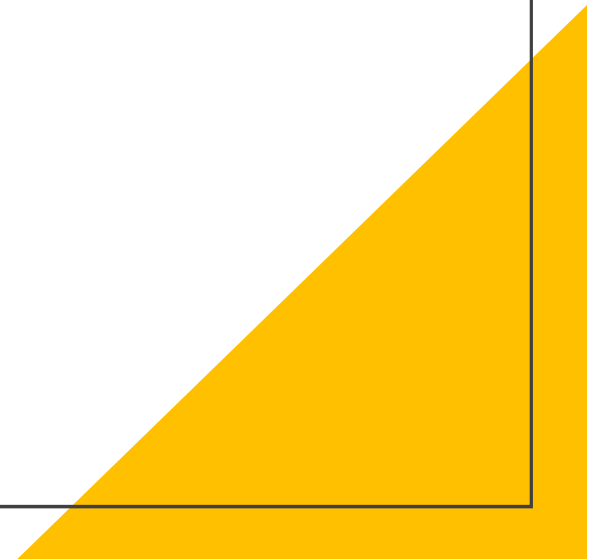


# Pending Crisis – America's Electric Grid

CLEER UAB

Seminar

June 24, 2023



# Systemwide Blackout Warnings

## FERC

- Power plants are **retiring faster than they're being replaced**, according to FERC Commissioner Mark Christie. "The arithmetic doesn't work."
- FERC Acting Chairman Willie Phillips said, "We face **unprecedented challenges to the reliability** of our nation's electric system."
- There is a "**looming reliability crisis in our electricity markets**," FERC Commissioner James Danly said.

## NERC

- **Two-thirds** of North America could face power shortages this summer during periods of extreme electricity demand and spiking temperatures
- In a worst-case combination of severe heat and unexpected generation outages, the **western United States, most of Texas, and the Carolinas** face a heightened risk of rolling power blackouts
- The North American Electric Reliability Corp. on Monday issued its **highest [alert level](#) ever**, urging generators and transmission owners to take measures to prepare for winter.

## *Reasons for Crisis #1*

### Rapid Closure of Power Plants

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#### **MISO**

- Power Plants closed (29 coal, 15 natural gas, 1 nuclear)
- Total of 17,379 Megawatts
- Equivalent to average electric use of 11.2 million homes

#### **SPP**

- Closed 15 power plants (7 coal, 7 natural gas, 1 nuclear)
- 4,738 Megawatts
- Equivalent to 3.1 million homes

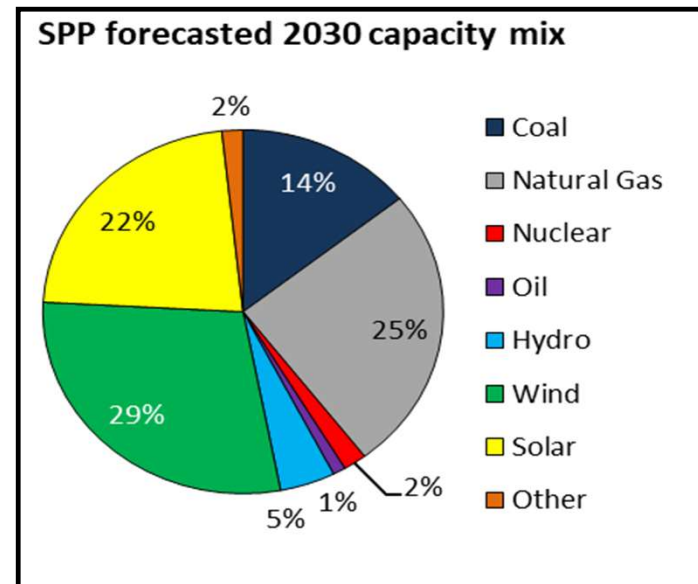
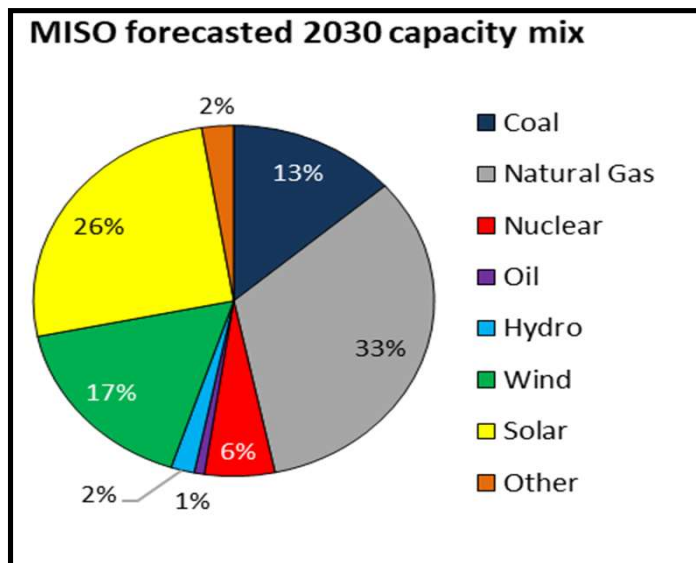
#### **PJM**

