

REINHOLD ENVIRONMENTAL[®]



2025 Reinhold/PCUG Round Table Presentation

Hosted by AEP and Buckeye Power

in The Hilton Columbus Polaris Hotel, Columbus, OH

on June 23-24, 2025

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Environmental and Regulatory Challenges

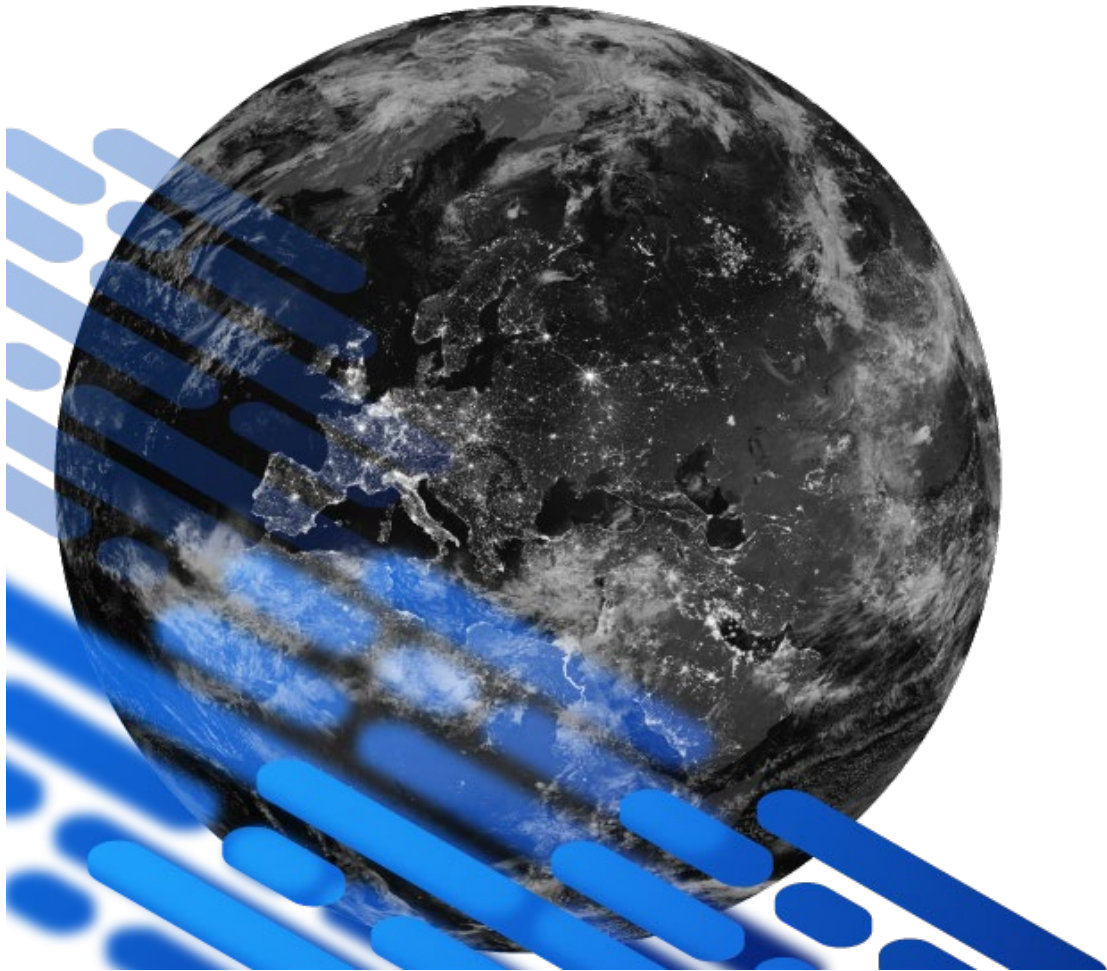


Mike Caravaggio

Vice President Energy Supply Reliability

June 2025





Agenda

- A little on EPRI
- A look at US Electricity Energy Supply
 - Capacity
 - Generation
- Recent EPA Reg Activity
 - Lots of activity in 2023 and 2024
 - 4 key regulations finalized in 2024
 - 2 Intent to repeal announcements 6/11
 - Opens up opportunities for extending coal units but ELG remains the hurdle
 - Decision timeline is running out or already gone
- Executive Orders
- Discussion

EPRI

Leading Global Collaborative Energy R&D

EPRI is advancing energy technologies and informing decision-making through ~\$450M in collaborative annual research with more than 450 entities in 45 countries – spanning the production, delivery, and use of energy.

Independent

Non-Profit

Collaborative

www.EPRI.com

The Future of Energy



Decarbonization

Accelerate economy-wide, low-carbon solutions

- Electric sector decarbonization
- Transmission and grid flexibility: storage, demand, EVs
- Efficient electrification

Achieve a net-zero clean energy system

- Ubiquitous clean electricity: renewables, advanced nuclear, CCUS
- Negative-emission technologies
- Low-carbon resources: hydrogen and related, low-carbon fuels, biofuels, and biogas

Resilience

Mitigate climate impacts and cyber/physical risks

- System and asset hardening
- Improved response
- Faster recovery
- Cybersecurity

Future proof energy system design basis

- Resilient power system design
- Advanced asset design and strategic undergrounding
- Smart integration of energy carriers

Transformation

Drive affordability of a clean and resilient energy system through digital transformation

- Power system modernization: pervasive sensors, monitoring, advanced analytics using AI
- Upgraded and expanded communications infrastructure and control systems

Making Energy More

Clean

Affordable

Reliable

~10-15 years

~15-30 years

~10-15 years

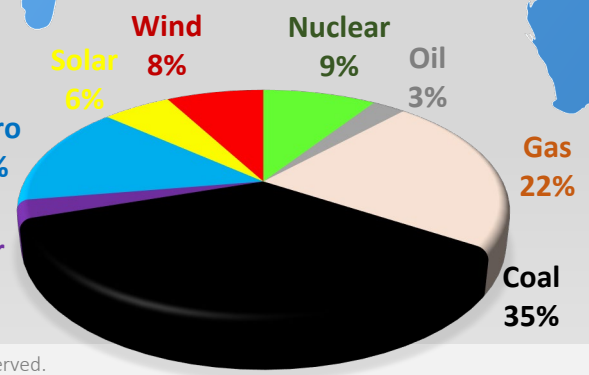
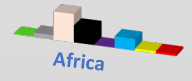
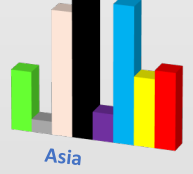
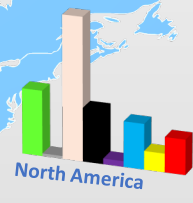
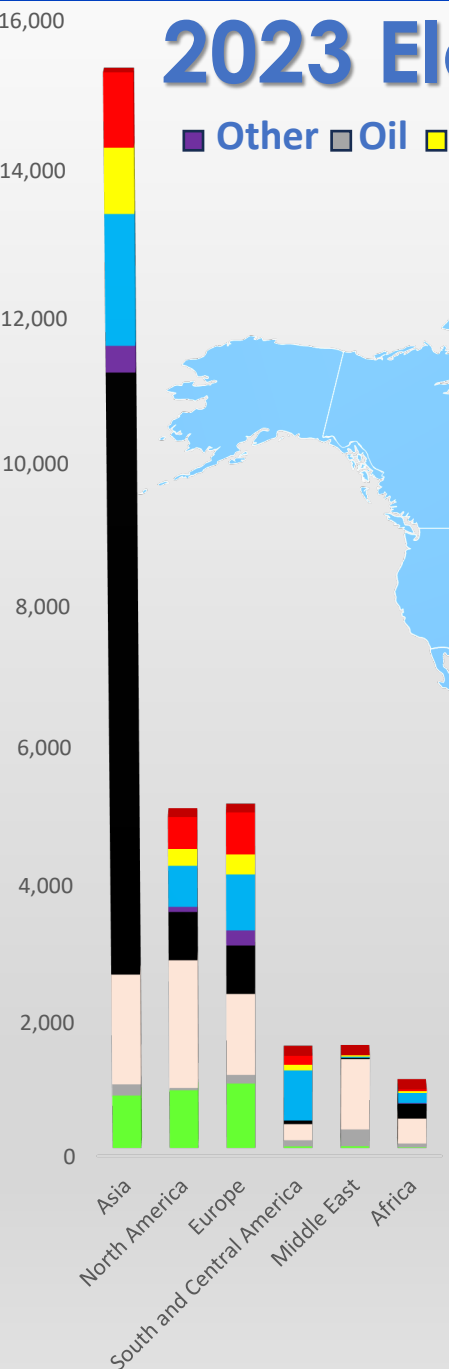
~15-30 years



