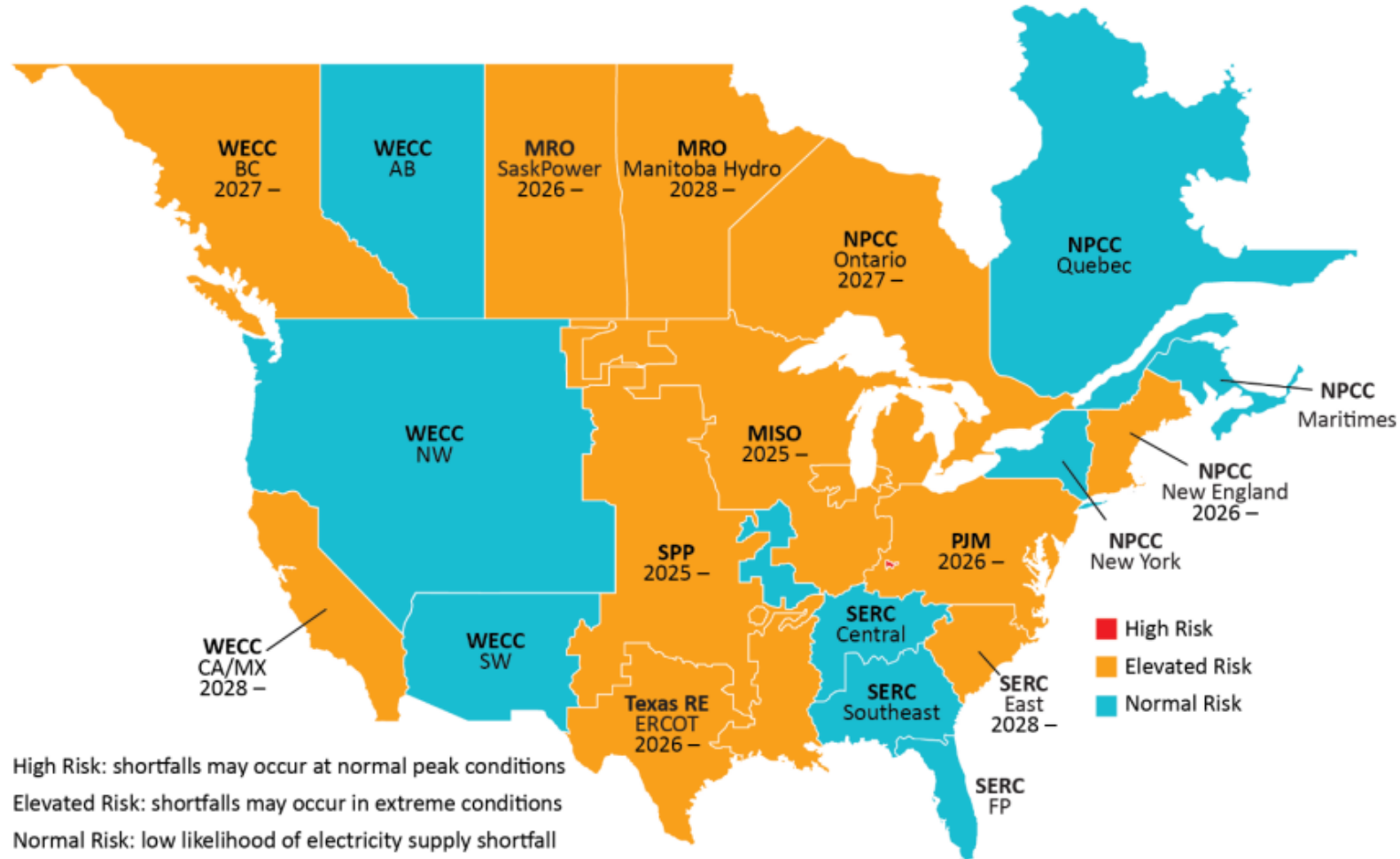


Reliability



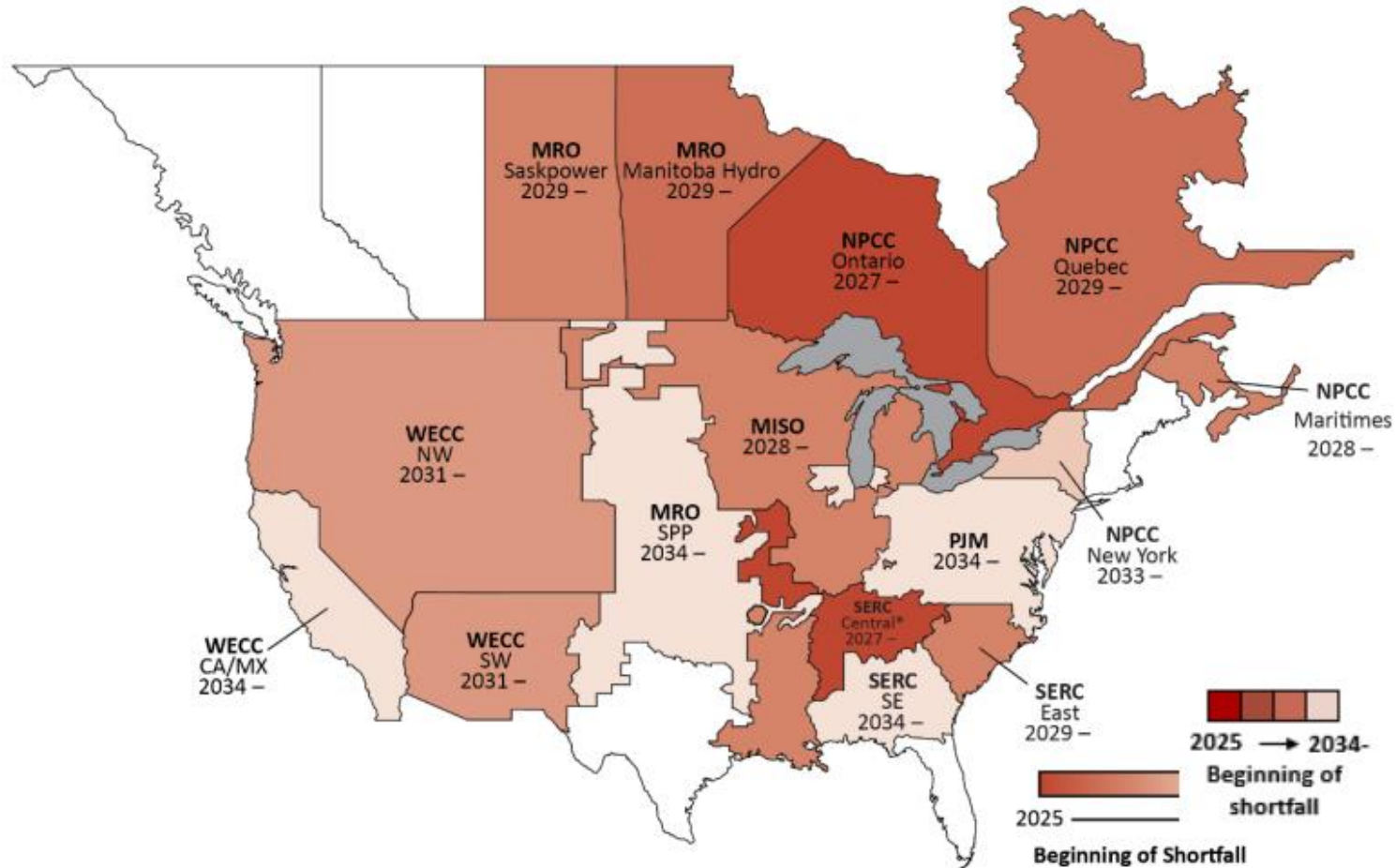
Power Markets Face Continued Risk

Risk Area Summary 2025–2029



Even More So When Accounting for Shortfalls from Retirements

Projected Reserve Margin Shortfall Areas with Announced Generator Retirements



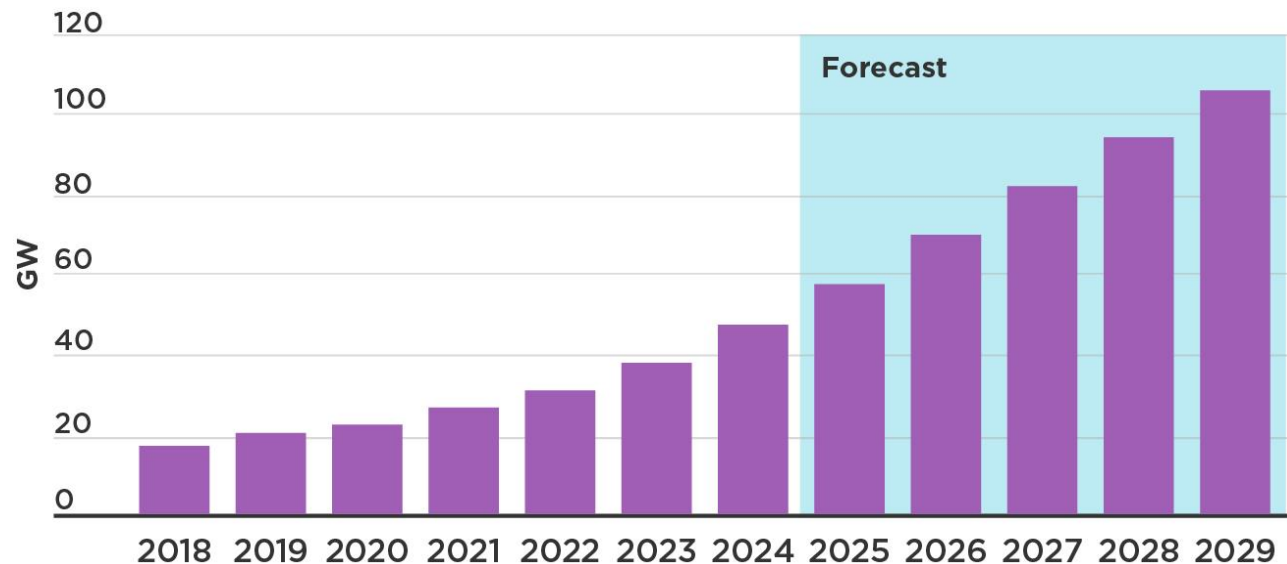
*14.99% bs 15% RML and then goes above until 2034