About 40 GW, or 21% of PJM's installed capacity, is at risk of retiring by 2030, the largest U.S. grid operator said in [a Feb. 24 report](#). PJM expects only 15.1 GW to 30.6 GW of accredited capacity to come online by 2030.

# Future Generation Mix (MISO & SPP)

45% of the electric generation mix in MISO will be intermittent sources

56% of the electric generation mix in SPP will be Intermittent sources

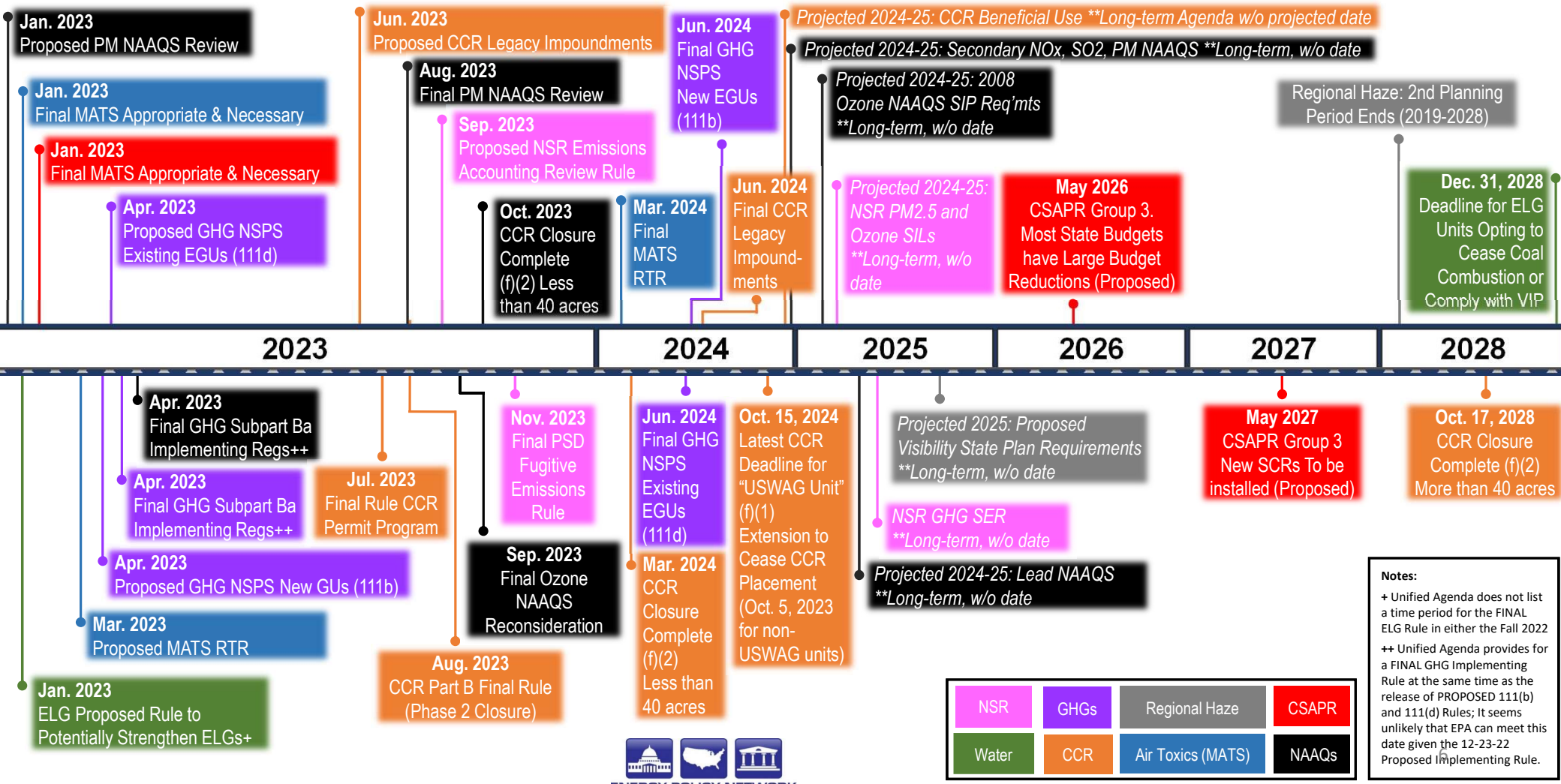


Source: Energy Ventures Analysis; Fuelcast, EIA database & MISO website

Reasons for the  
Crisis #2  
U.S. EPA  
Regulations

<b><u>EPA REGULATION OF CONCERN</u></b>	<b><u>TIMING</u></b>	<b><u>GRID IMPACT</u></b>
➤ <b>Good Neighbor (Ozone Transport) Rule</b>	March 2023	MASSIVE
➤ <b>CO2 Regulations for NEW Gas Plants</b>	April 2023	MAJOR
➤ <b>Coal Combustion Residuals (CCRs)</b>	Summer 2023	MAJOR
➤ <b>Mercury &amp; Air Toxics Standard (MATS)</b>	Spring 2024	MAJOR
➤ <b>CO2 Regulations for Existing Coal Plants (CPP/ACE Replacement)</b>	Summer 2024	MAJOR
➤ <b>Regional Haze SIP Disapprovals/FIP Threat</b>	2023-24	MAJOR

# Train-Wreck – EPA Regulatory Onslaught (present)



**Notes:**

- + Unified Agenda does not list a time period for the FINAL ELG Rule in either the Fall 2022
- ++ Unified Agenda provides for a FINAL GHG Implementing Rule at the same time as the release of PROPOSED 111(b) and 111(d) Rules; It seems unlikely that EPA can meet this date given the 12-23-22 Proposed Implementing Rule.



# Clean Power Plan 2.0 (carbon emissions)

## Natural Gas Plants

- Install the technology to **capture 90 percent** of their carbon pollution **by 2035**. Or they can choose to mix more clean-burning hydrogen into their fuel, reaching a 96 percent hydrogen mix by 2038.
- Intermediate plants, which run 20 percent to **50 percent of the time**, would have to eventually add some hydrogen into their fuel mix — **30 percent by 2032**.
- The first are “peaker” plants, smaller facilities that run **less than 20 percent** of the time to offset dips in solar or wind power or to fulfill sudden demand spikes. These plants would effectively avoid any new regulatory requirements.