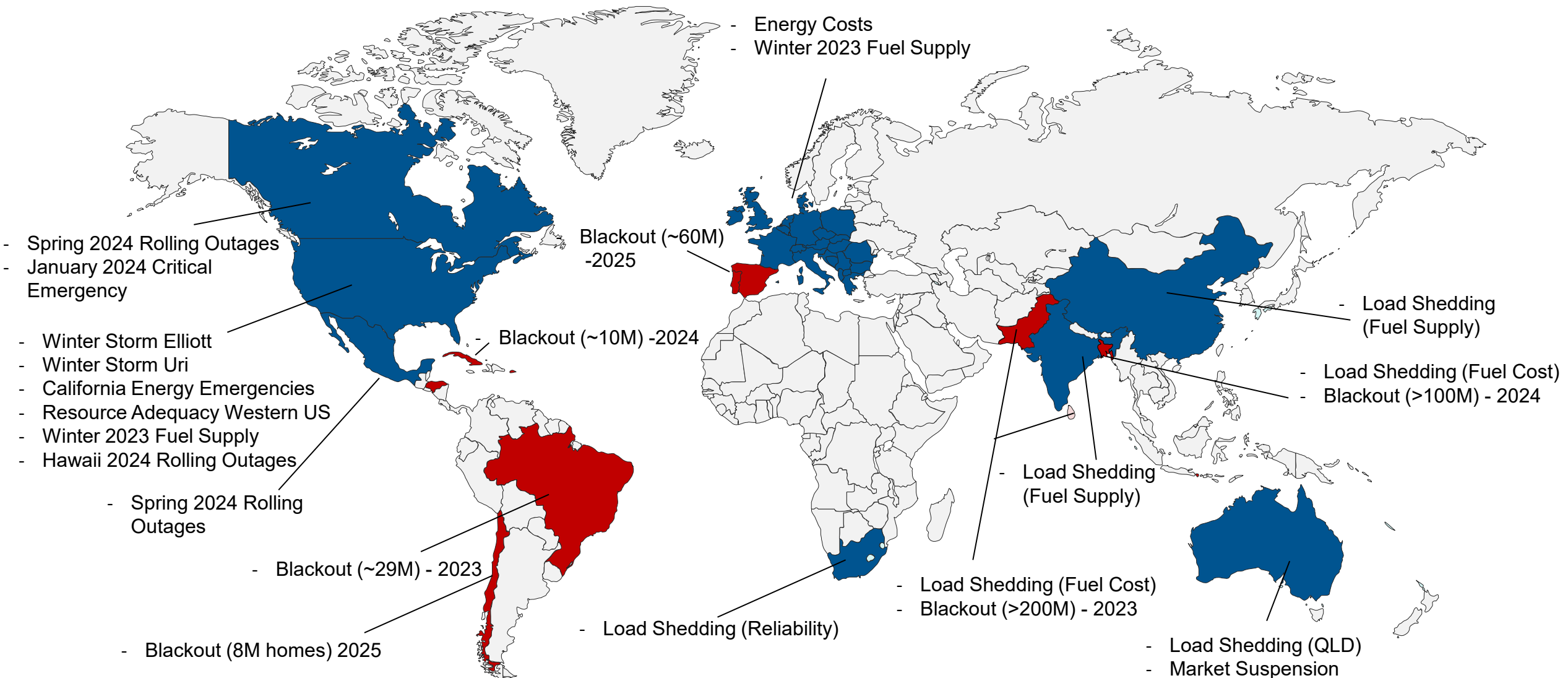
US Generation and Capacity

2023 Electricity Production by Source

■ Other
 ■ Oil
 ■ Solar
 ■ Wind
 ■ Hydro
 ■ Nuclear
 ■ Gas
 ■ Coal

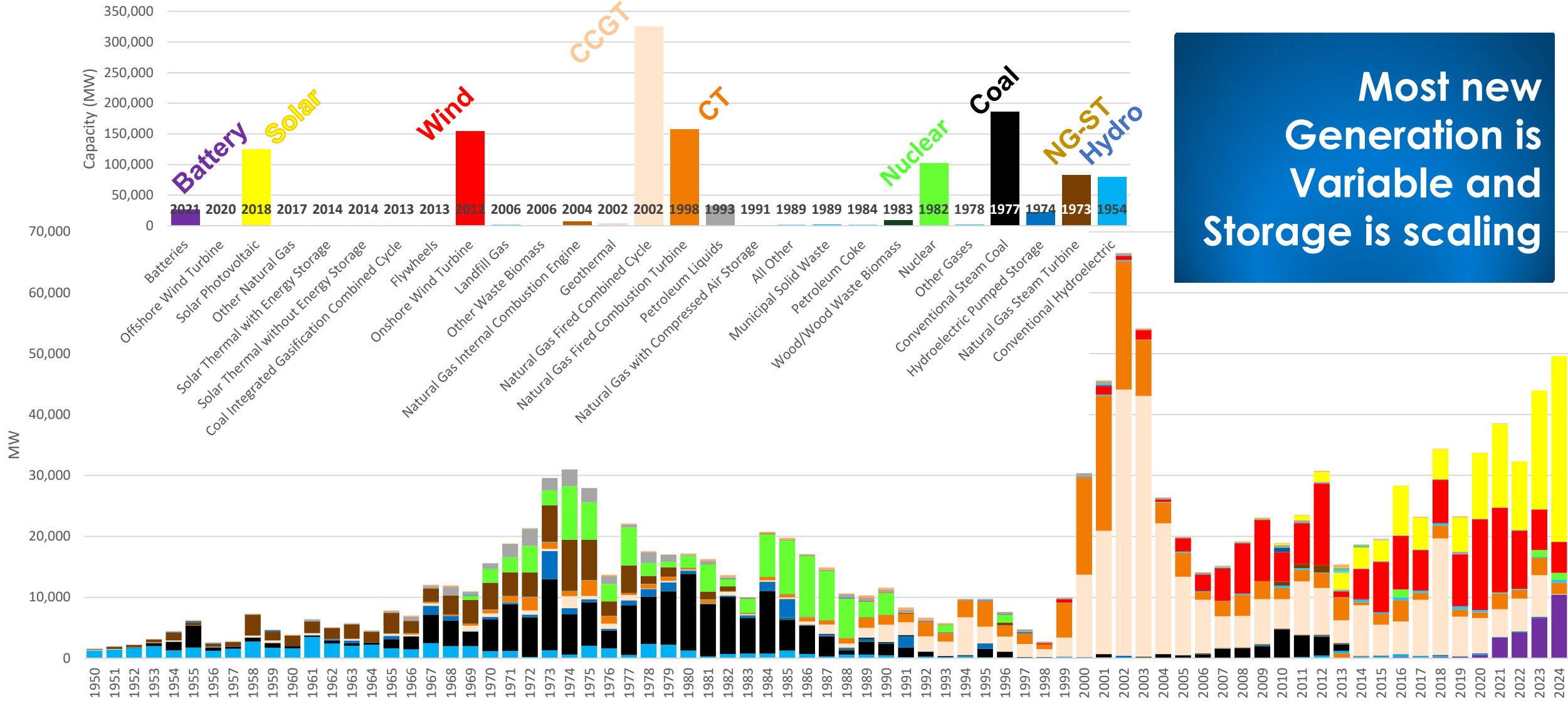


Global Challenges through the Energy Transition



US Capacity Detail

Few New Dispatchable Aging

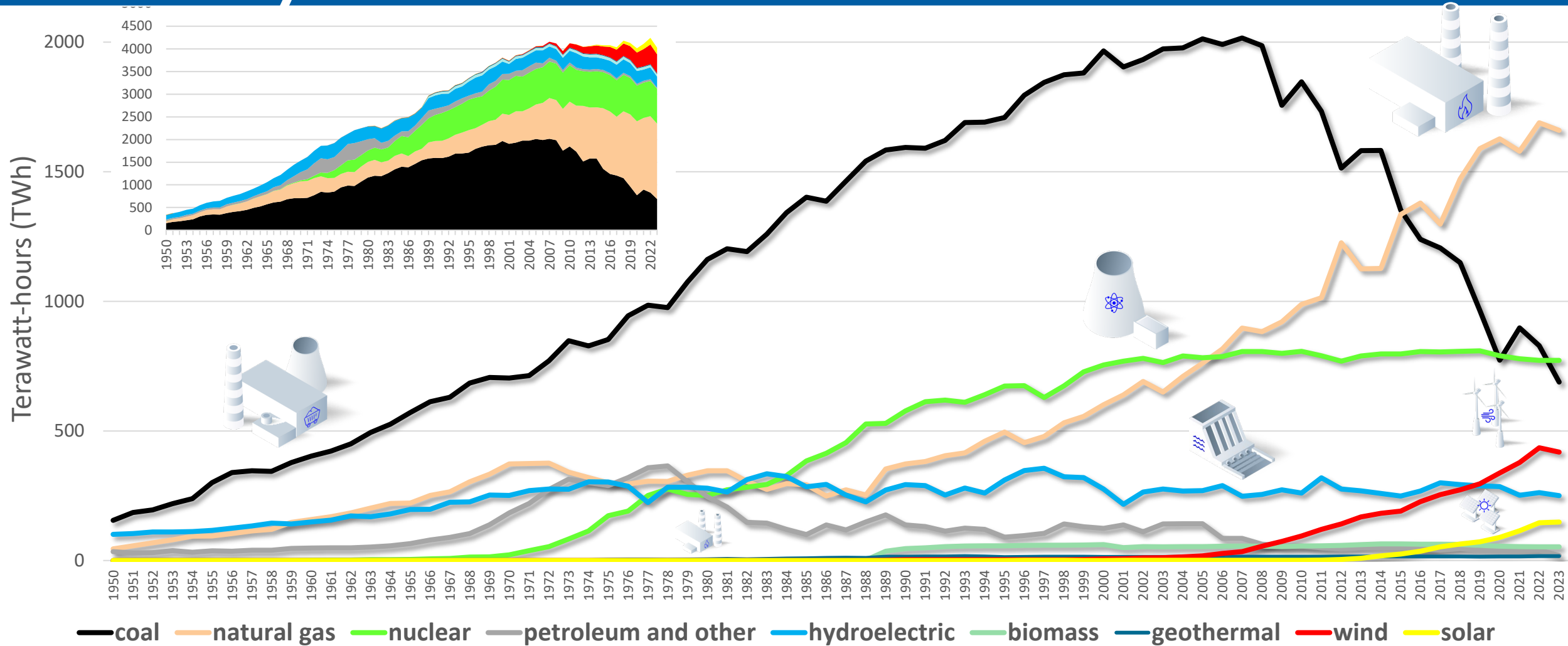


Most new Generation is Variable and Storage is scaling

US Electricity Generation last 70+ years ...



The Energy Transition



Gas is the leading electricity energy supply

Generating Technologies

Share of 2024 Generation (MWhs)

Installed 2024 Generation (MWs)

Variable

Total
16% | ~276GW

Wind



Solar PV



Wind + Solar + Storage & Hybrids

Semi-Dispatchable

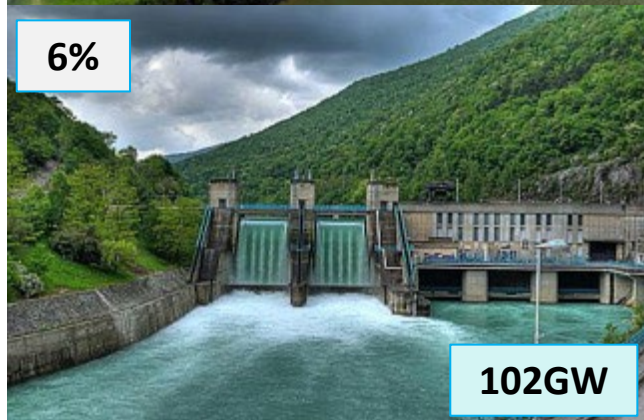
Total
24% | ~231GW



Nuclear



Hydroelectric



Peak Demand ~745GW

Dispatchable

Total
61% | ~815GW

Coal



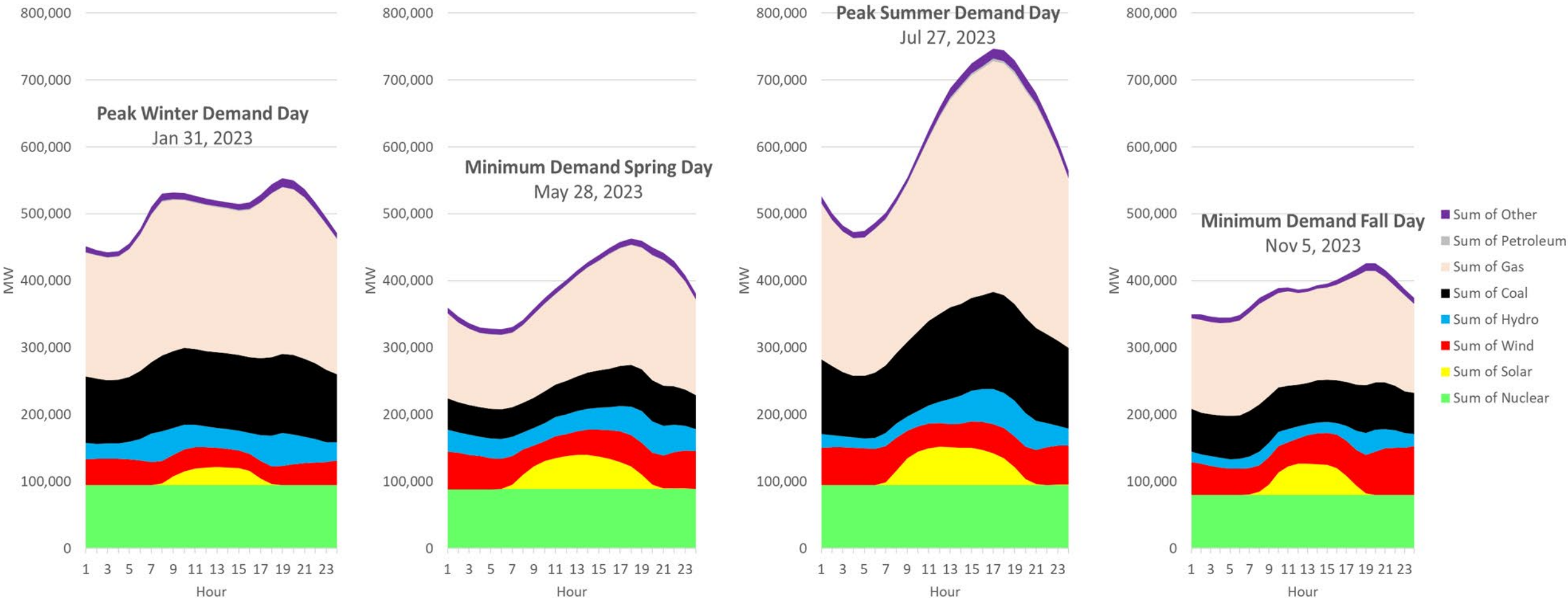
Natural Gas



Geothermal

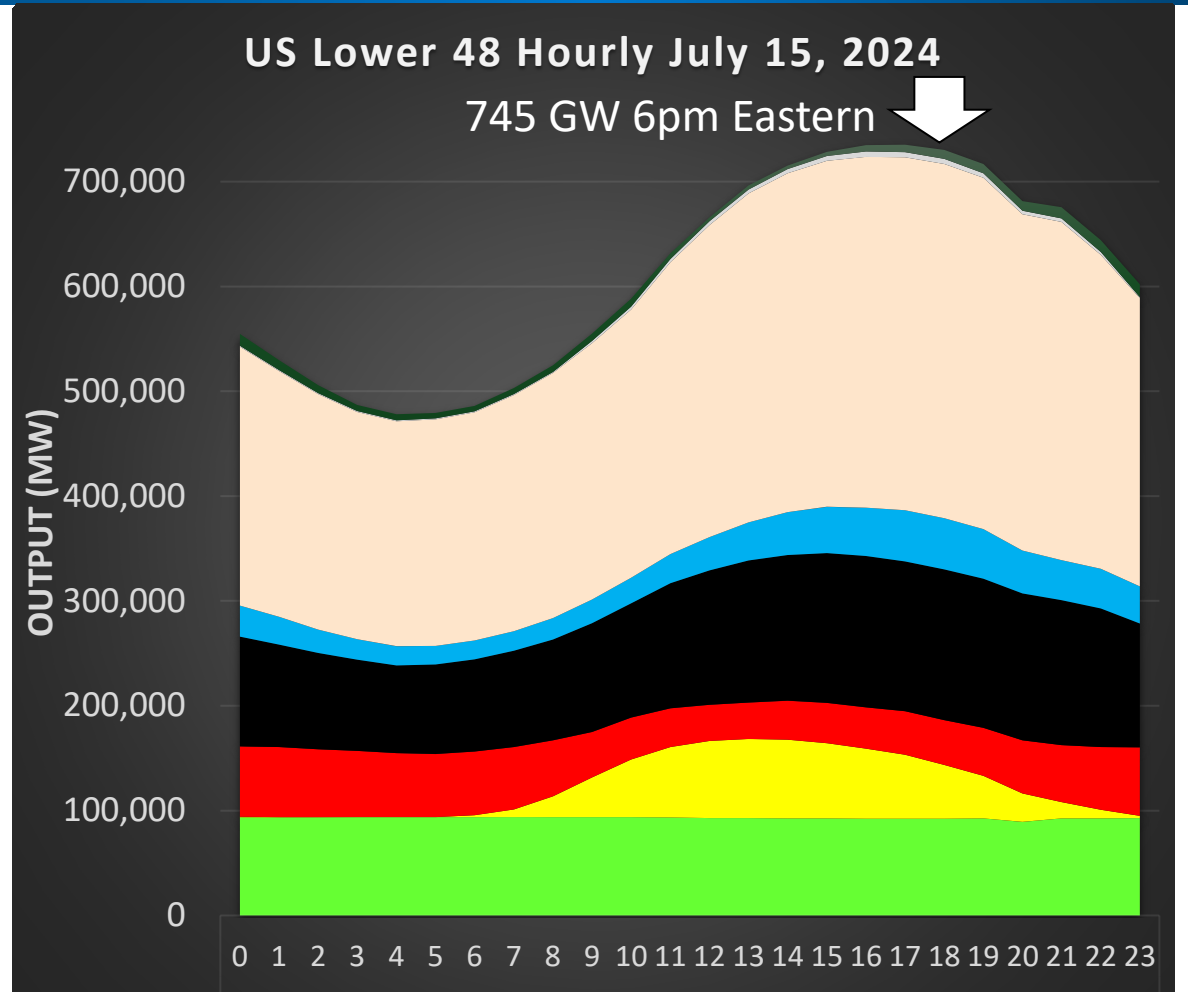
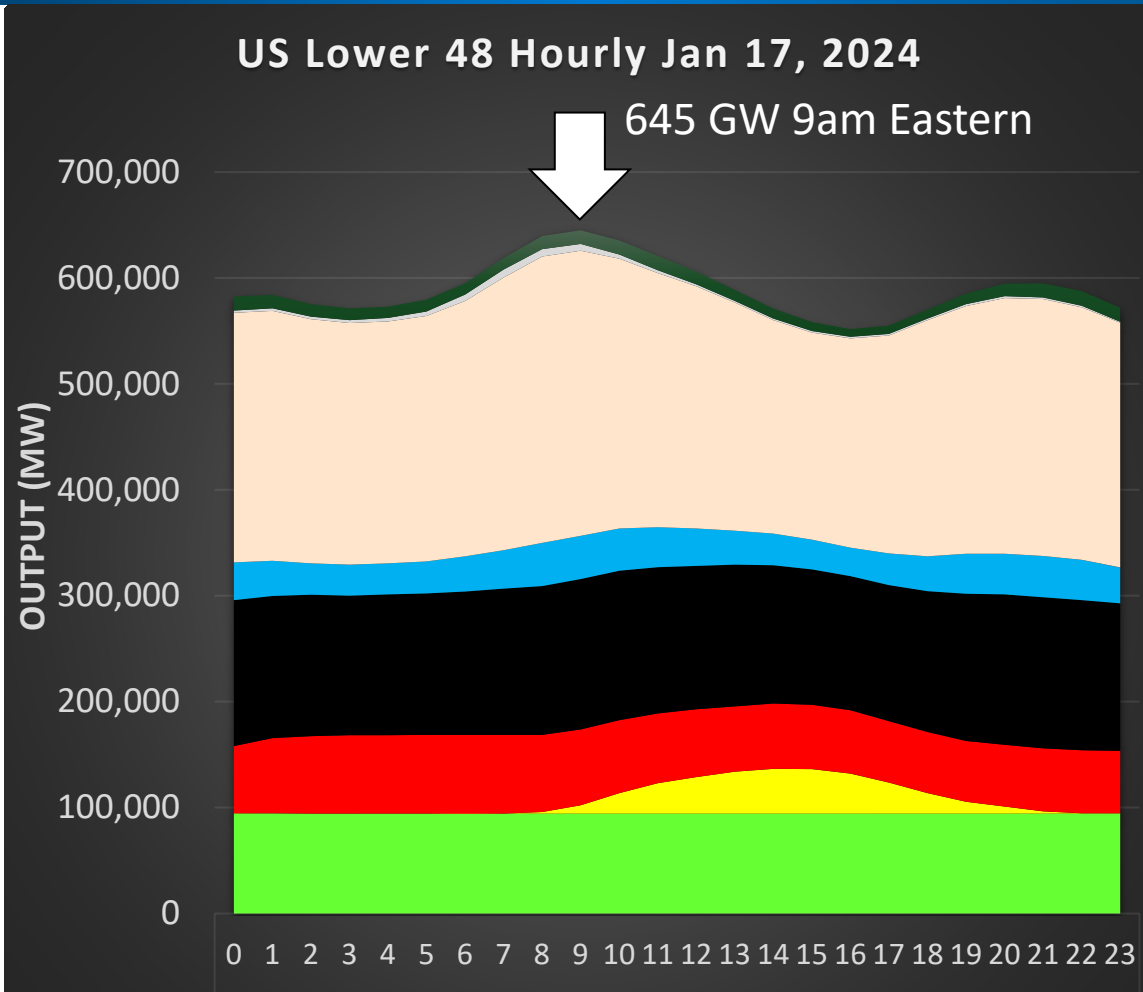