What is the driving factor of the reliability risks?

Impact of U.S. Data Center Expansion on Utilities

The scale of potential data center demand growth represents an unprecedented opportunity to deploy capital into energy infrastructure; however, the pace and uncertainty of this demand creates unique challenges for utilities.

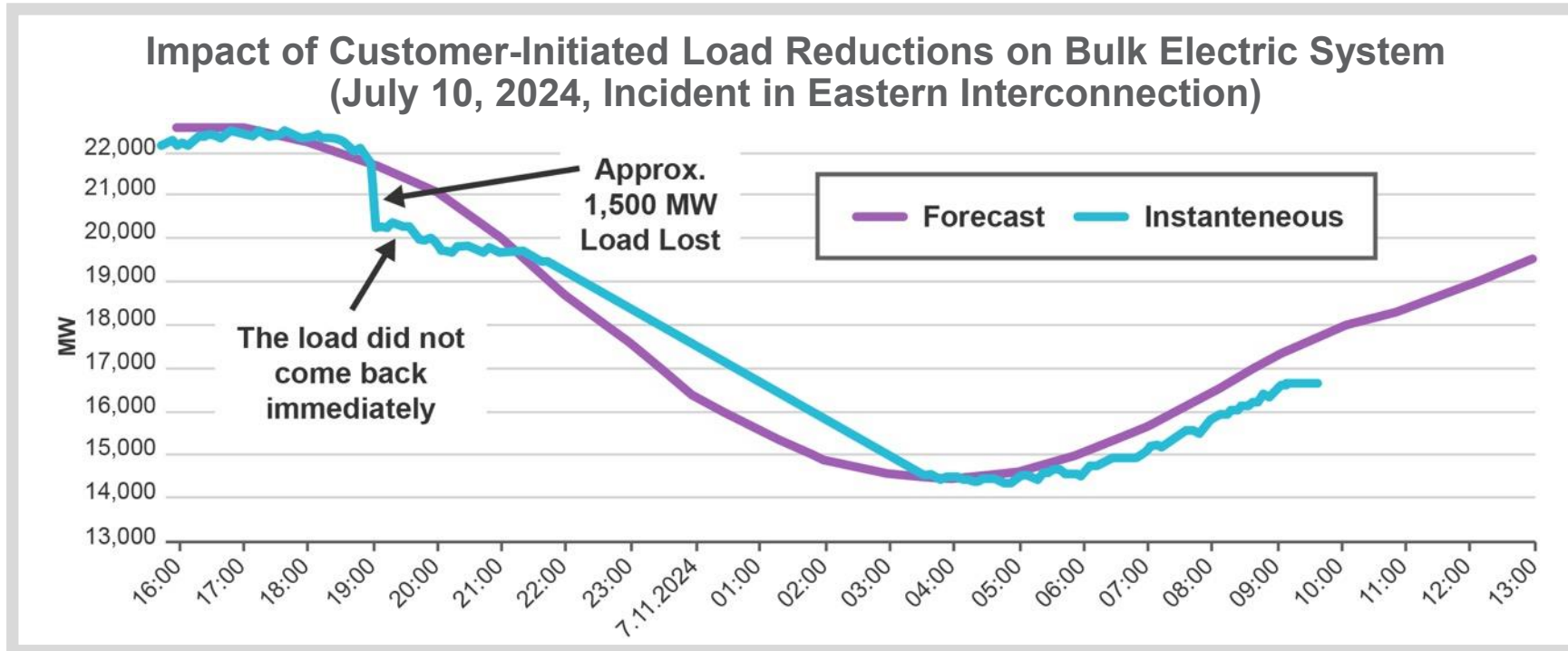
U.S. Utility Power Demand from Data Centers (GW)