## Coal Plants

- Those set to **retire before 2032 or 2035** can avoid any real pollution reductions. Any plants retiring between **2035 and 2040** would have to reduce their emissions by 16 percent, which EPA said can be achieved by shifting the plant’s fuel mix to **60 percent coal and 40 percent natural gas** in a process known as “co-firing.”
- And coal plants expected to be operating in **2040 and beyond would have to curb their emissions almost 90 percent**

## *Reason for Crisis #3*

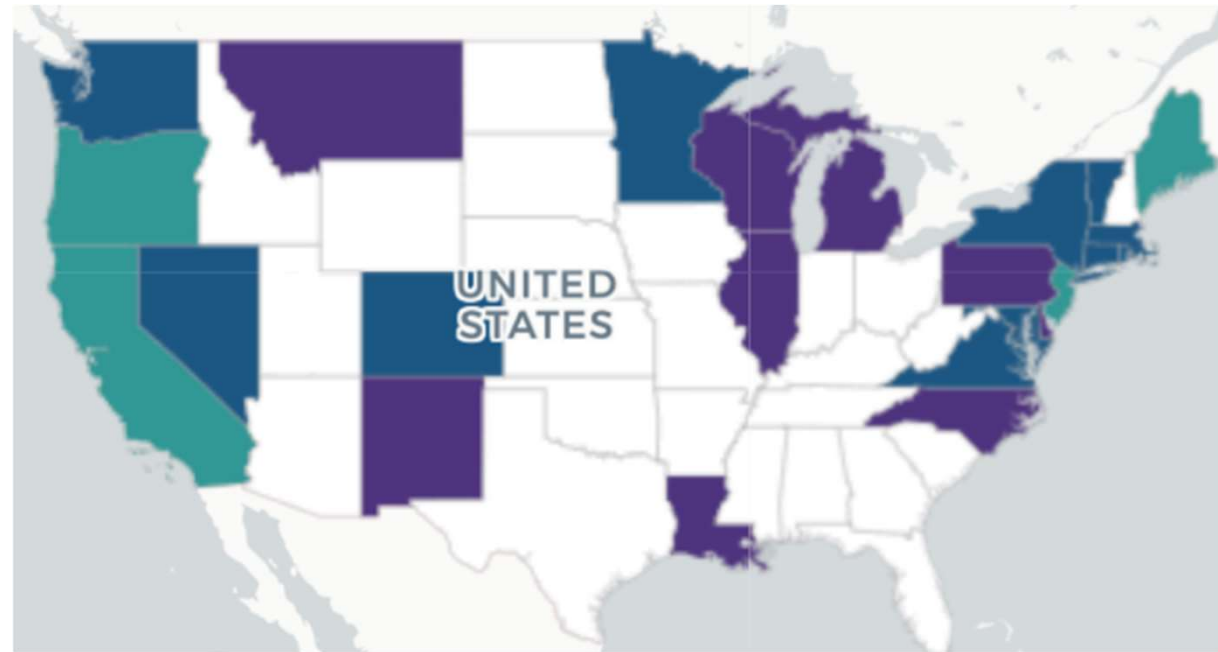
# States with Zero-Carbon Requirements

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U.S. State GHG Emission...