US Lower 48 - Seasonality



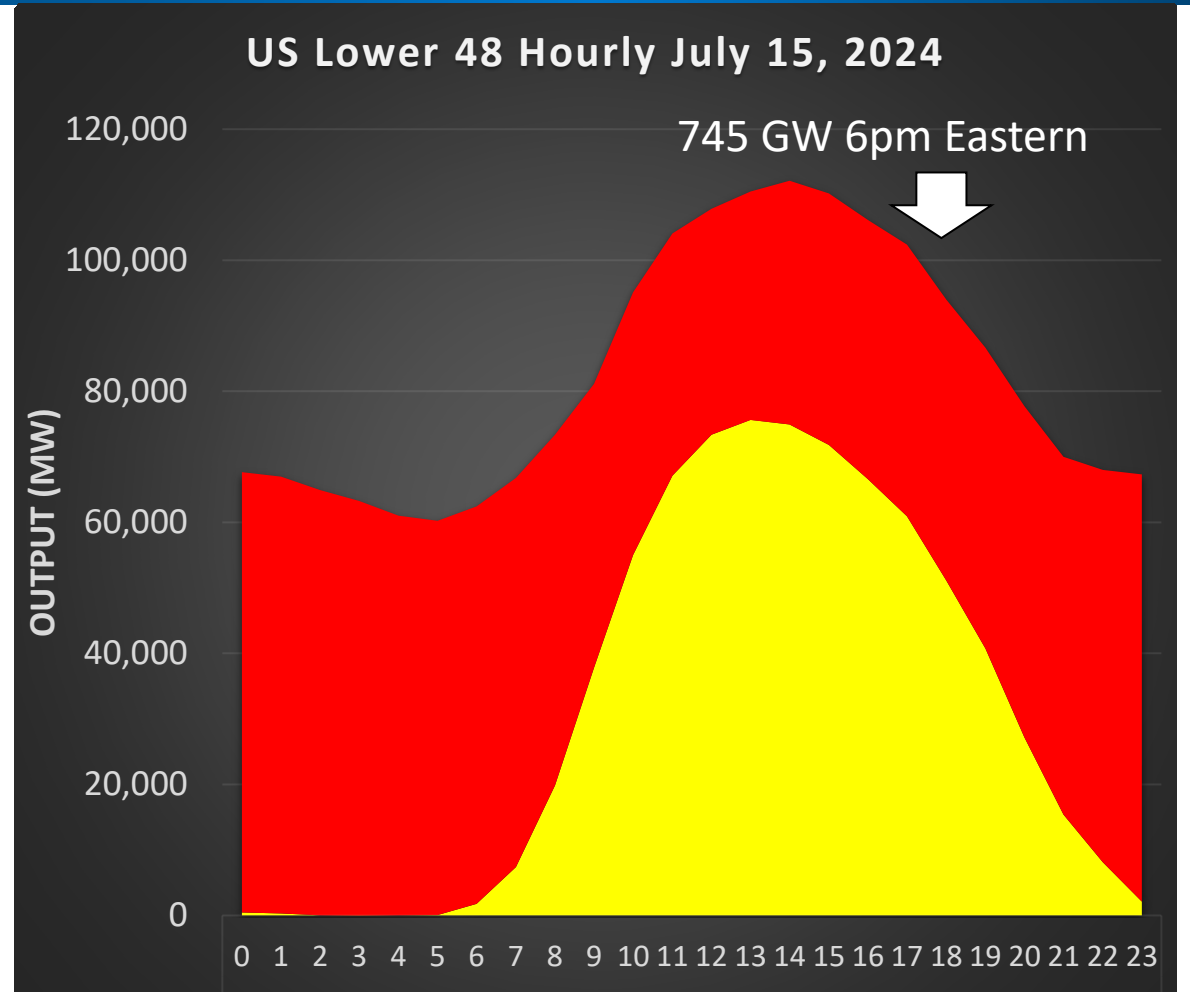
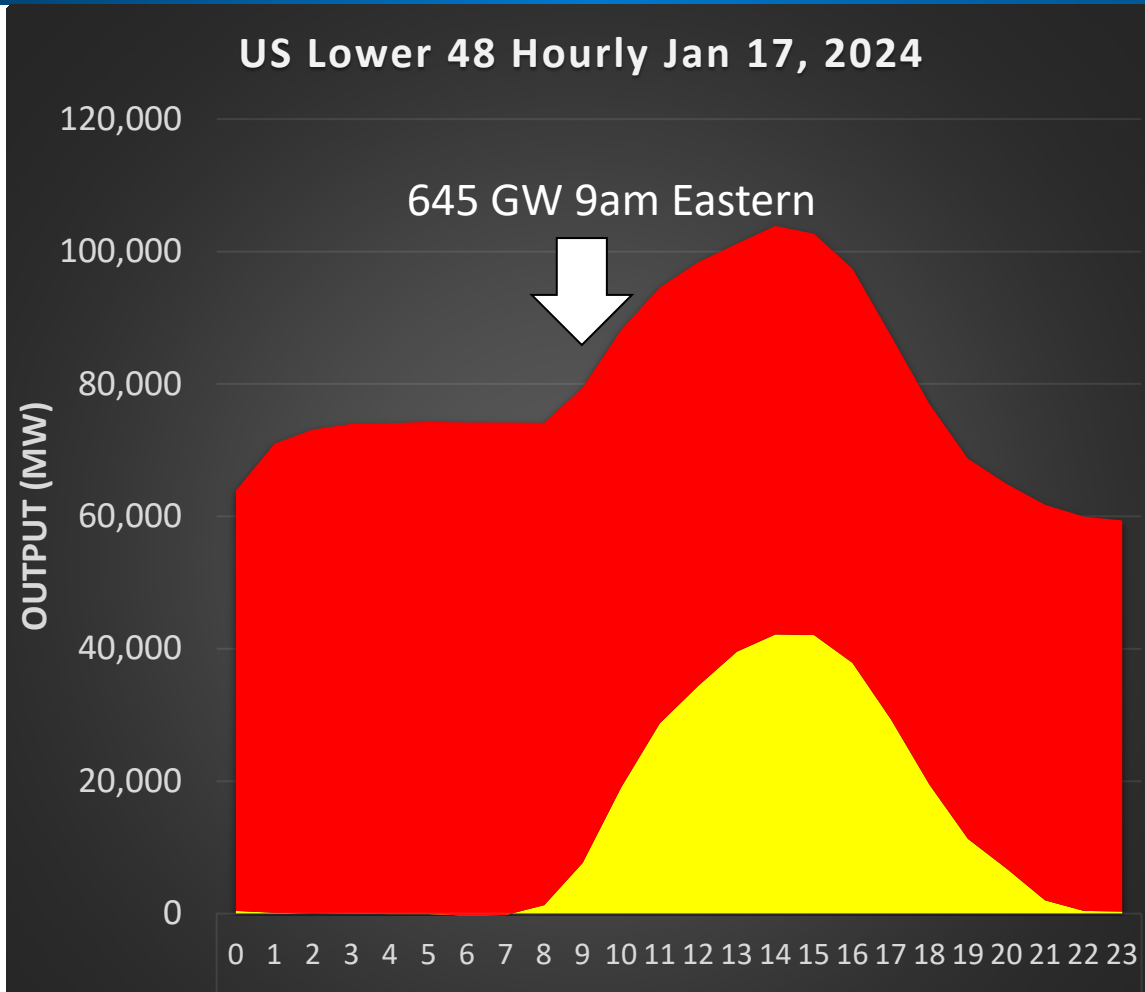
Marginal Days and Marginal Hours

US Lower 48 - Seasonality



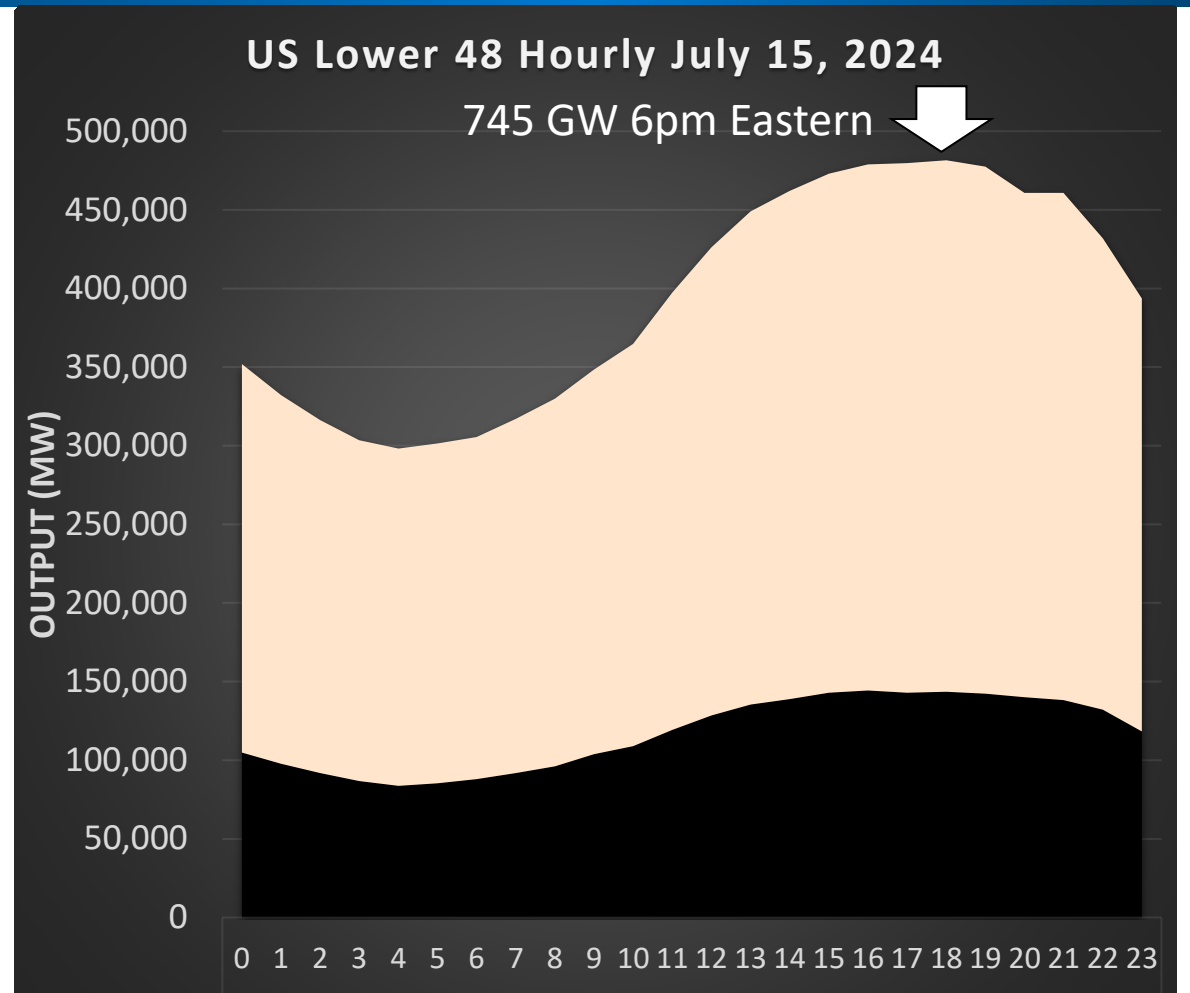
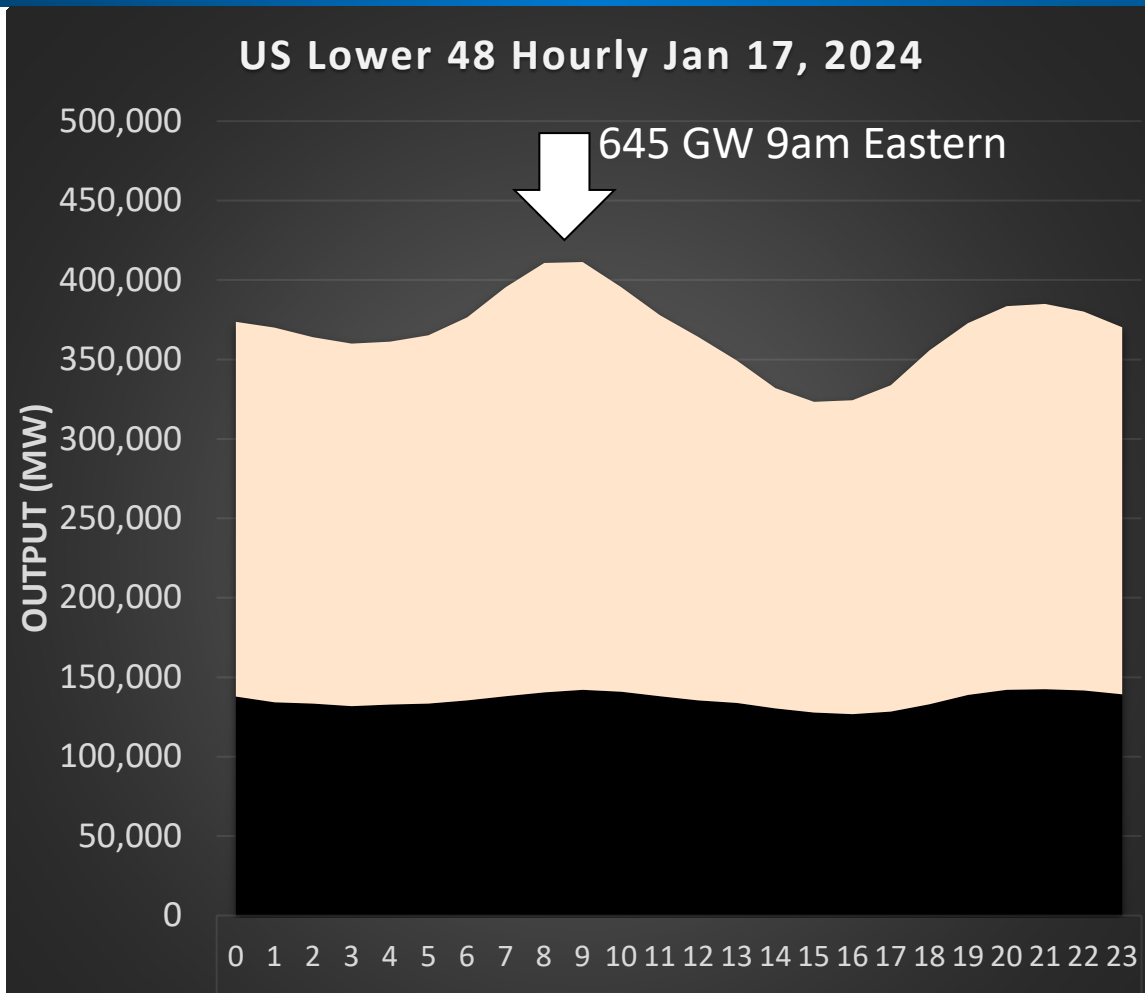
Marginal Days and Marginal Hours

US Lower 48 - Seasonality



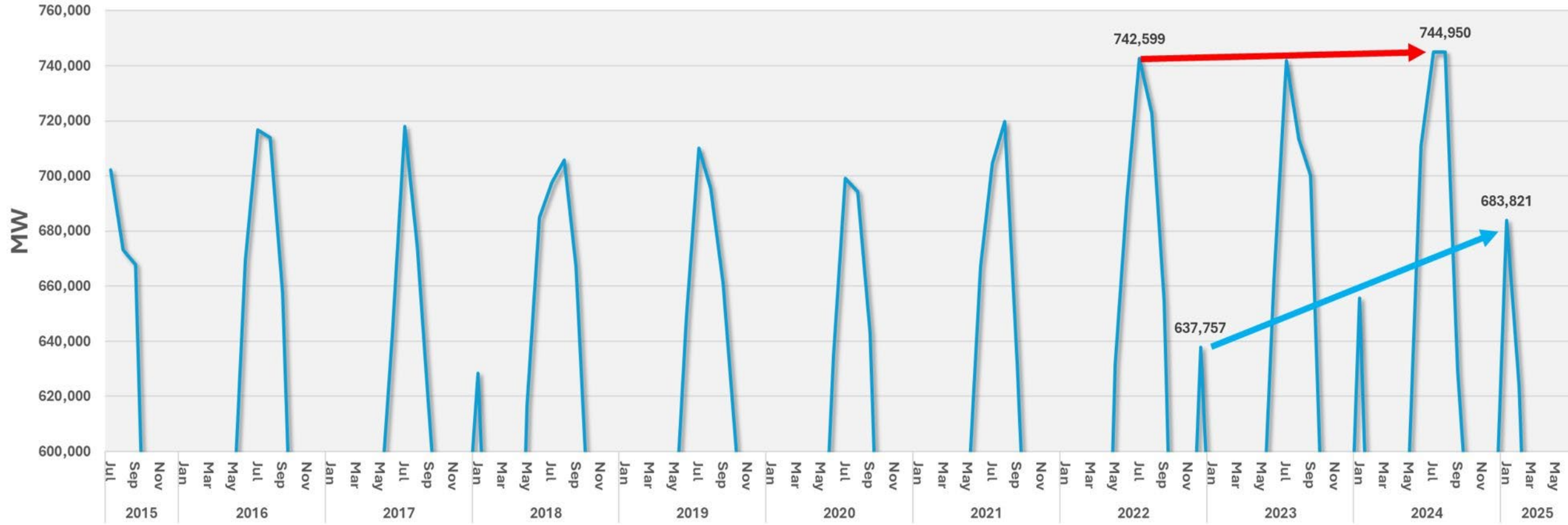
Marginal Days and Marginal Hours

US Lower 48 - Seasonality



Marginal Days and Marginal Hours

US Lower 48 – Demand Peaks



Winter Demand is on the move!