Key Issues for New Large Loads

- Incremental investment requirements and potential cost shifts
- Impact on system performance
- Longevity of demand and risk of stranded costs
- Interest in and risk allocation for new technologies

Operational Headaches: Customer-Initiated Load Reductions



Source: NERC

From the October 2024 kickoff meeting of NERC’s Large Loads Task Force:

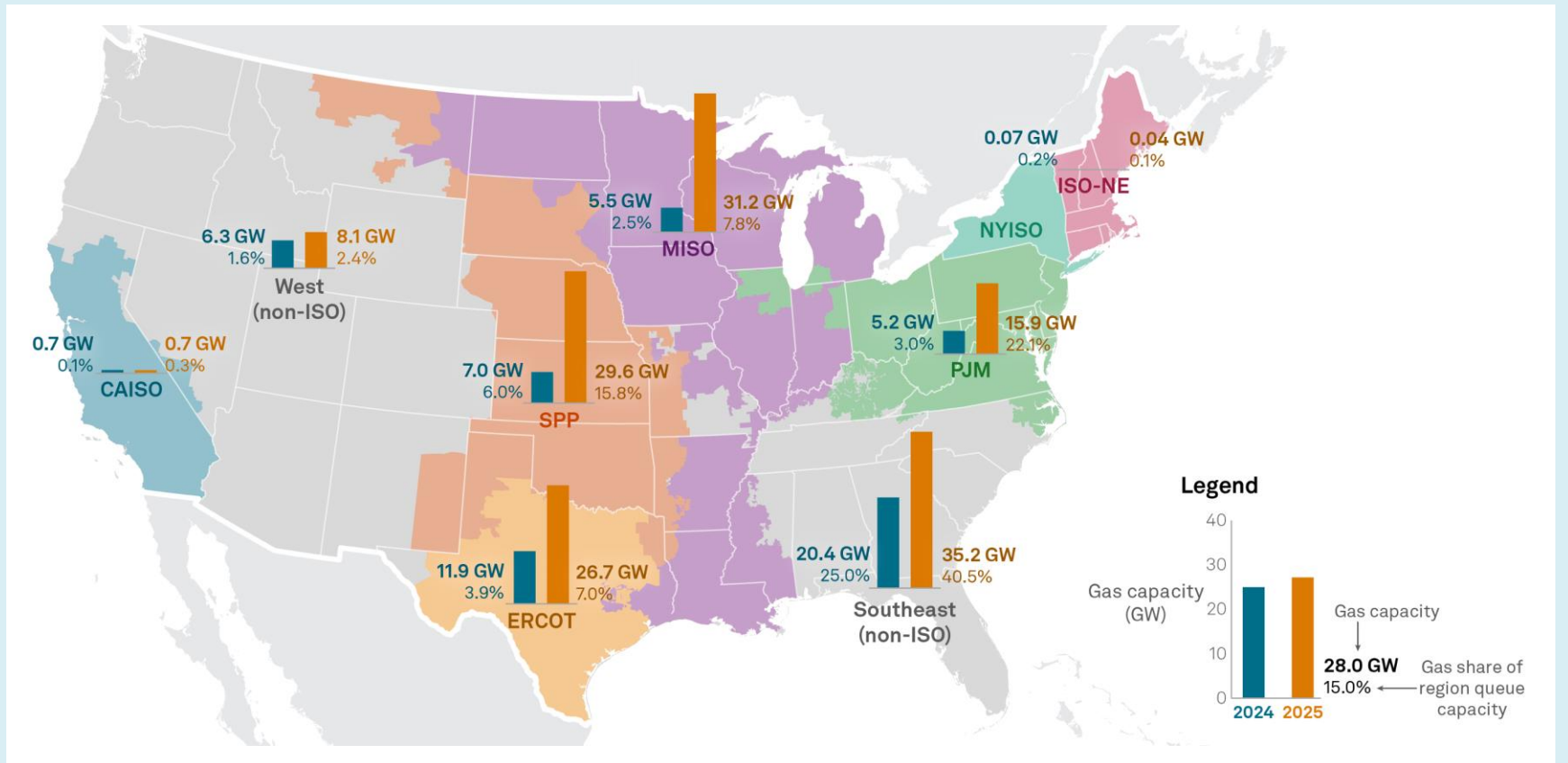
Large Data Centric Flexible Loads (LDCFL) in an area intentionally or unintentionally cycle in a way that creates a modal frequency in the grid that cannot be identified to the source in a timely manner, thus causing the grid to begin “self-isolation.” The isolation may be at an area, zone, or interconnection level depending on the number of LDCFLs contributing to the oscillation.

—David Ball, Senior Vice President Energy Delivery – American Electric Power

Interconnection Is Still a Gate

Interconnection queues are tilting toward gas across key regions as wind and hybrid proposals recede. Recent reforms are weeding out speculative projects, but approval timelines remain lengthy and largely unchanged.

Gas-Fired Generation in U.S. Interconnection Queues (2024 vs. 2025) (GW)



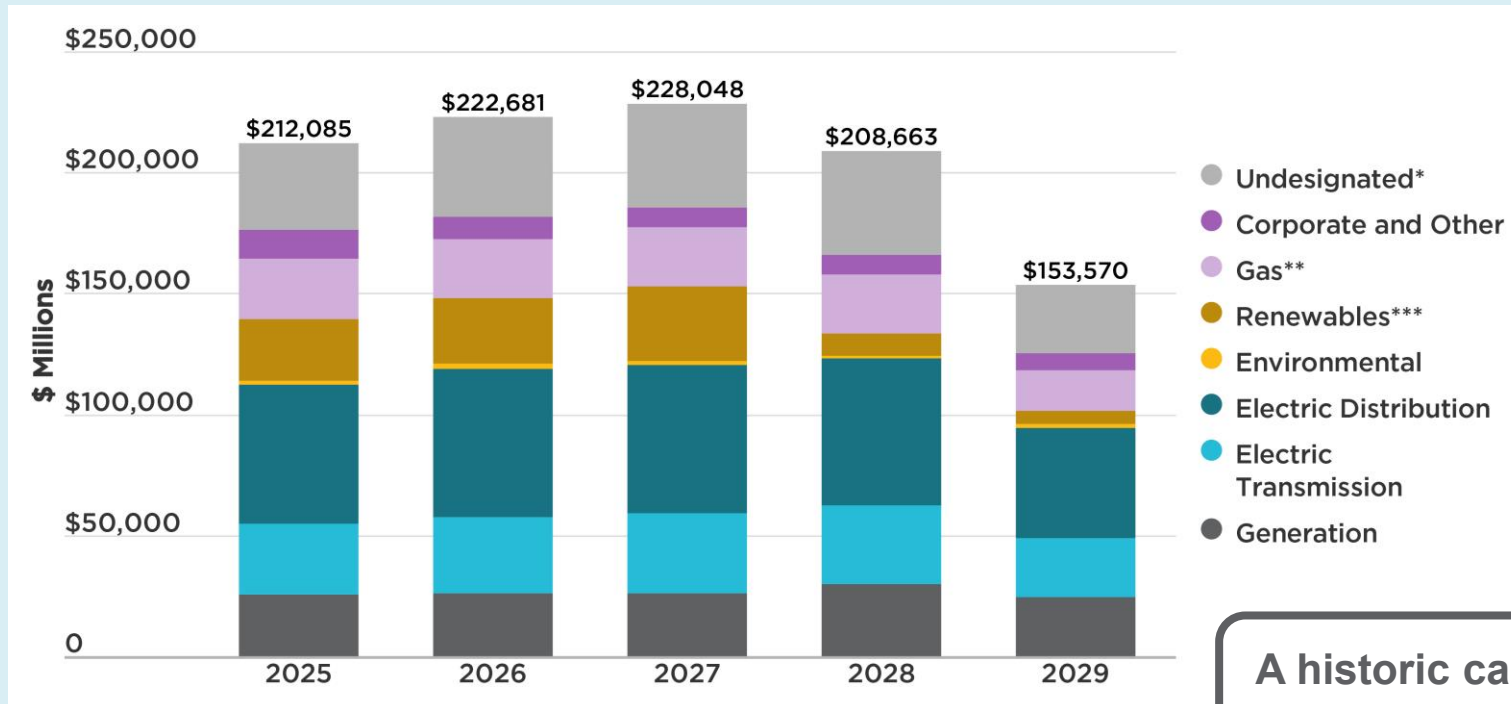
Notes: As of June 9, 2025. Calculations based upon stand-alone gas projects; active queues only. PJM active capacity for 2024 updated based on energy/capacity MW.