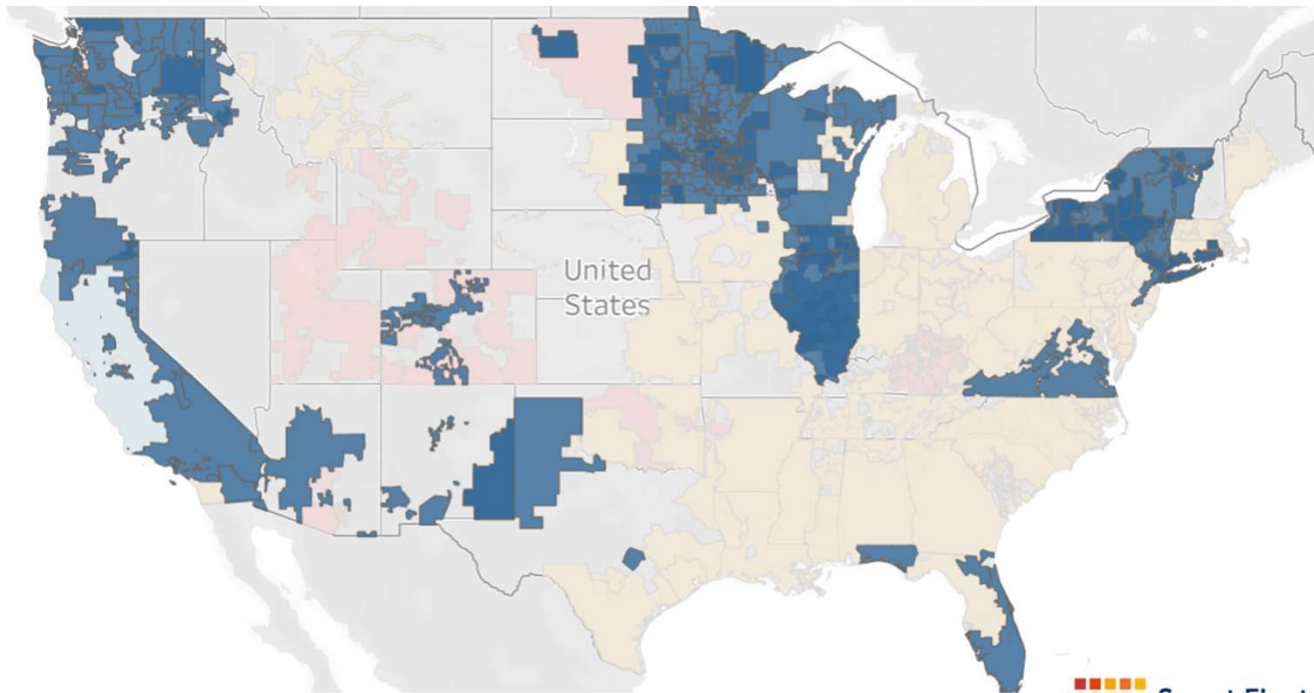
State GHG Targets

- NO TARGET
- STATUTORY TARGET
- EXECUTIVE TARGET
- STATUTORY AND EXECUTIVE TARGETS





- Electric Utilities that have pledged 100% renewable energy by 2050



*Reason for the  
Crisis #4*  
Renewable  
Energy  
Incentives

### Production Tax Credit

Base Rate: \$5.2/MWh\*

Bonus Rate: \$26/MWh\*

Domestic Content Rate: 10%  
higher, up to \$28.6/MWh\*

2.8 cents/kWh  
From 2023 – 2032 **10 years**

### Investment Tax Credit

Base Rate: 6%

Bonus Rate: 30%

Domestic Content Rate: 10%  
higher, up to 33%

EJ Rate\*: 10-20% higher

Energy Community Rate\*\*: up to  
10% higher

# Why Close a Plant and Build Renewable Project

	Coal Plant	Solar Equivalent	Wind Equivalent
Size (MW)	500	1,000	625
Utilization rate (%)	50%	25%	40%
Electric Generation (million kWh)	2,190	2,190	2,190
Capital Cost (\$million) \$	-	\$ 1,100	\$ 813
Return on Investment (%)	15%	15%	15%
Profit (\$million) \$	-	\$ 165	\$ 122
Investment Tax Credit (30% of capital cost - \$million) \$	-	\$ 330	\$ 244
<u>or</u> Production Tax Credit (10 years @ \$26/MWh - \$million) \$	-	\$ 569	\$ 569
<b>(simplified) Total Utility Profit (\$million) \$</b>	<b>-</b>	<b>\$ 734</b>	<b>\$ 691</b>

*Reason for Crisis #5*  
Post-Covid Supply Chain Problems

EIA reports that of the 17.8 GigaWatts of solar energy planned to be built in 2022, only 4.2 GW came in first half (Jan.-June)

Wind energy installations were 78% lower in the second quarter of 2022 vs. 2021

Supply chain issues are pushing renewable projects an additional 18 months (from 2.5 years to 4 years)