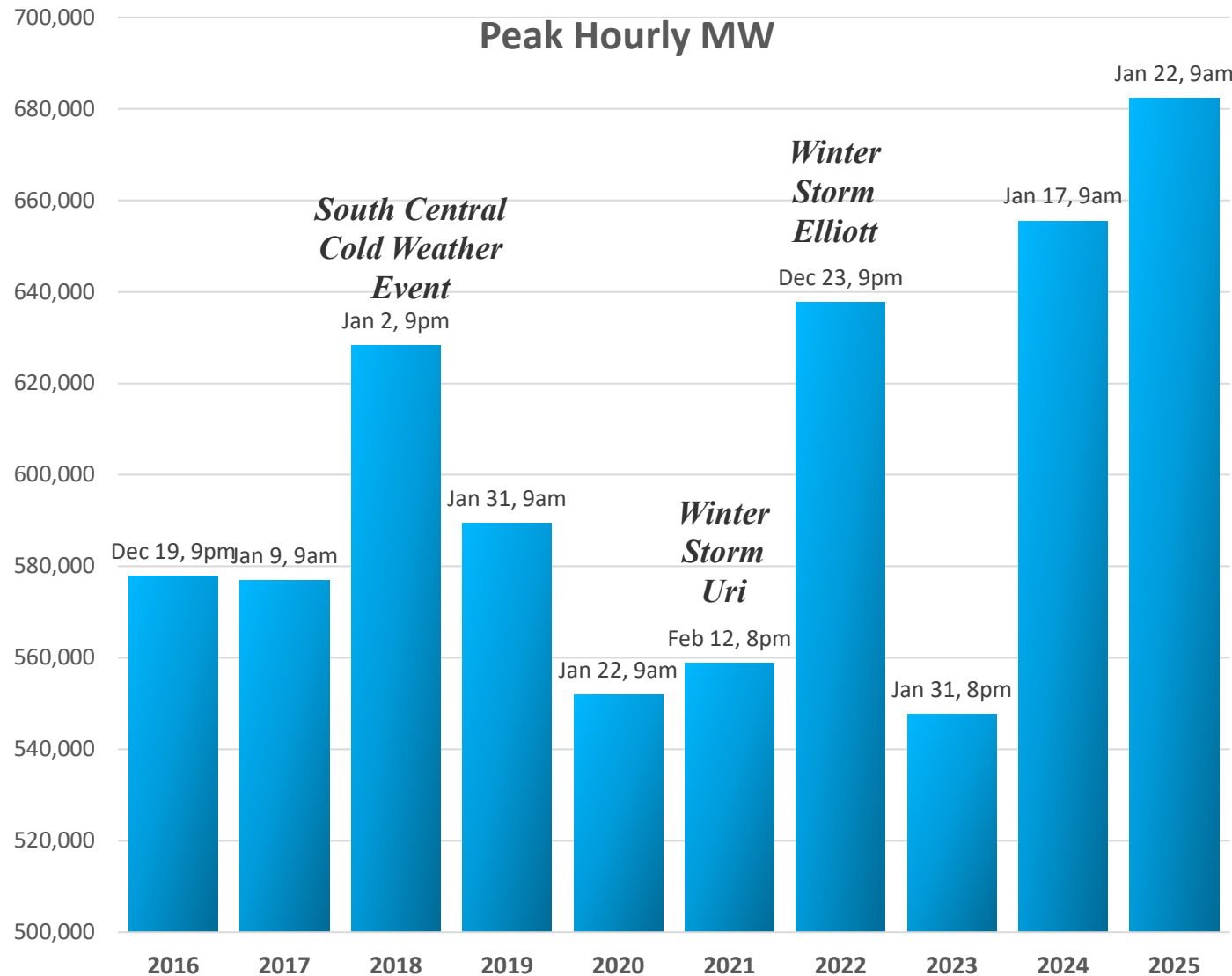
US Lower 48 Winter Records

Megawatts on Peak Hour

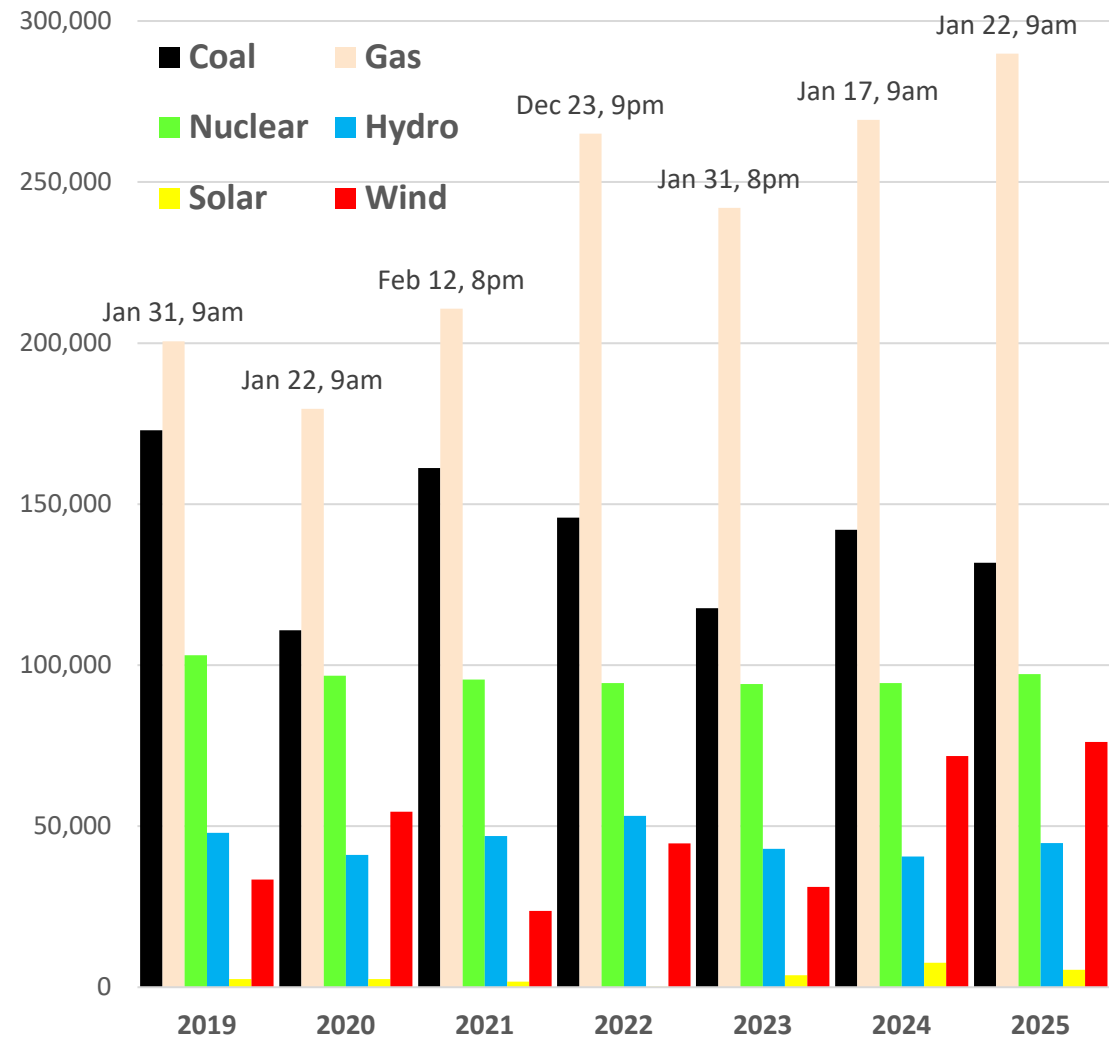
North America

Regional Reliability Concerns

Peak Hourly MW



Peak Demand Hour Output (MW)



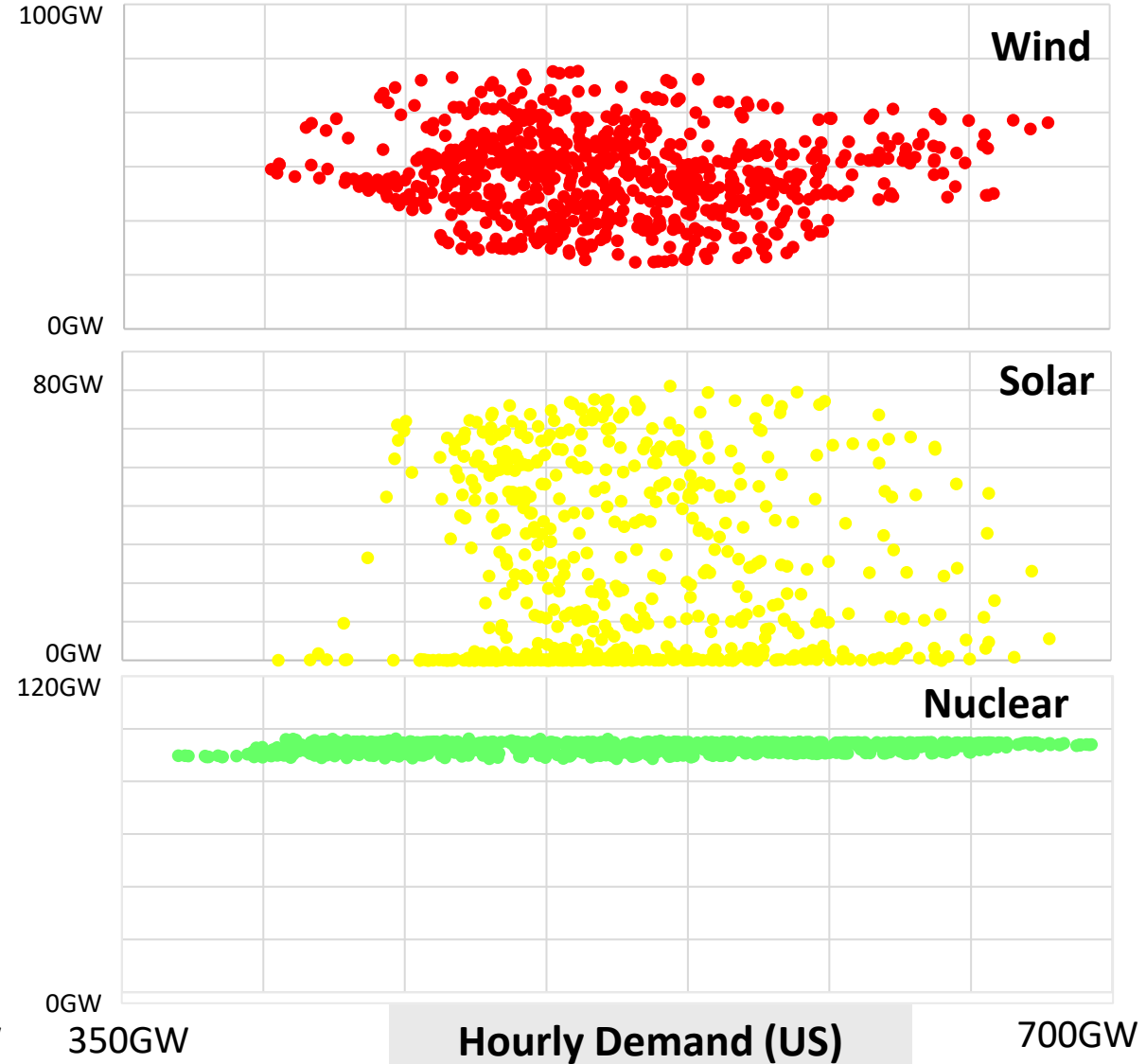
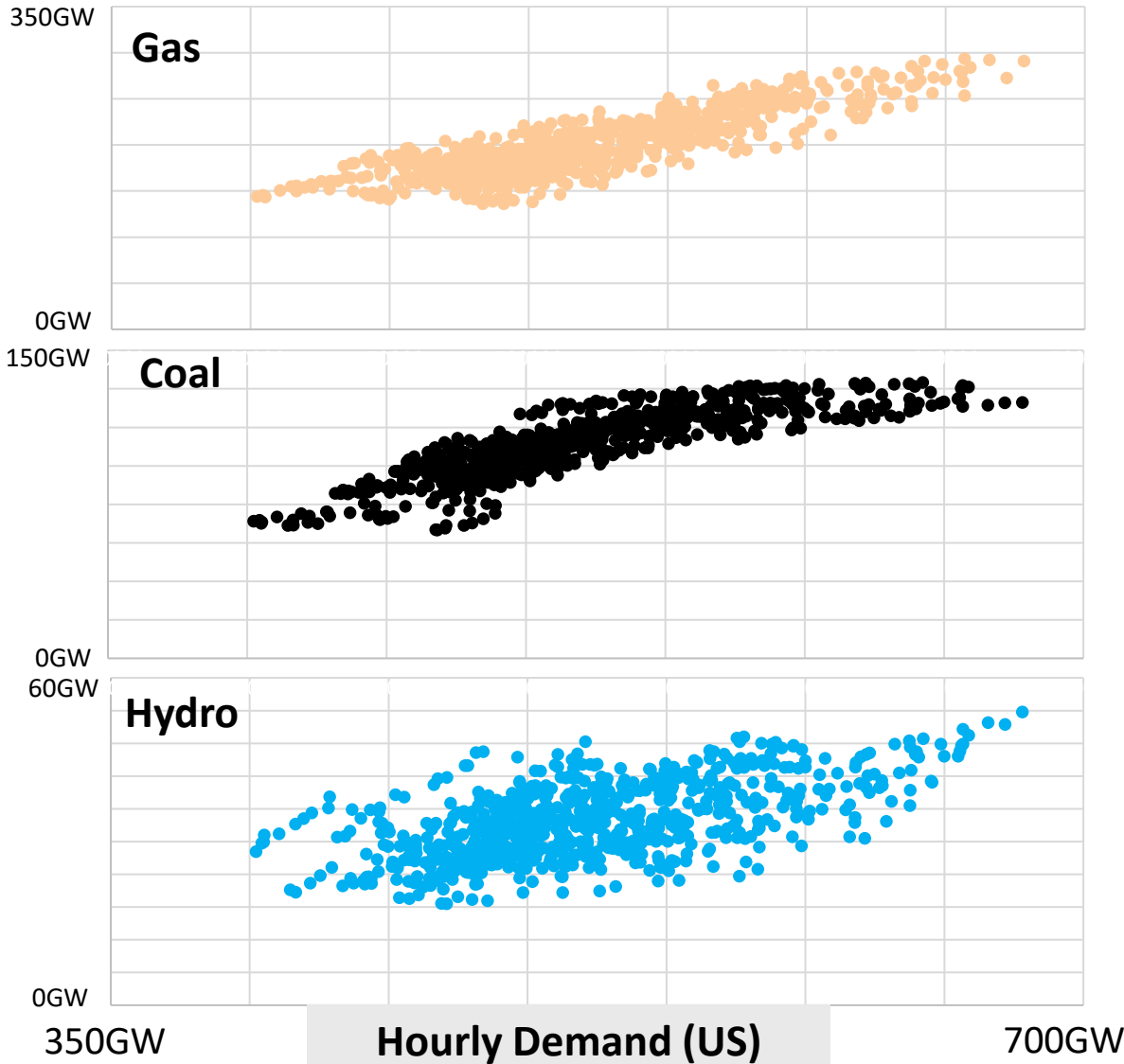
US Lower 48