Source: S&P Global Commodity Insights

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The Investment Wave: Where CAPEX Is Going

Capital Investment Trends by Segment for Selected U.S. Electric, Gas, and Combination Utilities (\$ Millions) (2025–2029 Forecast)



- More than \$1.1T planned
- T&D = backbone (largest, fastest-growing)
- Renewables + storage ramping
- Gas adds firm capacity
- Near-term years most reliable
- Execution > ambition

A historic capex cycle is here; T&D is the backbone. Prioritize near-term, shovel-ready value.

Notes: *Undesignated reflects totals for companies that do not disclose segmented capex, including Dominion Energy, PG&E Corp., Sempra Energy, Northwest Natural Holding Co., Avista Corp., MDU Resources, and Hawaiian Electric Industries. **Gas includes gas pipelines, storage, distribution, and other gas expenditures. ***Renewables includes planned energy storage spending. Data are for 17 electric utilities, 9 gas utilities, and 21 combination utilities. Capex data for the first three years is the most reliable, as some companies do not consistently release fourth- and fifth-year projections.

Key Takeaways

Industry Concern

The messages from industry leaders about reliability have been **consistent and urgent**.

Generation Mix

The generation mix continues to see **more intermittent resources, but policy changes are shifting toward baseload resources**.

Large Loads

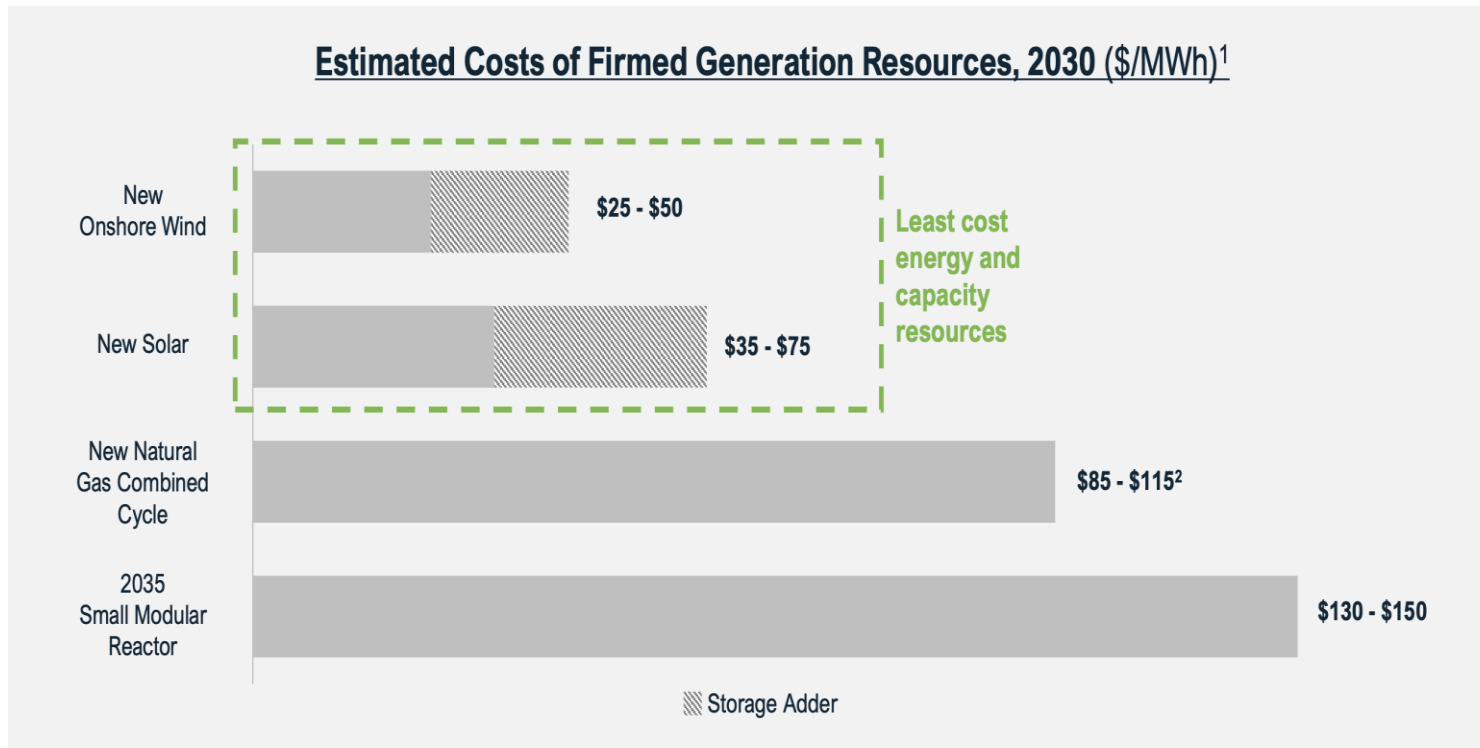
Large loads are seeking to connect across the country, **stressing systems that are already tight** on generation and transmission capacity.