*Reason for Crisis #6*

Transmission  
Line (Siting,  
Permitting,  
Construction)

FERC announced 8,100 renewable project totaling 1,400 GW of generation were not built because of Transmission constraints

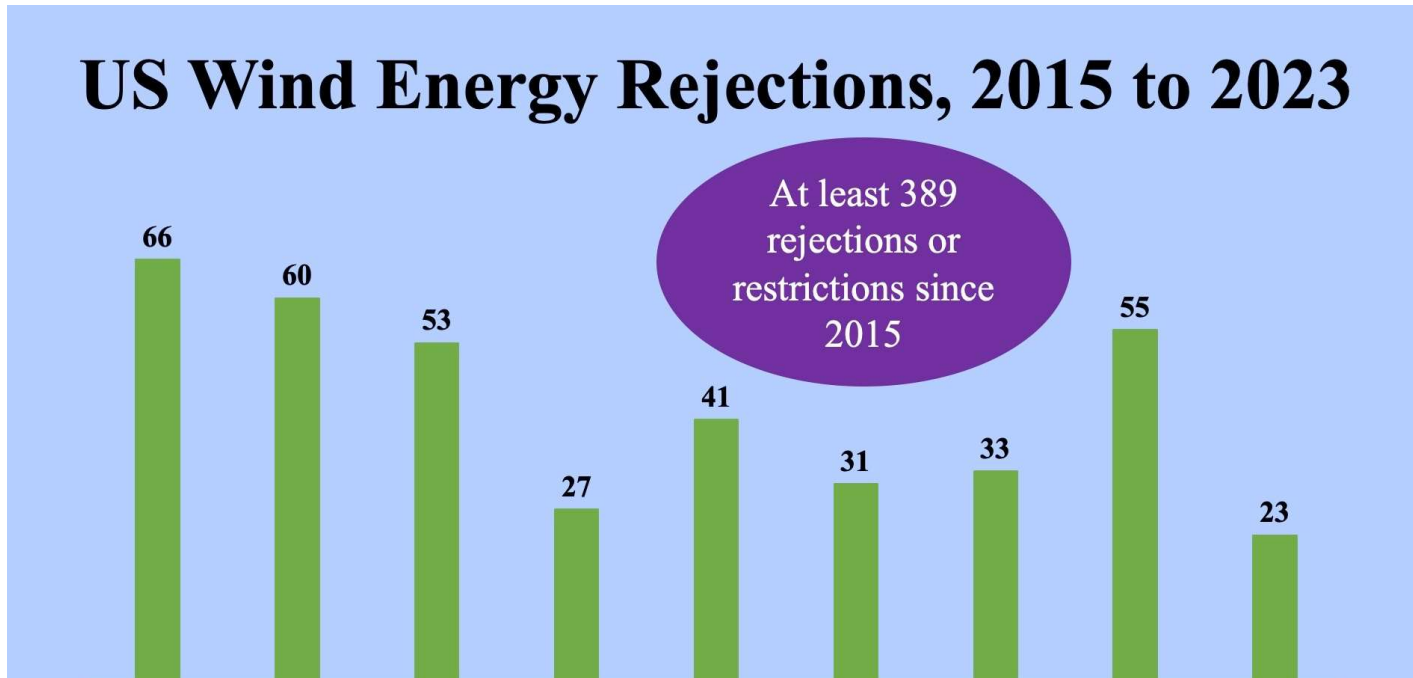
Transmission siting, permitting and construction of major power lines is taking 8 – 15 years (avg. 10 years)

Increased costs of steel, copper and materials for Transmission, Interconnects and substation