January 2025

North America

Record Peak

Resource Hourly Output



US Lower 48 Winter Records

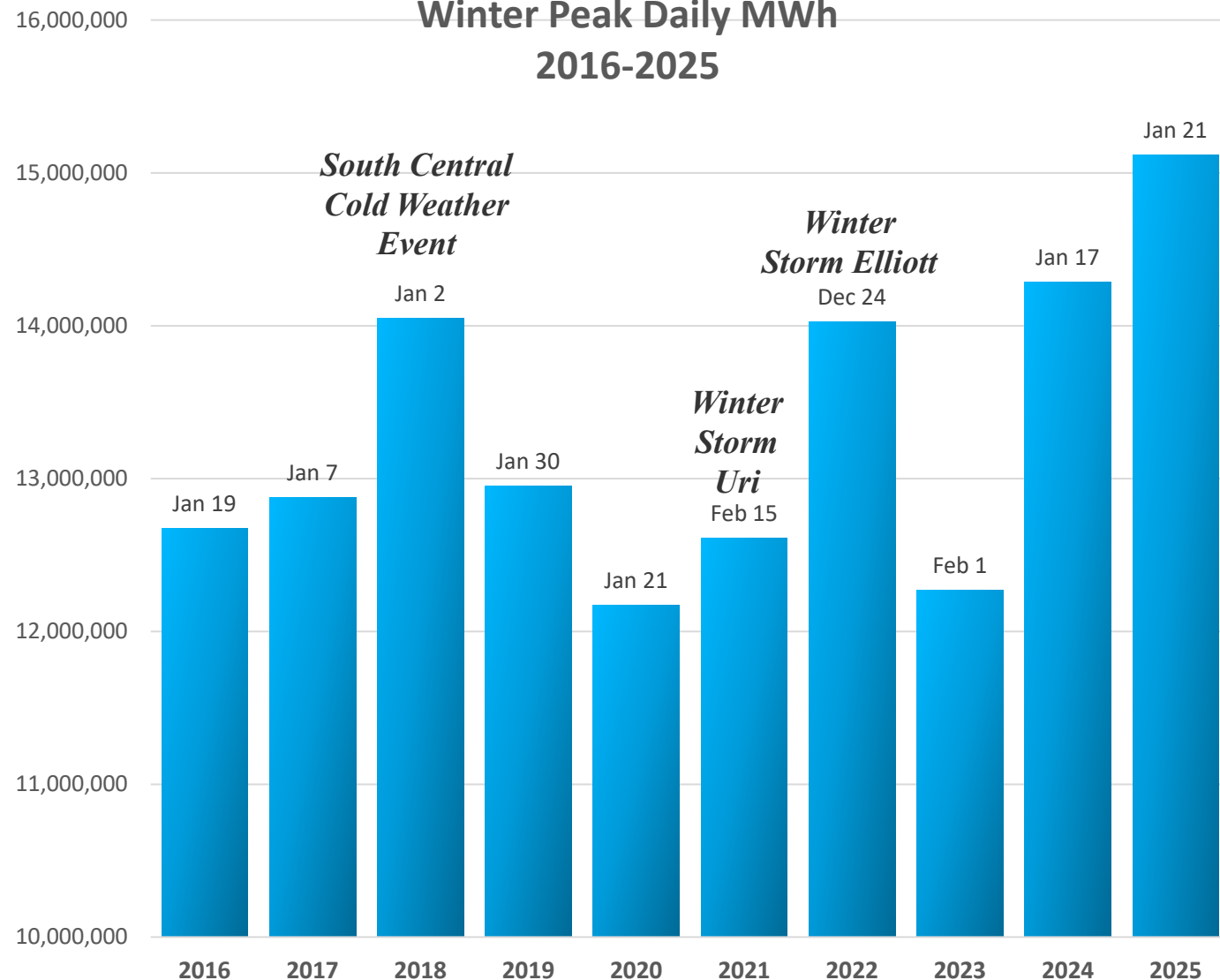
Megawatt-hours on Peak Day

North America

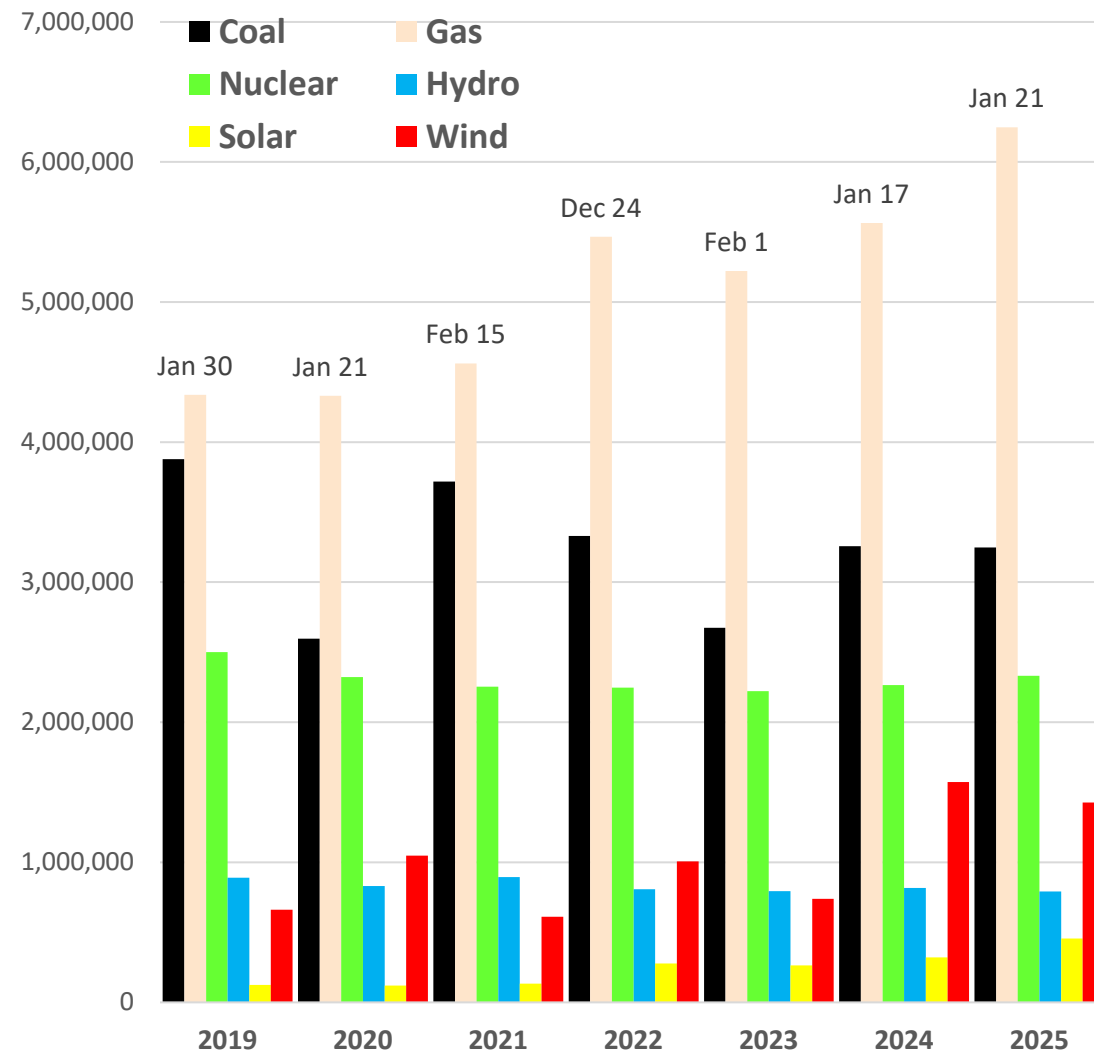
Regional Reliability Concerns

Winter Peak Daily MWh

2016-2025



Peak Demand Daily MWh



US Lower 48 Winter Records

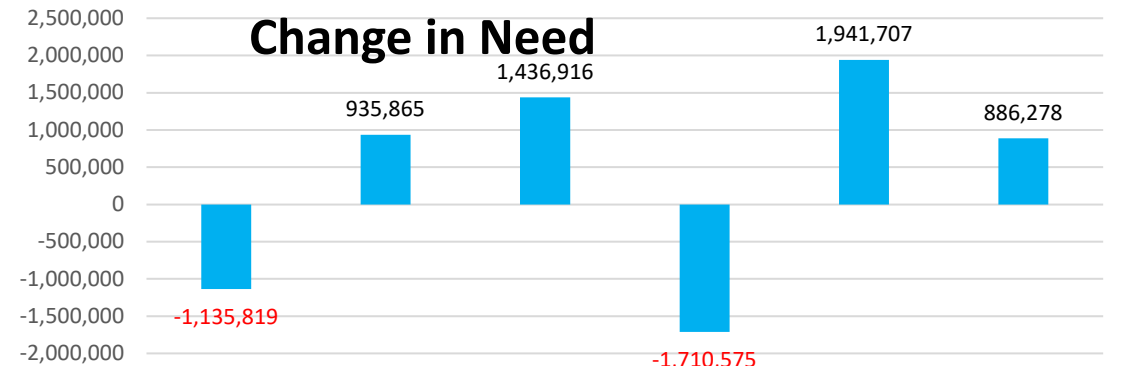
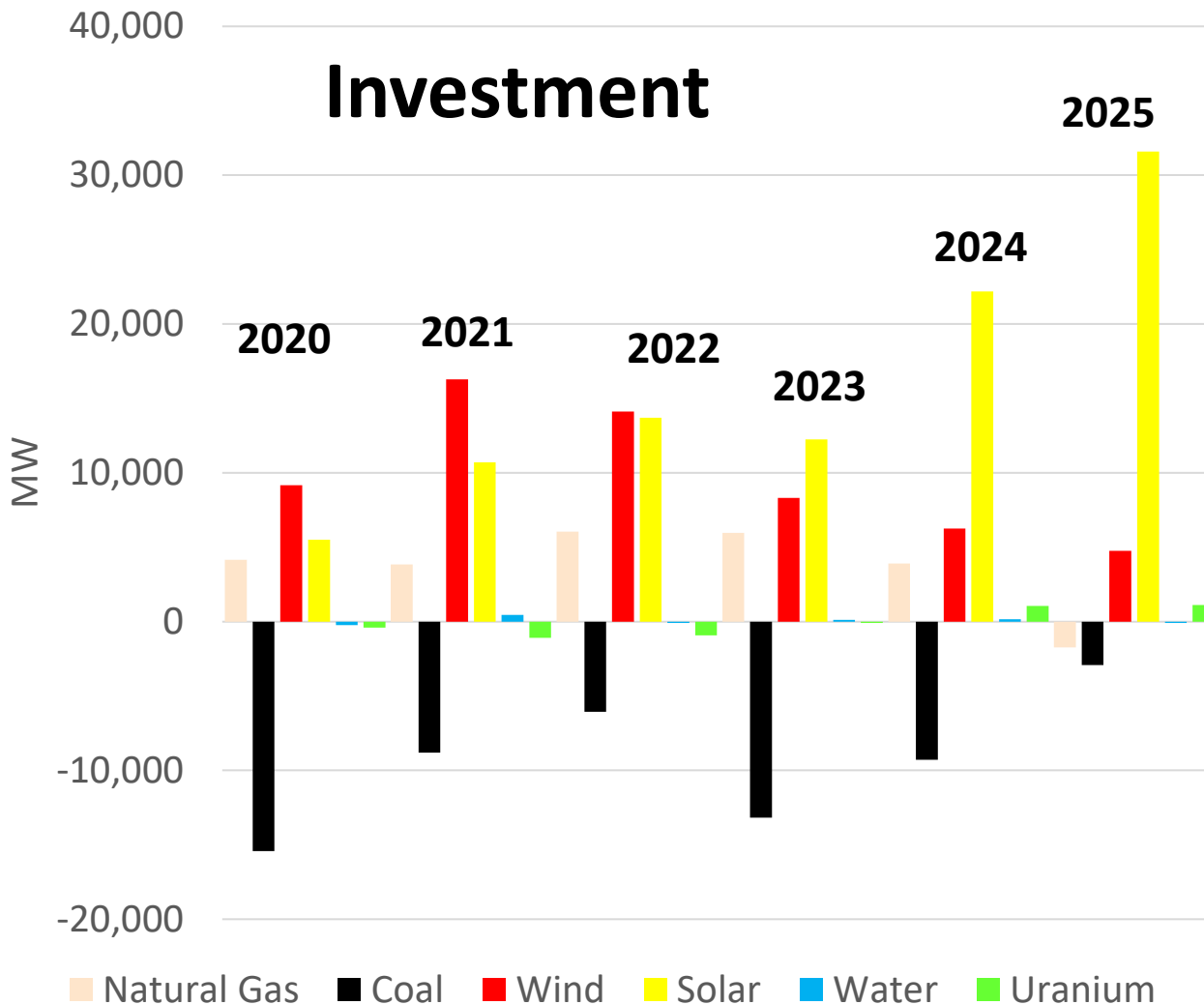
Megawatt-hours on Peak Day

North America

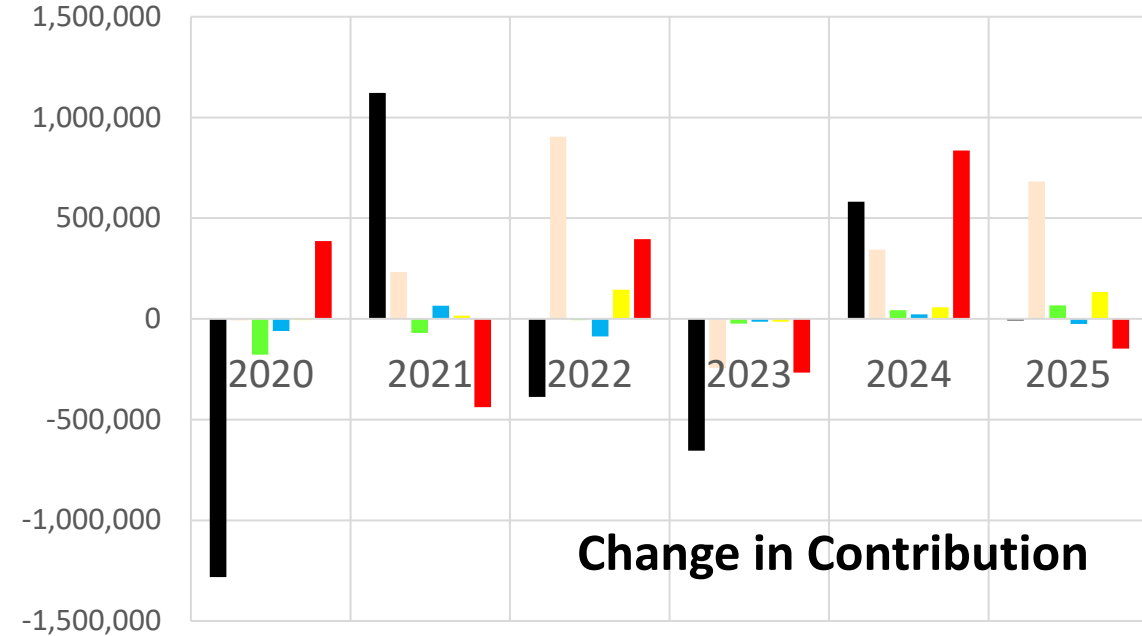
Regional Reliability Concerns

Year over Year Change in Capacity

Investment



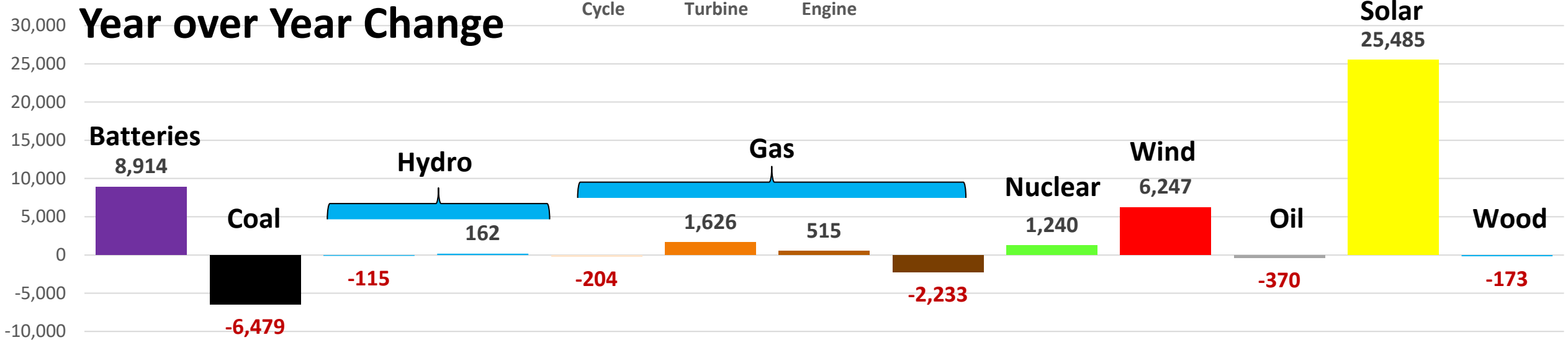
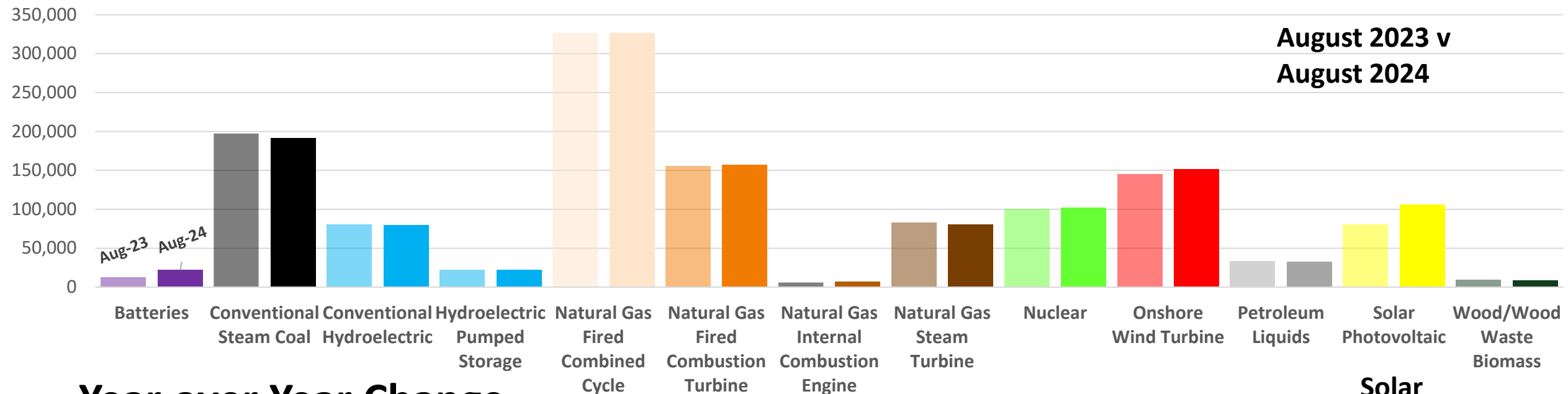
Year over Year Energy on Peak Winter Day (Energy)