Affordability



Generation Costs on the Rise (Cont'd)



Workforce Worries

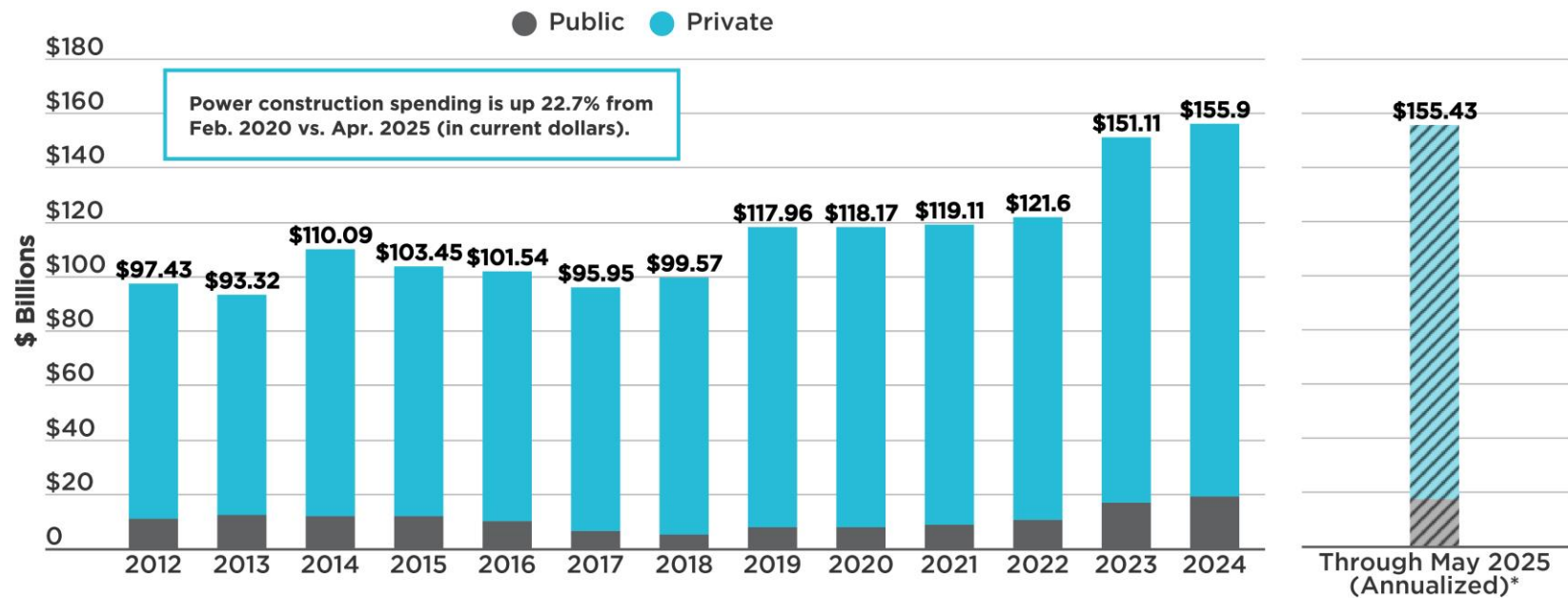
“Gas-fired, combined cycle plants rely on approximately 1,000 workers across **dozens of niche trades**.

We’ve learned EPCs are hiring thousands of extra people to address **high washout rates**, with some workers leaving earlier for **higher paying jobs** building, for example, LNG terminals, data centers, semiconductor chip manufacturing facilities and other industrial facilities. Other workers are showing up to job sites **without the necessary skills**.

All of this puts **upward pressure on prices and the time to build gas plants**. It’s why the cost to build a gas-fired plant has tripled in the last few years – and is poised to increase even further due to **tariff exposure**.”

People and Projects: Construction Continues to Rise

Annual Total Value of U.S. Construction Put in Place – Private and Public Sector Power (2012–May 2025 Annualized) (\$ Billions)



- Data centers amplify demand
- Project mix is shifting
- Inflation + tariffs = pressure

General Principles of Rate Regulation and Design

Utility rates are intended to compensate utilities for the operating of electric service as well as a reasonable return on and of capital deployed in “used and useful” utility assets. Key design principles include:

GENERAL PRINCIPLES

Classes Matter

Large customer rate classes are designed to reflect their unique service requirements and load characteristics.

Cost-Causer Pays

Customer and classes that impose costs on the system and other customers are responsible for their payment.

Just and Reasonable

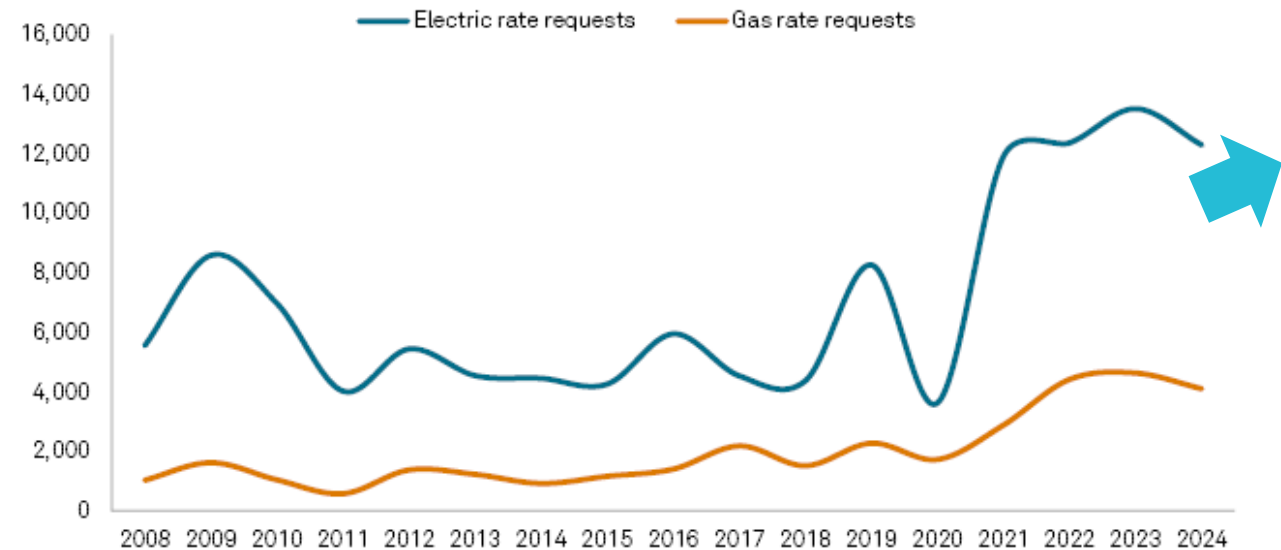
Rate design should ensure that service to those customers should not be subsidized by other customers or classes.