## Reason for Crisis #7

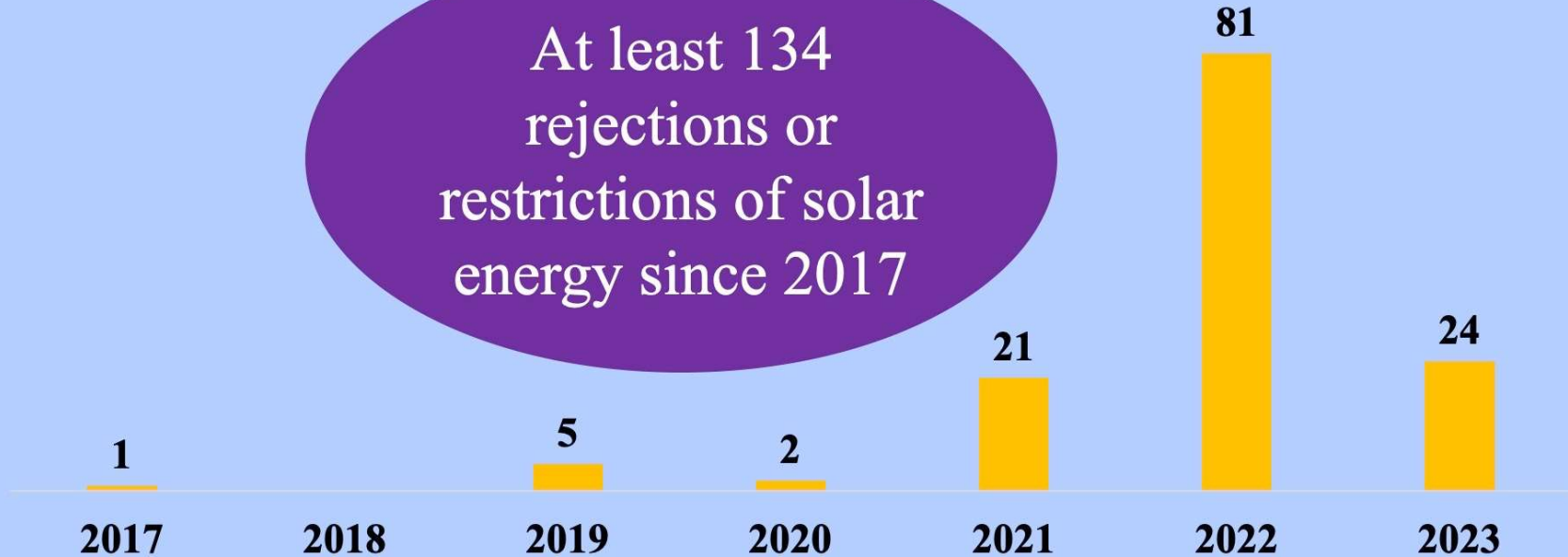
### Local Opposition

- Source: Columbis Law School



# US Solar Energy Rejections, 2017 to 2023

At least 134  
rejections or  
restrictions of solar  
energy since 2017



*Reason for Crisis  
#8*

Reasons for  
Electric  
Reliability  
Problem

- Reliability problems are driven by two main issues: faulty capacity markets and a **dearth of gas pipelines**, according to Christie. During Winter Storm Elliott in December, PJM was on the brink of rolling blackouts when a large number of gas-fired power plants failed to run, partly because they couldn't get fuel, he said.
- Dakota, Keystone, Atlantic Coast and Mountain Valley rejected
- National Energy Policy Act (NEPA) – federal agency environmental impact statement (avg. time for major transmission line 10 years)



THE WALL STREET JOURNAL.

## Old Coal Plant Nearing Retirement, but Now It's Needed to Keep the Lights On



WE Energies, Alliant Energy reverse green course, will keep coal plants open

**RealClear** Energy  
America's Emerging Energy Crisis

ENERGY NEWS NETWORK

## Grid concerns could prolong coal plant use

The Intelligencer.  
Wheeling News-Register

Government Foolish To Believe We Can Abandon Fossil Fuels

**THE HILL**

Don't write off coal. We need it to ensure power grid reliability

THE ROANOKE TIMES

Kandrach: Inflation, rising energy prices could squeeze U.S. families

The Washington Post

A summer of blackouts? Wheezing power grid leaves states at risk.