Change in Contribution

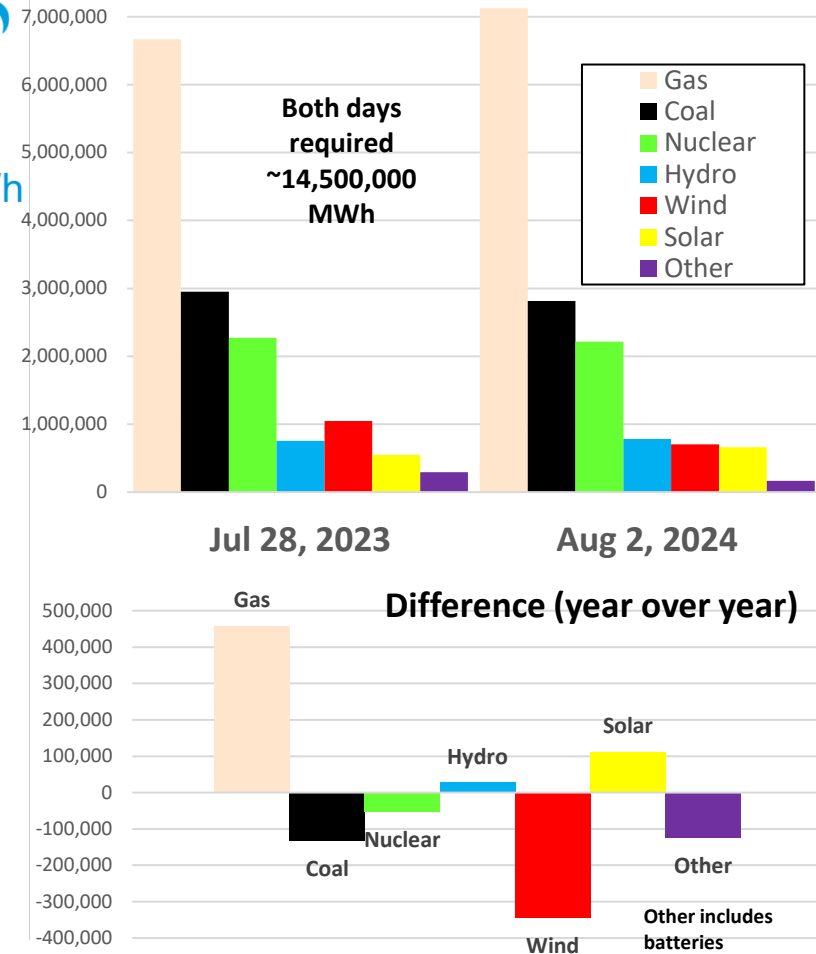
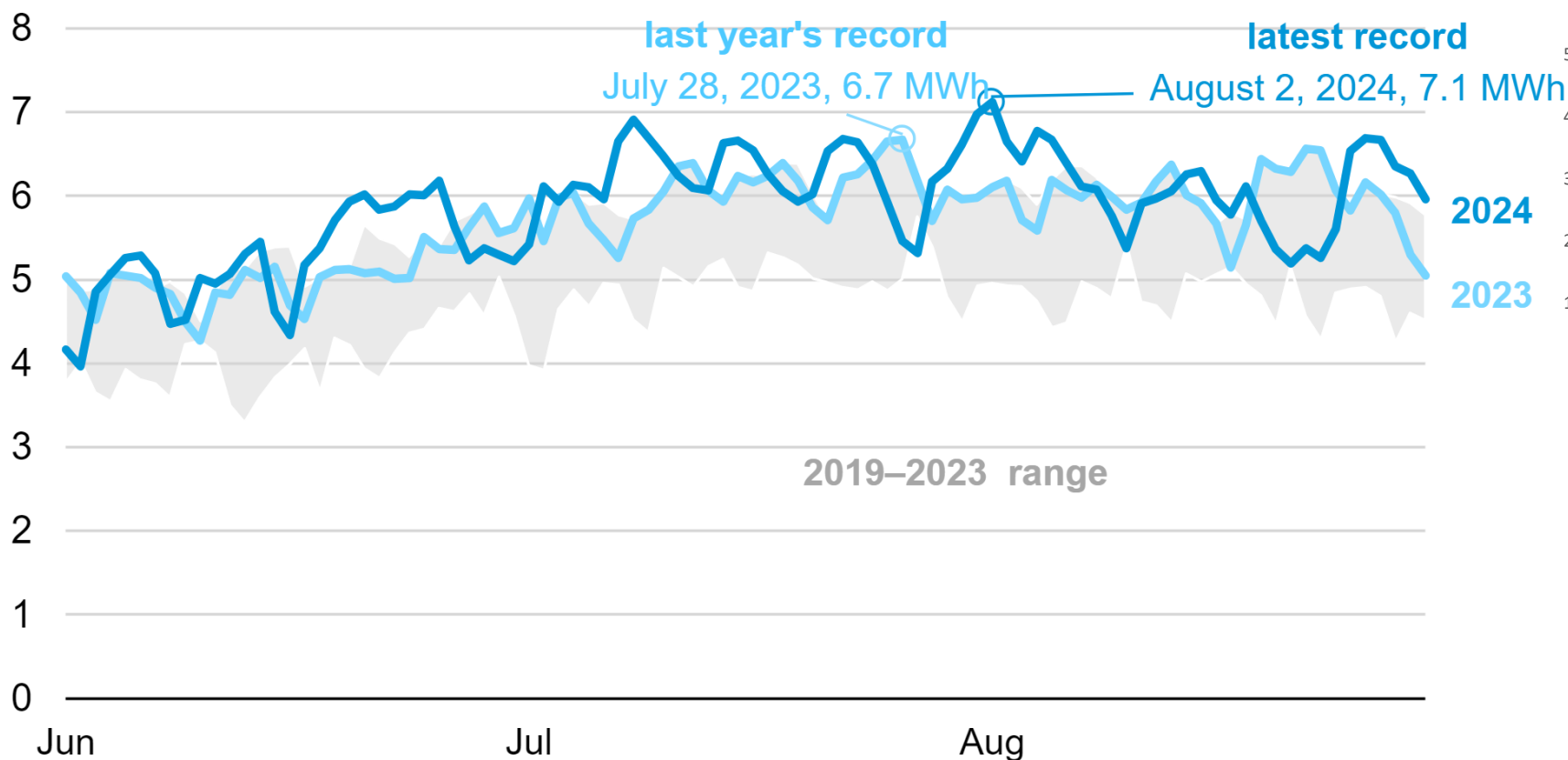
■ Coal ■ Gas ■ Nuclear ■ Hydro ■ Solar ■ Wind

US Lower 48 – Summer Capacity (MW)



US Lower 48 – Summer Generation (MWh)

U.S. daily natural gas-fired electricity generation (Jun 1–Aug 31, 2019–2024)
million megawatthours (MWh)



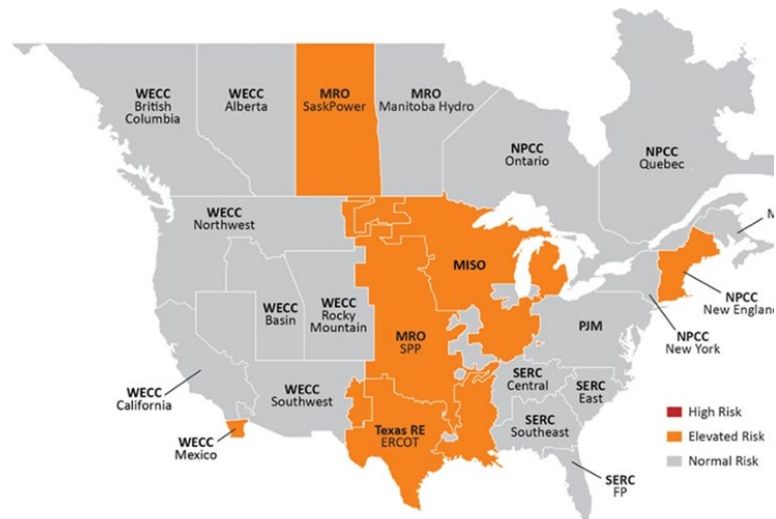
“Nine out of the ten days with the most U.S. natural gas-fired electricity generation on record occurred in the summer of 2024” EIA 2024