Rate Increase Requests Continue

Aggregate 2024 Electric Rate Requests Were Lower Than in Prior Two Years

- Approximately \$12.3B in electric rate requests in 2024 versus \$13.4B in 2023 and \$12.4B in 2022
 - Role of multi-year rate plans
 - Issues: inflation/supply chain, cost of capital
- Key drivers:
 - Capex plans for T&D upgrades, including smart infrastructure and grid modernization
 - Cybersecurity
 - New generation and technologies for energy transition
 - Storm and wildfire risk mitigation
- Average allowed returns on equity increased slightly to 9.74% – as 10-year Treasury yields have moved from up from sub-2% to 4%
 - Increases not proportionate to Treasuries
 - Most awards between 9.5% and 10%
 - CA utilities seeking higher ROEs to attract capital given wildfire mitigation and energy transition needs

Rate Requests by Utility Service Type and by Year (\$ Millions)

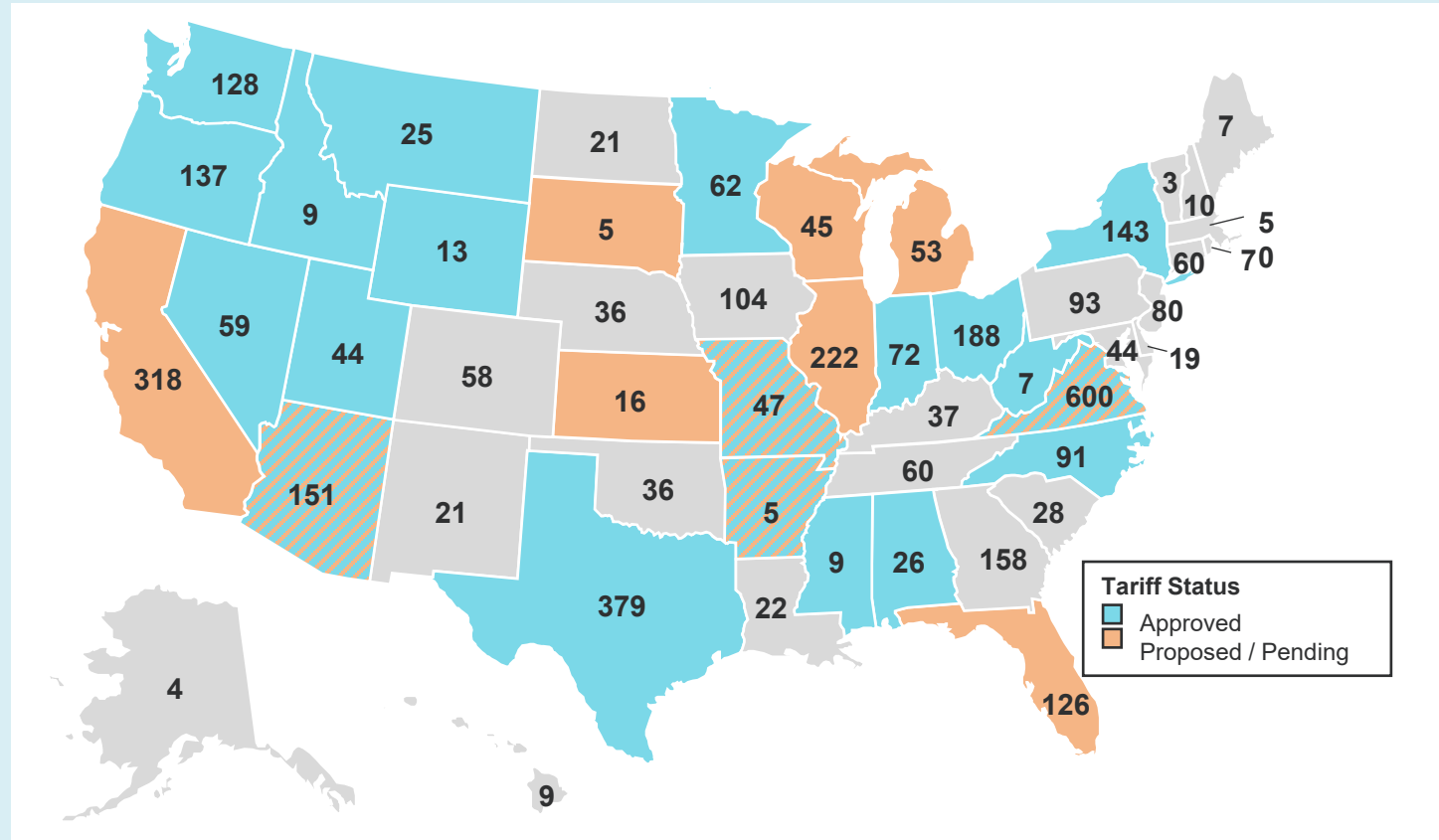


Note: As of Feb. 24, 2025
Source: S&P Regulatory Research Associates

Adapting Utility Tariffs for Large Load Customers

While data center development has largely been clustered in key markets, most notably Northern Virginia, utilities, regulators, and stakeholders across the country are taking actions to re-evaluate how this infrastructure is paid for.

Large Load Tariffs and Data Center Count by State



Key Takeaways

Customer Bills and Affordability

Electricity rates will continue to rise, as will customer bills. Utilities and stakeholders are considering metrics to assess energy burden and ‘share of wallet’.

Increasing Investment

Aggregate **power system investment is increasing** as utilities modernize their grids, replace aging infrastructure, incorporate new resources, and accommodate increasing electrification.

Natural Gas Costs are Rising

Due to significant demand, **timelines for building new combined cycle natural gas are extending**.



Timely



Can We Get the Gear?

Power Infrastructure Equipment: Estimated Lead Times

Equipment Type	Estimated Delivery from Manufacturer*								
	2025	2026	2027	2028	2029	2030	2031	2032	
Combined-Cycle Gas Turbines				[Lead Time Bar]					
Gas Peakers					[Lead Time Bar]				
Battery Storage		[Lead Time Bar]							
Transformers			[Lead Time Bar]						
Distribution Transformers**		[Lead Time Bar]							

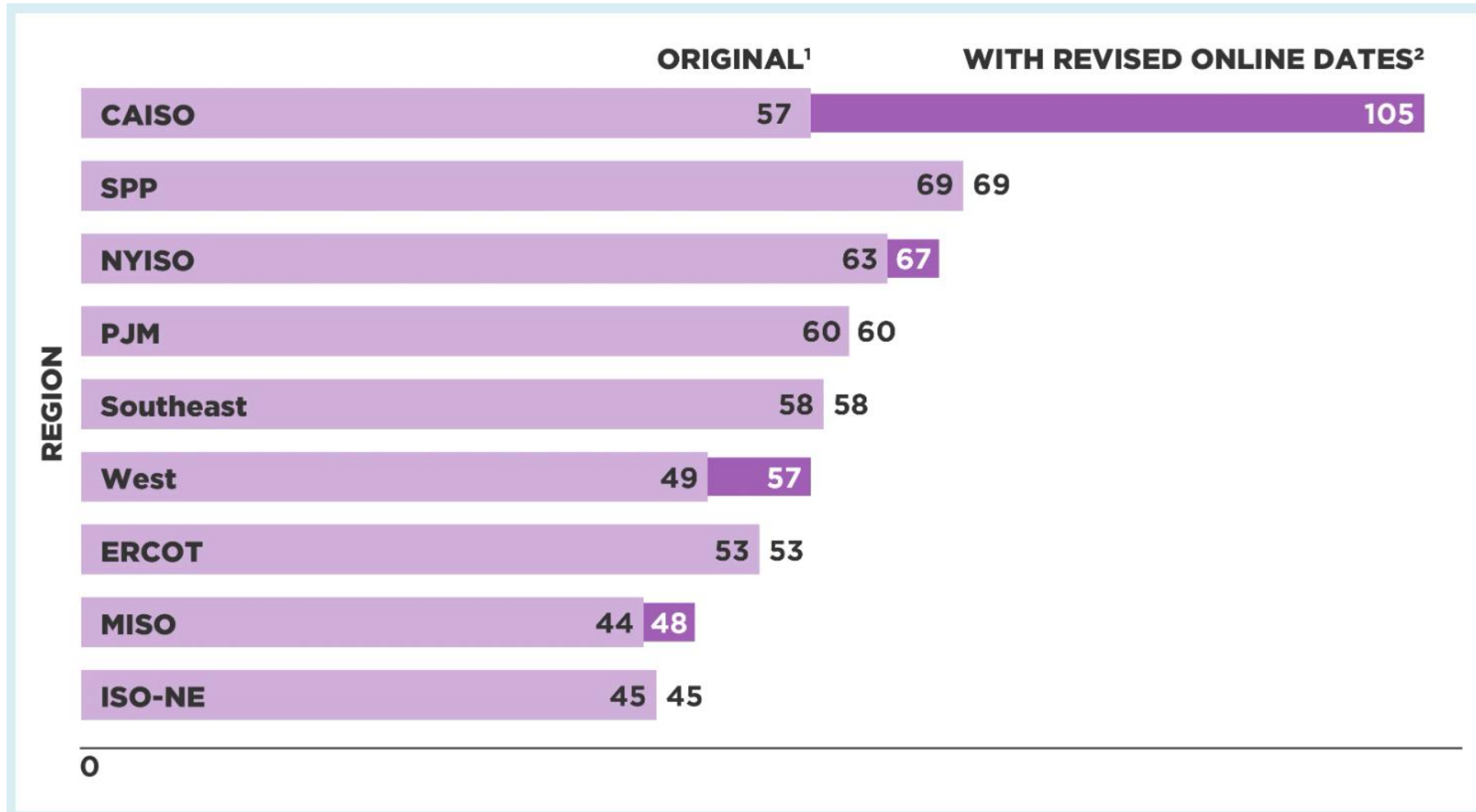
*For orders placed mid-2025

**Pad-mount

Long lead times and 2X cost inflation demand *early commitments, OEM alliances, and smart sequencing.*

Average Interconnection Queue Timelines are Outrageous

Average Time from Queue Date to Proposed Online Date (Months)



Permitting Adds yet Anther Barrier

It currently takes on average 4.5 years for an energy project and 7.5 years for a transmission project just to get the required permits needed to build. As a result, we are building less transmission today than we did 10 years ago.

For example:

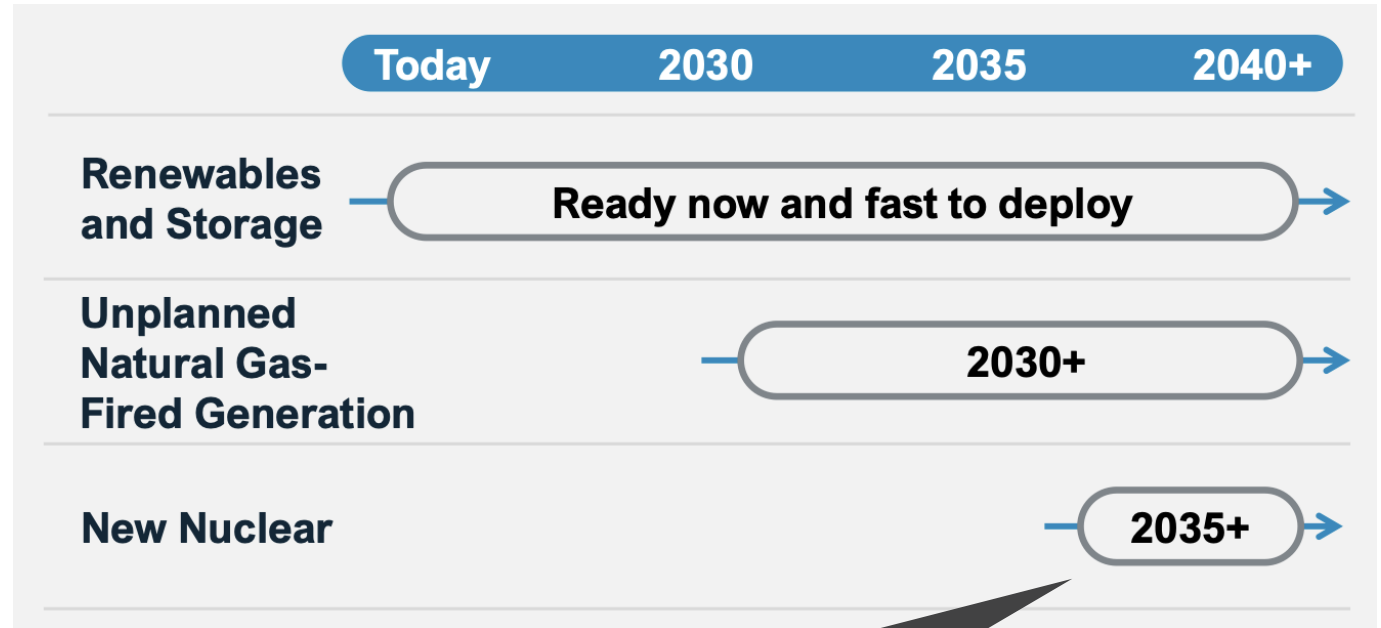
- TransWest Express transmission line: 15 years to get permitting approval
- SunZia transmission line: 17 years to get permitting approval
- Pine Ridge Reservation transmission line: 20 years to get permitting approval

DOE estimates we need to expand our transmission system 60% by 2030, make significant process improvements, and increase private sector investment to meet growing clean energy demands.

According to ACP's 2023 Market Report, only 255 miles of transmission were delivered last year. To put that in context, developers are pursuing 10,000 miles through 2030.

Renewables Could be Key Until New Technologies are Ready

*“We should be thinking about **renewables and battery storage** as a **critical bridge** to when other technology is ready at scale, like new gas-fired plants.”*



Executive Orders have moved to speed this up as much as possible, looking to create less barriers in getting new reactors constructed.

Key Takeaways

Equipment Leads Times Extending

Due to demand, **the time to get combined cycle gas turbines has extended to 4+ years**, and demand isn't slowing down.

Interconnection Queue is Long

Though progress is being made to weed out speculative projects, **timelines are still 45+ months**.

Permitting Reform is Happening

Permitting reform is being pushed by the administration as **current timelines are 4-7 years**.



And Another Thing...



And Another Thing...