NERC Assessments

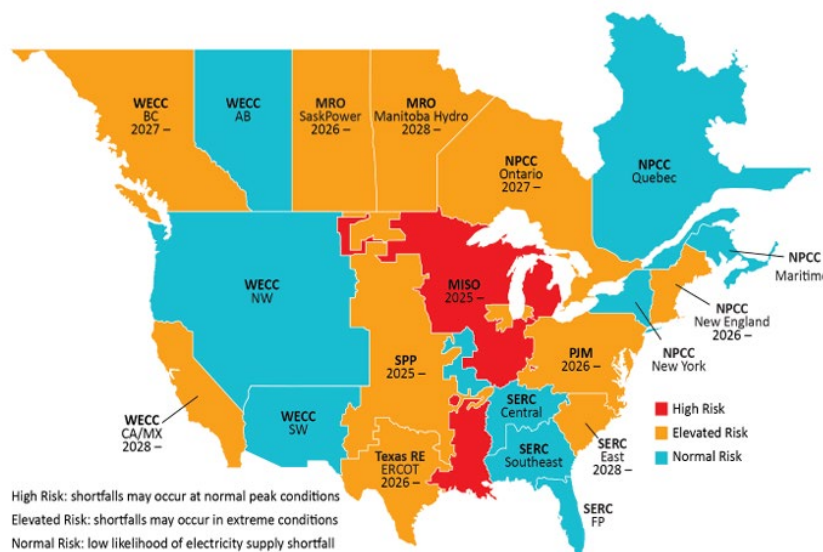
June 2025

North America

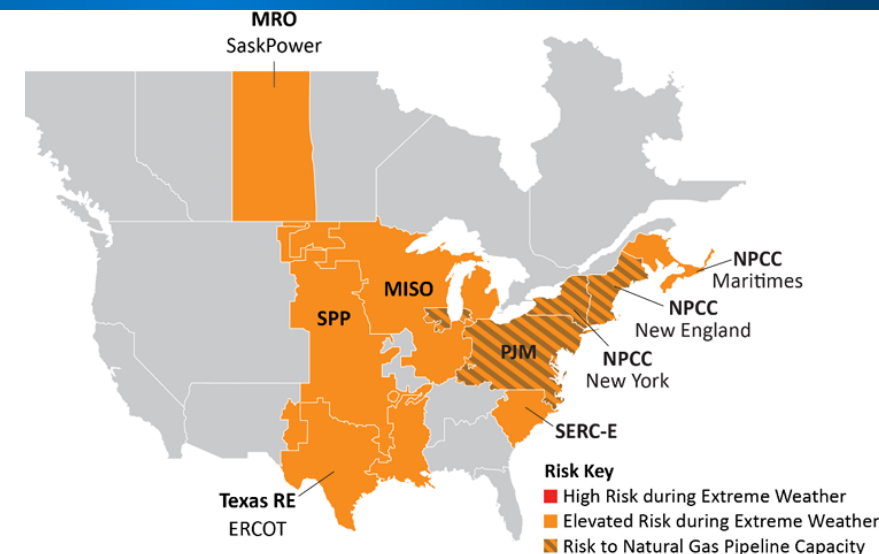
Regional Reliability Concerns



Summer 2025 Reliability Assessment

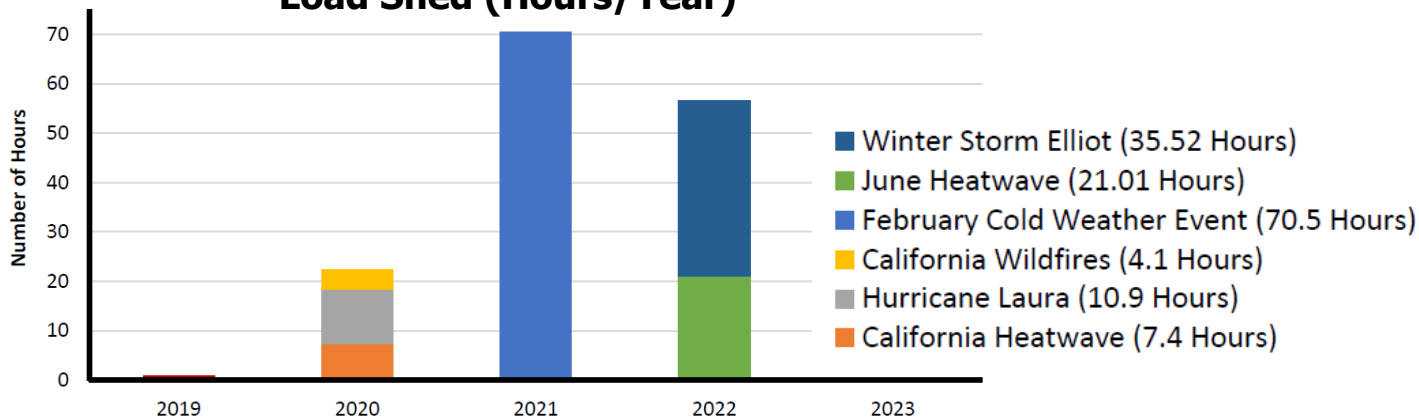


2024 Long-Term Reliability Assessment



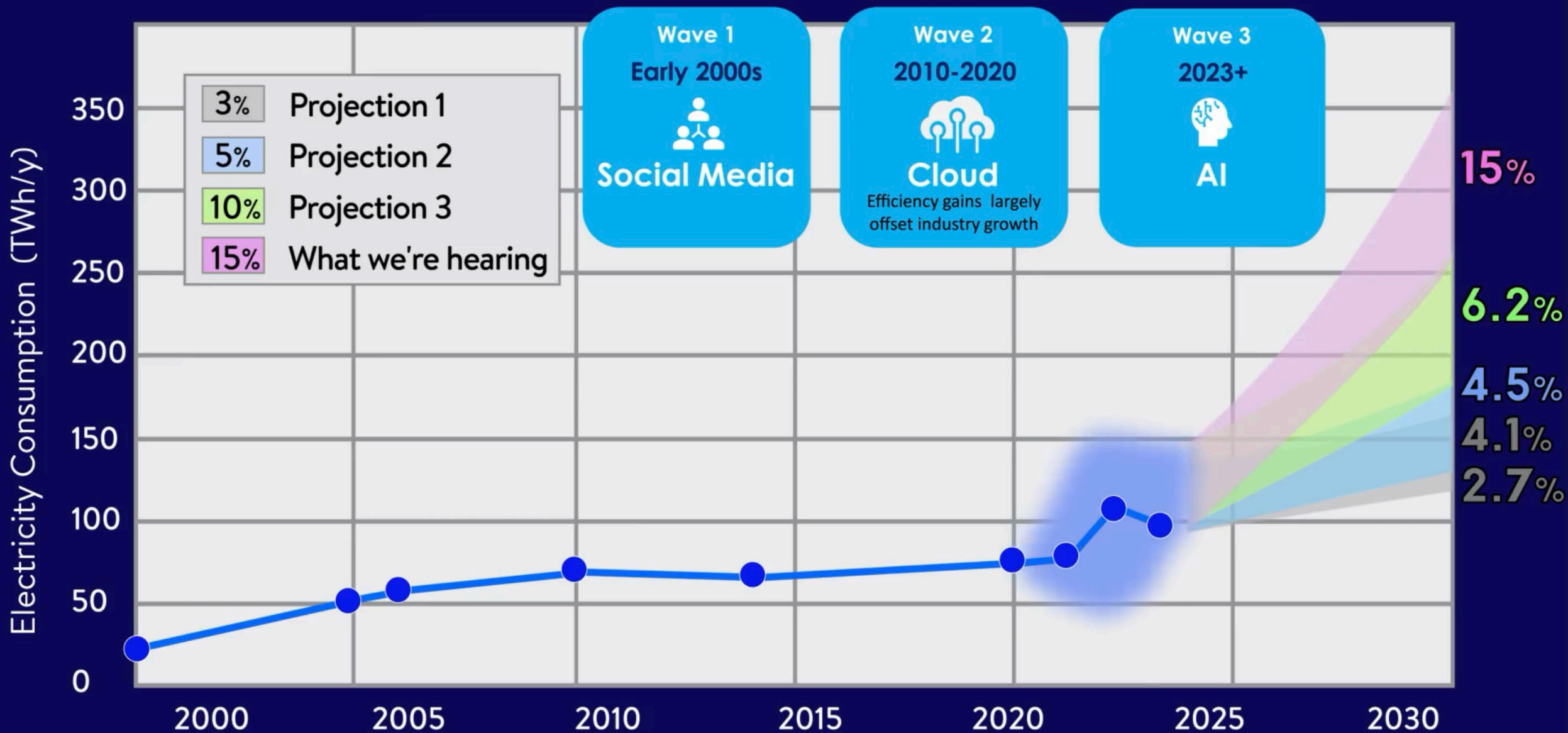
Winter 2024/25 Reliability Assessment

Hours with Operator-Initiated Firm Load Shed (Hours/Year)



Many Regions at Elevated and / or High Risk
Load Shedding Occurs

AI is Driving a Third Wave of Data Center Growth

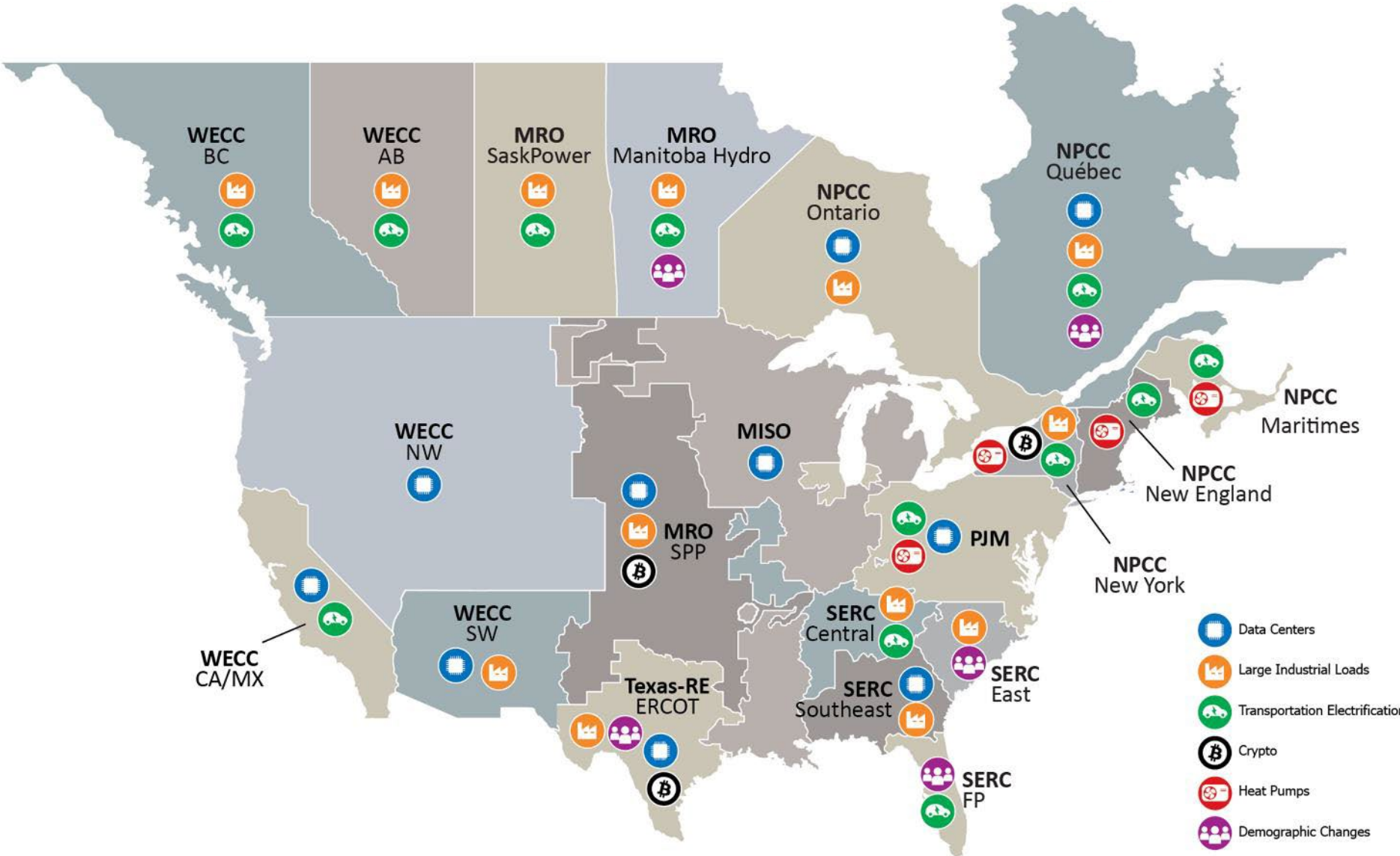


NERC Assessments

From Long Term Reliability Risk 2024

North America

Regional Reliability Concerns



Data Centers
Driving Load
Growth in the
United States

NERC Long-Term
Reliability Assessment

EPRI

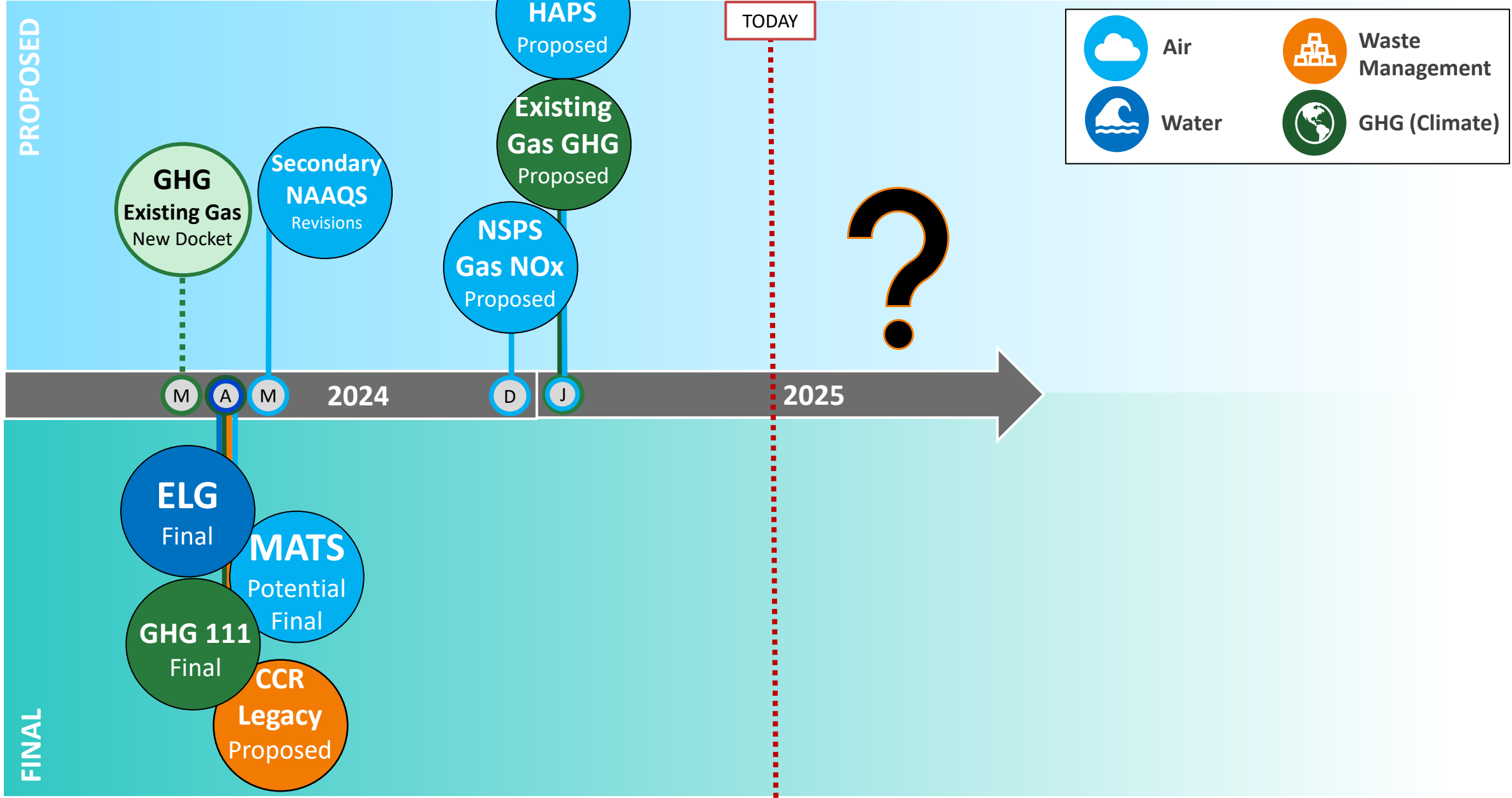
<https://dcflex.epri.com/>





Rules and Regs

Recent EPA Regulation Activity



	Air		Waste Management
	Water		GHG (Climate)

2024 Finalized EPA Regulations



GHG Rule (111 b/d)

Existing Coal & New Gas

Existing Coal

- Operate beyond 2038 – CCS
- Operate thru 2038 – 40% NG Co-firing
- Control by Jan 1, 2032 (CCS) or Jan 1, 2039 (Co-firing)

New/Modified Gas

- Defined as Commencing construction after May 2023
- >40% Cap Factor - CCS
- 20%<CF≤40% - High Efficiency Req

Intent to Repeal Announced

Accelerated Coal Retirements

40% CF Caps for New gas



Effluent Guidelines (ELG)

Existing Coal

Control no later than Dec 2029

- Retire by 2028 – nothing additional

Zero Liquid Discharge (ZLD)

- FGD Wastewater
- All ash transport water

Landfill leachate

- Operate to 2034 – Hg & As limits
- Operate beyond 2034 – ZLD

Significant Post-retirement Water Treatment



Legacy CCR Impoundments

No Operating Unit Impacts

Inclusion of previously excluded inactive ash impoundments & landfills

Meet 2015 CCR Rule Requirements

- Inspections
- Groundwater Monitoring & Corrective Actions
- Closure & Post Closure Care
- Others

Additional Impoundment Closures / Remediation



MATS Risk & Technology Review

Existing Coal & Oil Fired

Lower filterable particulate matter (PM) standard

Lower Hg standards for lignite units

PM Continuous Emissions Monitoring (CEMs) required for compliance

Intent to Repeal Announced

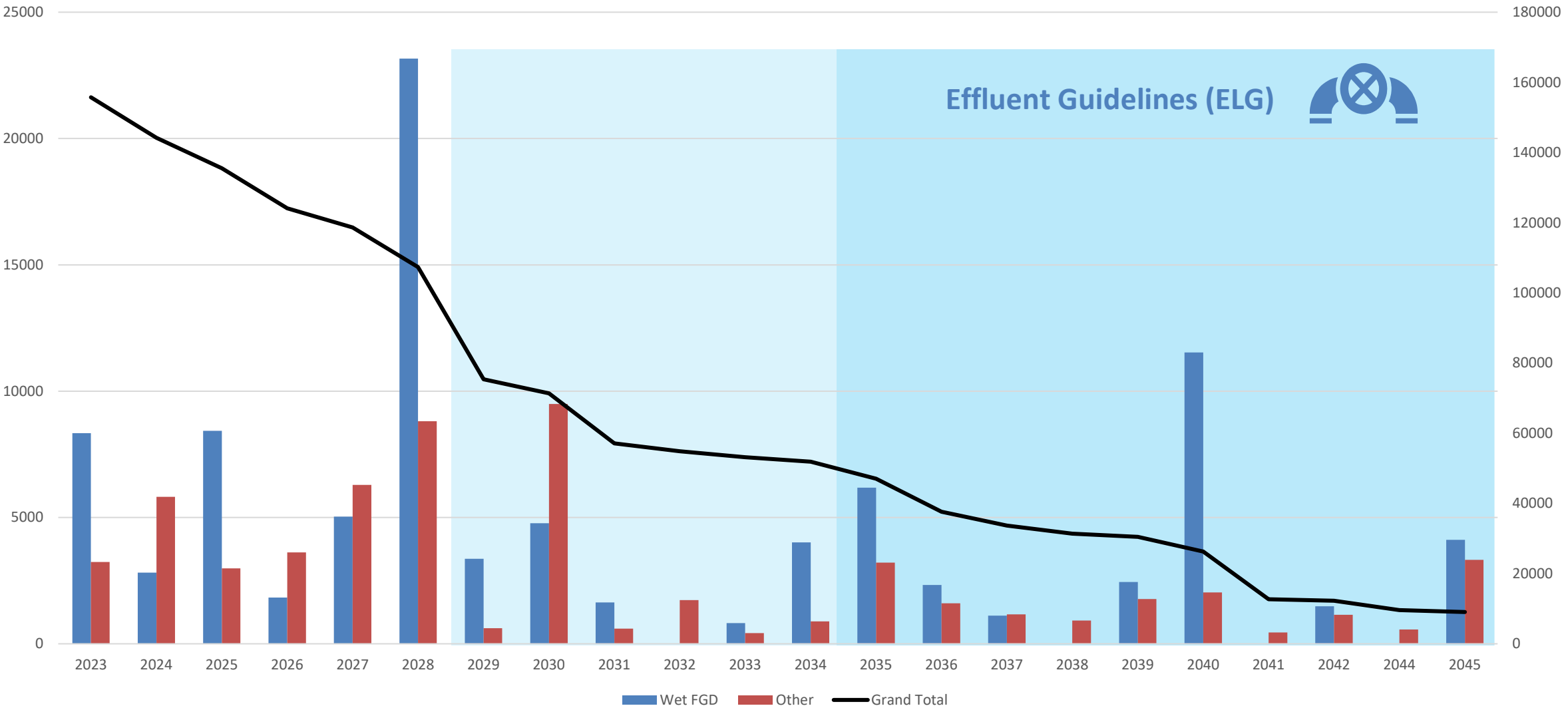
Additional Continuous Emissions Monitoring

Isolated Unit-specific Controls Improvements

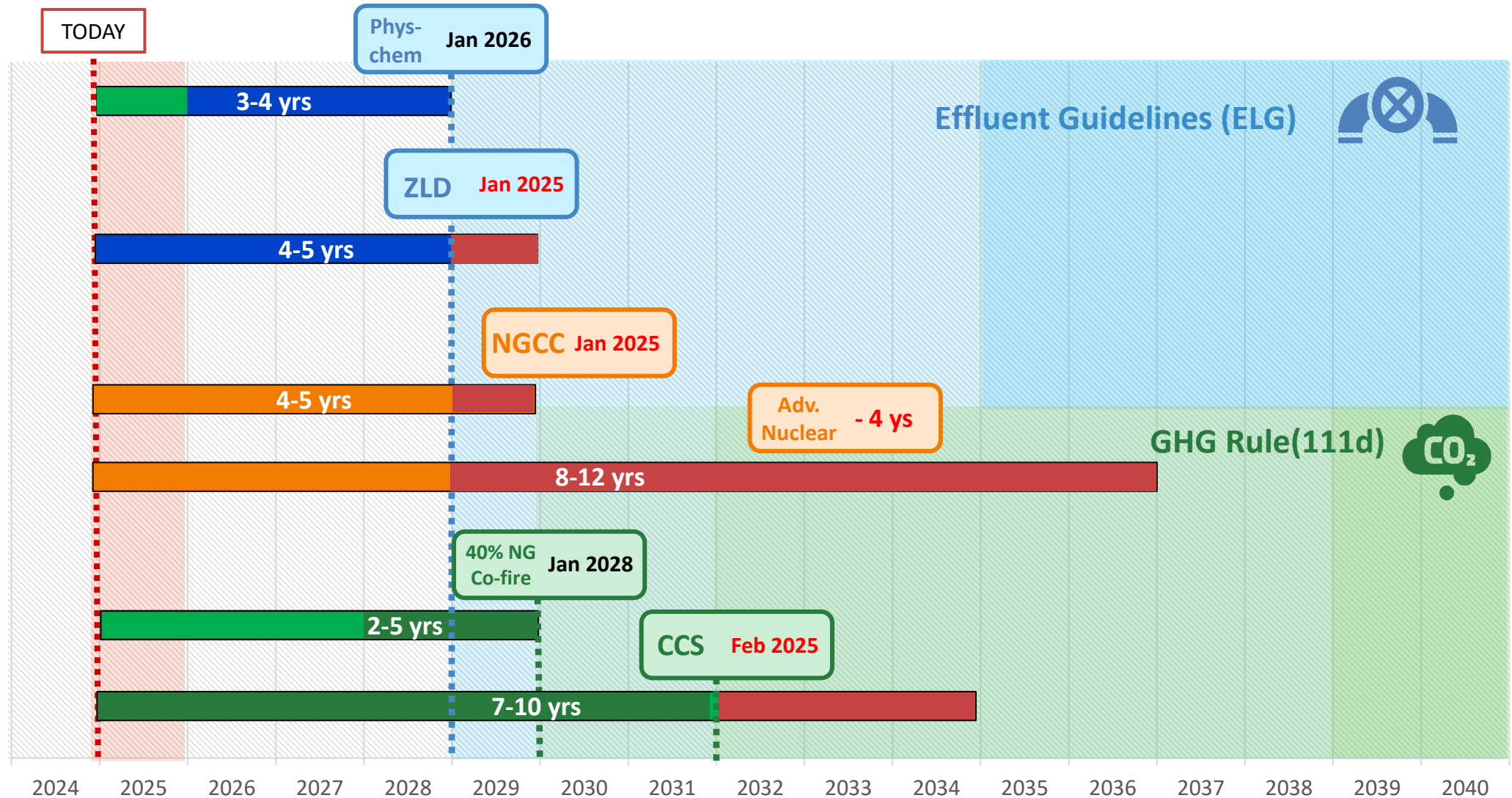
Anticipated Actions

Compliance Timelines for ELG

Projected Coal Plant Retirements



Time is running out or already gone.



DOE 202(c) Emergency Orders:

- On [May 30, 2025](#), Department of Energy (DOE) issued an emergency order, pursuant to section 202(c) of the Federal Power Act, to PJM Interconnection. The emergency order directs PJM, in coordination with Constellation Energy, to ensure specified generation units at the **Eddystone Generation Station in Pennsylvania** remain available for operation, minimizing the risk of generation shortfall that could lead to unnecessary power outages.
 - Expires August 28, 2025
- On [May 23, 2025](#), Department of Energy (DOE) issued an emergency order, pursuant to section 202(c) of the Federal Power Act, to Midcontinent Independent System Operator (MISO). The emergency order directs MISO, in coordination with Consumers Energy, to ensure that the **J.H. Campbell Power Plant in West Olive, Michigan** remains available for operation, minimizing any potential generation shortfall that could lead to unnecessary power outages.
 - Expires August 21, 2025

Coal Plant Closures
subject to
Emergency Orders
Under DOE Federal
Powers Act

Eddystone order
references EO 14262

<https://www.federalregister.gov/documents/2025/04/14/2025-06381/strengthening-the-reliability-and-security-of-the-united-states-electric-grid>



Executive Orders

Executive Orders

Energy Related

US Policy

Reliability, Security

publication_date	title	pdf_url
1/29/2025	Unleashing American Energy	https://www.govinfo.gov/content/pkg/FR-2025-01-29/pdf/2025-01956.pdf
1/29/2025	Declaring a National Energy Emergency	https://www.govinfo.gov/content/pkg/FR-2025-01-29/pdf/2025-02003.pdf
2/20/2025	Establishing the National Energy Dominance Council	https://www.govinfo.gov/content/pkg/FR-2025-02-20/pdf/2025-02928.pdf
4/14/2025	Protecting American Energy From State Overreach	https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06379.pdf
4/14/2025	Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241	https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06380.pdf
4/14/2025	Strengthening the Reliability and Security of the United States Electric Grid	https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06381.pdf
4/15/2025	Zero-Based Regulatory Budgeting To Unleash American Energy	https://www.govinfo.gov/content/pkg/FR-2025-04-15/pdf/2025-06466.pdf
5/29/2025	Reforming Nuclear Reactor Testing at the Department of Energy	https://www.govinfo.gov/content/pkg/FR-2025-05-29/pdf/2025-09799.pdf

<https://www.federalregister.gov/presidential-documents/executive-orders>

... It is thus in the national interest to unleash America's affordable and reliable energy and natural resources.

Sec. 4. Revocation of and Revisions to Certain Presidential and Regulatory

Actions. (a) The following are revoked and any offices established therein are abolished:

- (i) Executive Order 13990 of January 20, 2021 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis);
- (ii) Executive Order 13992 of January 20, 2021 (**Revocation of Certain Executive Orders Concerning Federal Regulation**);
- (iii) Executive Order 14008 of January 27, 2021 (Tackling the Climate Crisis at Home and Abroad);
- (iv) Executive Order 14007 of January 27, 2021 (President's Council of Advisors on Science and Technology);
- (v) Executive Order 14013 of February 4, 2021 (Rebuilding and Enhancing Programs to Resettle Refugees and Planning for the Impact of Climate Change on Migration);
- (vi) Executive Order 14027 of May 7, 2021 (Establishment of the Climate Change Support Office);
- (vii) Executive Order 14030 of May 20, 2021 (Climate-Related Financial Risk);
- (viii) Executive Order 14037 of August 5, 2021 (Strengthening American Leadership in Clean Cars and Trucks);
- (ix) Executive Order 14057 of December 8, 2021 (Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability);
- (x) Executive Order 14072 of April 22, 2022 (Strengthening the Nation's Forests, Communities, and Local Economies);
- (xi) Executive Order 14082 of September 12, 2022 (Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022); and
- (xii) Executive Order 14096 of April 21, 2023 (Revitalizing Our Nation's Commitment to Environmental Justice for All).

<https://www.govinfo.gov/content/pkg/FR-2025-01-29/pdf/2025-01956.pdf>

Unleashing
American Energy
14154

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the National Emergencies Act (50 U.S.C. 1601 *et seq.*) (“NEA”), and section 301 of title 3, United States Code, it is hereby ordered:

Section 1. Purpose. The energy and critical minerals (“energy”) identification, leasing, development, production, transportation, refining, and generation capacity of the United States are all far too inadequate to meet our Nation’s needs. We need a reliable, diversified, and affordable supply of energy to drive our Nation’s manufacturing, transportation, agriculture, and defense industries, and to sustain the basics of modern life and military preparedness. Caused by the harmful and shortsighted policies of the previous administration, our Nation’s inadequate energy supply and infrastructure causes and makes worse the high energy prices that devastate Americans, particularly those living on low- and fixed-incomes. I hereby declare a national emergency.

<https://www.govinfo.gov/content/pkg/FR-2025-01-29/pdf/2025-02003.pdf>

Declaring a
National Energy
Emergency
14156

- **Sec. 4. Functions.** (a) The Chair shall convene and preside over meetings of the Council, in consultation with the Office of the Chief of Staff, provided that in his absence the Vice Chair shall preside. (b)
- The Council shall: (i) advise the President on how best to exercise his authority to produce more energy to make America energy dominant; (ii) advise the President on improving the processes for permitting, production, generation, distribution, regulation, transportation, and export of all forms of American energy, including critical minerals; (iii) provide to the President a recommended National Energy Dominance Strategy to produce more energy that includes long-range goals for achieving energy dominance by cutting red tape, enhancing private sector investments across all sectors of the energy-producing economy, focusing on innovation, and seeking to eliminate longstanding, but unnecessary, regulation; (iv) advise and assist the President in facilitating cooperation among the Federal Government and domestic private sector energy partners; and (v) advise the President on facilitating consistency in energy production policies included in the Strategy developed under subsection (b)(iii) of this section.

Establishing the National Energy Dominance Council 14213

The Secretary of the Interior shall serve as Chair of the Council. The Secretary of Energy shall serve as Vice Chair of the Council.

<https://www.govinfo.gov/content/pkg/FR-2025-02-20/pdf/2025-02928.pdf>

- **Sec. 2. State Laws and Causes of Action.**

- (a) The Attorney General, in consultation with the heads of appropriate executive departments and agencies, shall identify all State and local laws, regulations, causes of action, policies, and practices (collectively, State laws) burdening the identification, development, siting, production, or use of domestic energy resources that are or may be unconstitutional, preempted by Federal law, or otherwise unenforceable. The Attorney General shall prioritize the identification of any such State laws purporting to address “climate change” or involving “environmental, social, and governance” initiatives, “environmental justice,” carbon or “greenhouse gas” emissions, and funds to collect carbon penalties or carbon taxes.
- (b) The Attorney General shall expeditiously take all appropriate action to stop the enforcement of State laws and continuation of civil actions identified in subsection (a) of this section that the Attorney General determines to be illegal.
- (c) Within 60 days of the date of this order, the Attorney General shall submit a report to the President, through the Counsel to the President, regarding actions taken under subsection (b) of this section. The Attorney General shall also recommend any additional Presidential or legislative action necessary to stop the enforcement of State laws identified in subsection (a) of this section that the Attorney General determines to be illegal or otherwise fulfill the purpose of this order.

Protecting American Energy From State Overreach 14260

4/14/2025

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06379.pdf>

Sec. 6. Supporting American Coal as an Energy Source.

- (a) Within 30 days of the date of this order, the Administrator of the Environmental Protection Agency, the Secretary of Transportation, the Secretary of the Interior, the Secretary of Energy, the Secretary of Labor, and the Secretary of the Treasury shall identify any guidance, regulations, programs, and policies within their respective executive department or agency that seek to transition the Nation away from coal production and electricity generation.
- (b) (c) Agencies that are empowered to make loans, loan guarantees, grants, equity investments, or to conclude offtake agreements, both domestically and abroad, shall, to the extent permitted by law, take steps to rescind any policies or regulations seeking to or that actually discourage investment in coal production and coal-fired electricity generation, such as the 2021 U.S. Treasury Fossil Fuel Energy Guidance for Multilateral Development Banks rescinded by the Department of the Treasury and similar policies or regulations.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06380.pdf>

Reinvigorating
America's Beautiful
Clean Coal Industry
and Amending
Executive Order
14241

Sec. 10. Powering Artificial Intelligence Data Centers.

- (a) For the purposes of this order, “artificial intelligence” or “AI” has the meaning set forth in 15 U.S.C. 9401(3).
- (b) Within 60 days of the date of this order, the Secretary of the Interior, Secretary of Commerce, and the Secretary of Energy shall identify regions where coal-powered infrastructure is available and suitable for supporting AI data centers; assess the market, legal, and technological potential for expanding coal-based infrastructure to power data centers to meet the electricity needs of AI and high-performance computing operations; and submit a consolidated summary report with their findings and proposals to the Chair of the NEDC, the Assistant to the President for Science and Technology and the Special Advisor for AI and Crypto.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06380.pdf>

Reinvigorating
America's Beautiful
Clean Coal Industry
and Amending
Executive Order
14241

Sec. 11. Acceleration of Coal Technology.

(a) The Secretary of Energy shall take all necessary actions, consistent with applicable law, to accelerate the development, deployment, and commercialization of coal technologies including, but not limited to, utilizing all available funding mechanisms to support the expansion of coal technology, including technologies that utilize coal and coal byproducts such as building materials, battery materials, carbon fiber, synthetic graphite, and printing materials, as well as updating coal feedstock for power generation and steelmaking.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06380.pdf>

Reinvigorating
America's Beautiful
Clean Coal Industry
and Amending
Executive Order
14241

Section 1. Purpose.

The United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and an increase in domestic manufacturing. This increase in demand, coupled with existing capacity challenges, places a significant strain on our Nation's electric grid. Lack of reliability in the electric grid puts the national and economic security of the American people at risk. The United States' ability to remain at the forefront of technological innovation depends on a reliable supply of energy from all available electric generation sources and the integrity of our Nation's electric grid.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06381.pdf>

Strengthening the
Reliability and
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United States
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Sec. 2. Policy.

It is the policy of the United States to ensure the reliability, resilience, and security of the electric power grid. It is further the policy of the United States that in order to ensure adequate and reliable electric generation in America, to meet growing electricity demand, and to address the national emergency declared pursuant to Executive Order 14156 of January 20, 2025 (Declaring a National Energy Emergency), our electric grid must utilize all available power generation resources, particularly those secure, redundant fuel supplies that are capable of extended operations.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06381.pdf>

Strengthening the
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Sec. 3. Addressing Energy Reliability and Security with Emergency Authority.

(c) The Secretary of Energy shall establish a process by which the methodology described in subsection (b) of this section, and any analysis and results it produces, are assessed on a regular basis, and a protocol to identify which generation resources within a region are critical to system reliability. This protocol shall additionally: (i) include all mechanisms available under applicable law, including section 202(c) of the Federal Power Act, to ensure any generation resource identified as critical within an at-risk region is appropriately retained as an available generation resource within the at-risk region; and (ii) prevent, as the Secretary of Energy deems appropriate and consistent with applicable law, including section 202 of the Federal Power Act, an identified generation resource in excess of 50 megawatts of nameplate capacity from leaving the bulk-power system or converting the source of fuel of such generation resource if such conversion would result in a net reduction in accredited generating capacity, as determined by the reserve margin methodology developed under subsection (b) of this section.

<https://www.govinfo.gov/content/pkg/FR-2025-04-14/pdf/2025-06381.pdf>

Strengthening the
Reliability and
Security of the
United States
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Coal to Gas?

- This regime of governance-by-regulator has imposed particularly severe costs on energy production, where innovation is critical. The net result is an energy landscape perpetually trapped in the 1970s. By rescinding outdated regulations that serve as a drag on progress, we can stimulate innovation and deliver prosperity to everyday Americans.
- This order directs certain agencies to incorporate a sunset provision into their regulations governing energy production to the extent permitted by law, thus compelling those agencies to reexamine their regulations periodically to ensure that those rules serve the public good.
- **Covered Agencies and Regulations.** (a) This order applies to the following agencies and their subcomponents: the Environmental Protection Agency (EPA); the Department of Energy (DoE); the Federal Energy Regulatory Commission (FERC); and the Nuclear Regulatory Commission (NRC) ...
- (b) The sunset rule shall provide that each Covered Regulation in effect on the date of this order shall have a Conditional Sunset Date of 1 year after the effective date of the sunset rule, subject to the process set forth in subsection (d) of this section. Unless the extension condition specified in subsection (d) of this section is satisfied, agencies will treat Covered Regulations as ceasing to be effective on that date for all purposes. An agency shall not take any action to enforce such an ineffective regulation and, to the maximum extent permitted by law, shall remove it from the Code of Federal Regulations.

<https://www.govinfo.gov/content/pkg/FR-2025-04-15/pdf/2025-06466.pdf>

Zero-Based
Regulatory
Budgeting To
Unleash American
Energy
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Not more than 5
years for Amended
Sunset Dates

Discussion



Michael Caravaggio

Vice President - Energy Supply
- Reliability, EPRI





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