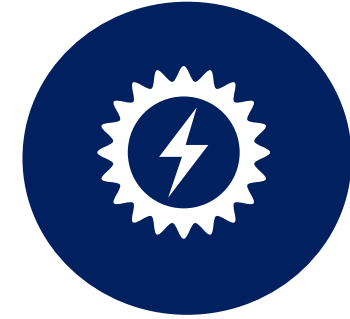
Balancing Objectives and New Priorities...



Clean



Reliability



Security



Workforce
Pipeline



Timely



Affordability



Cost
Effectiveness



How to Think About All This



A Few Thoughts



There's a disconnect in the timelines for new loads, new generation, and new transmission. It is likely that new loads will need to take a slower trajectory.



Affordability matters. Utilities and regulators are monitoring and managing potential impacts to other customers of ramping up infrastructure to serve large demand (e.g., special tariffs and rates).



The new administration is focused less on clean and more on reliability. This poses great opportunity for nuclear if it can be done in time.

What could failure look like?

If we don't have the buildout to support new load coming online, the load will look elsewhere. This could have economic impacts and potential national security issues.

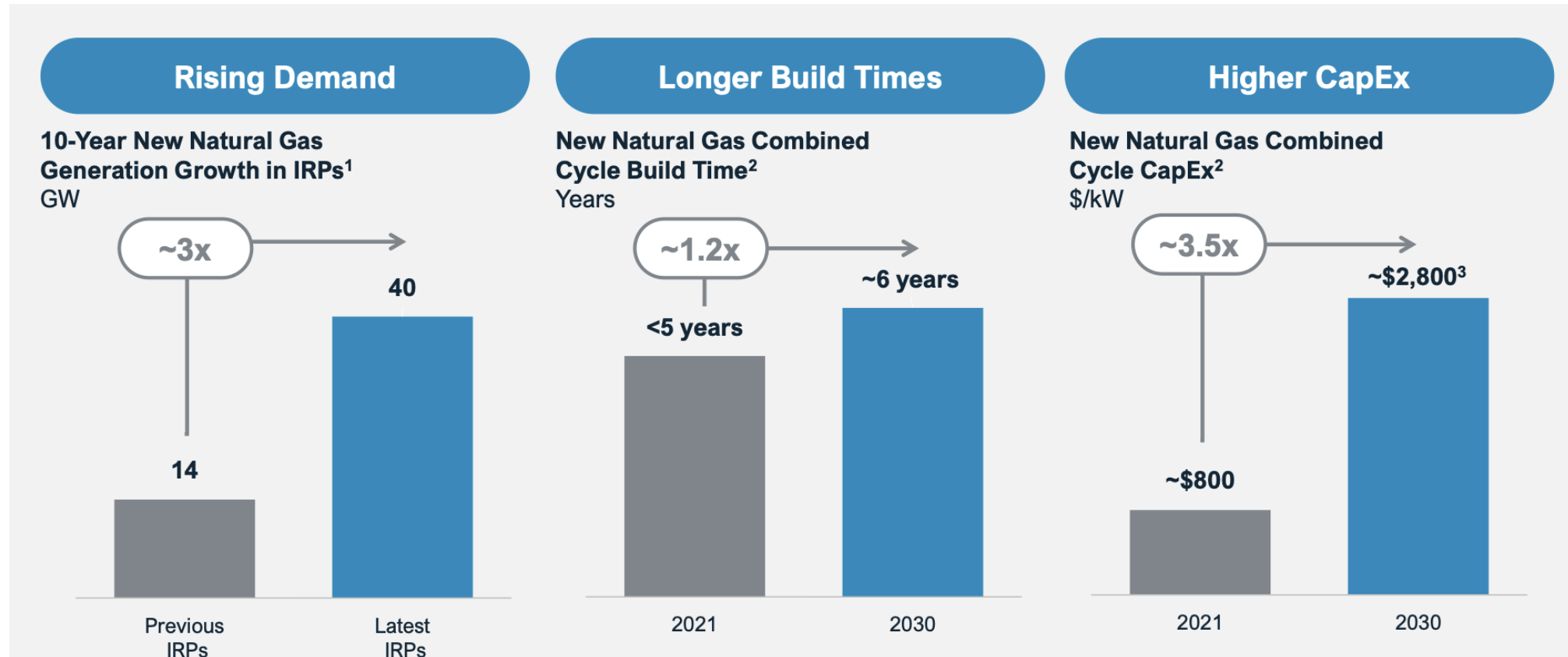
What if we are betting on the wrong technology? When will we find out?



Morgan Schadegg

Director
Energy Practice

Natural Gas: Combined Cycle Plants Costs on the Rise

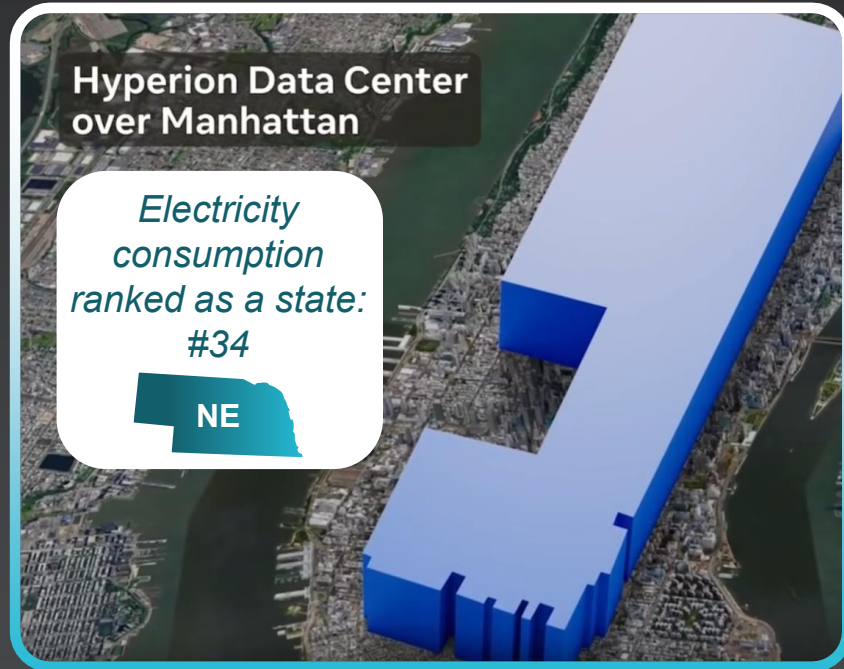


“It’s... important to understand that gas-fired plants will come online at a **higher cost than renewables and storage**. That’s because gas turbines are in **short supply and in high demand**. It’s also proving difficult to **reestablish the highly skilled workforce** required to build these complex power plants.”

Life Moves Fast

“My guess is energy consumption goes up quite substantially.”
– Jensen Huang, CEO, NVIDIA (June 2024)

Meta: 5 GW



Plant Vogtle: 4.5 GW



“As I said a few years ago, the AI scaling constraint will move from chips to voltage transformers to electricity generation. That is worrying for U.S. leadership in AI long-term.”
– Elon Musk, CEO, xAI (April 2025)