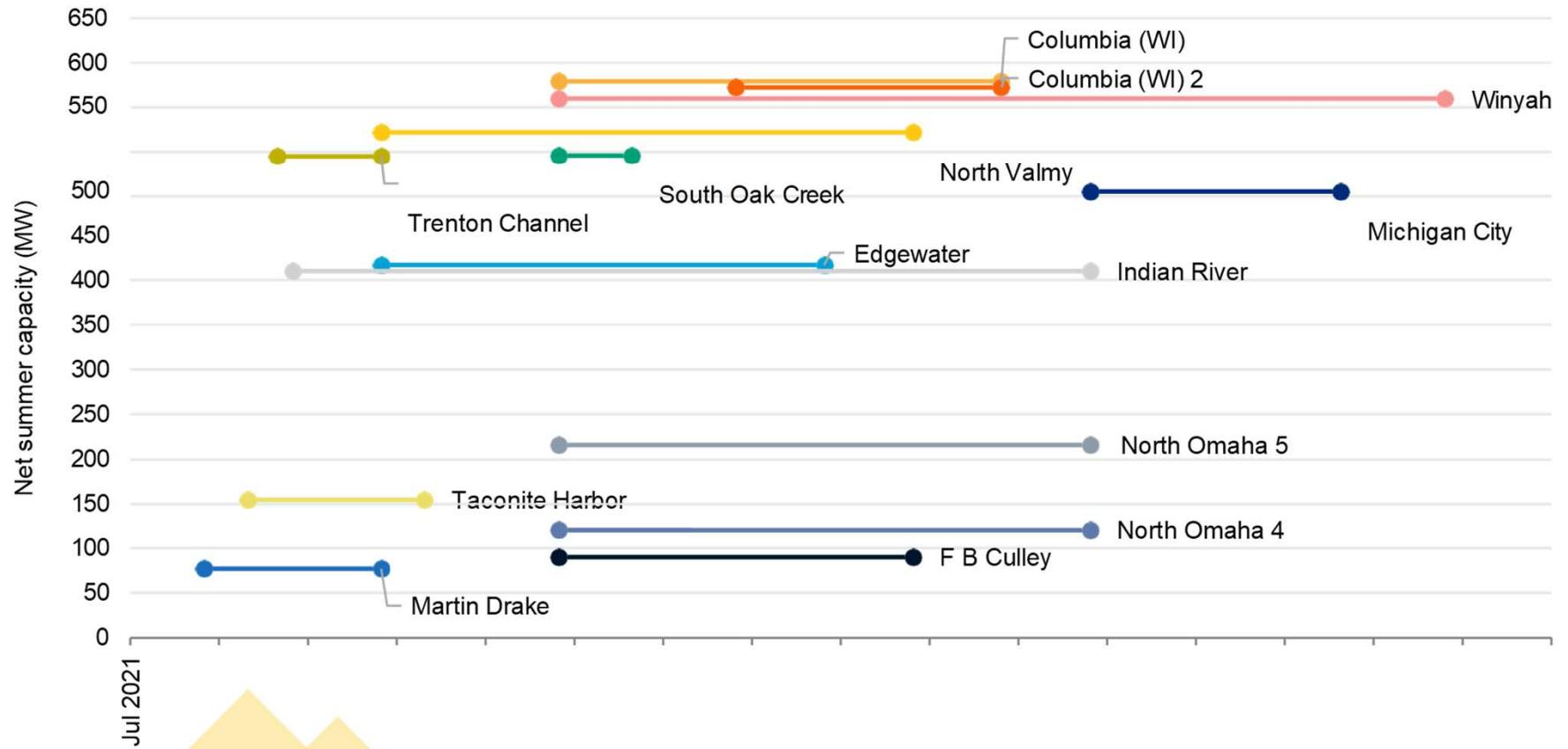
Times Record News

America's power grid facing real trouble

SALEM NEWS

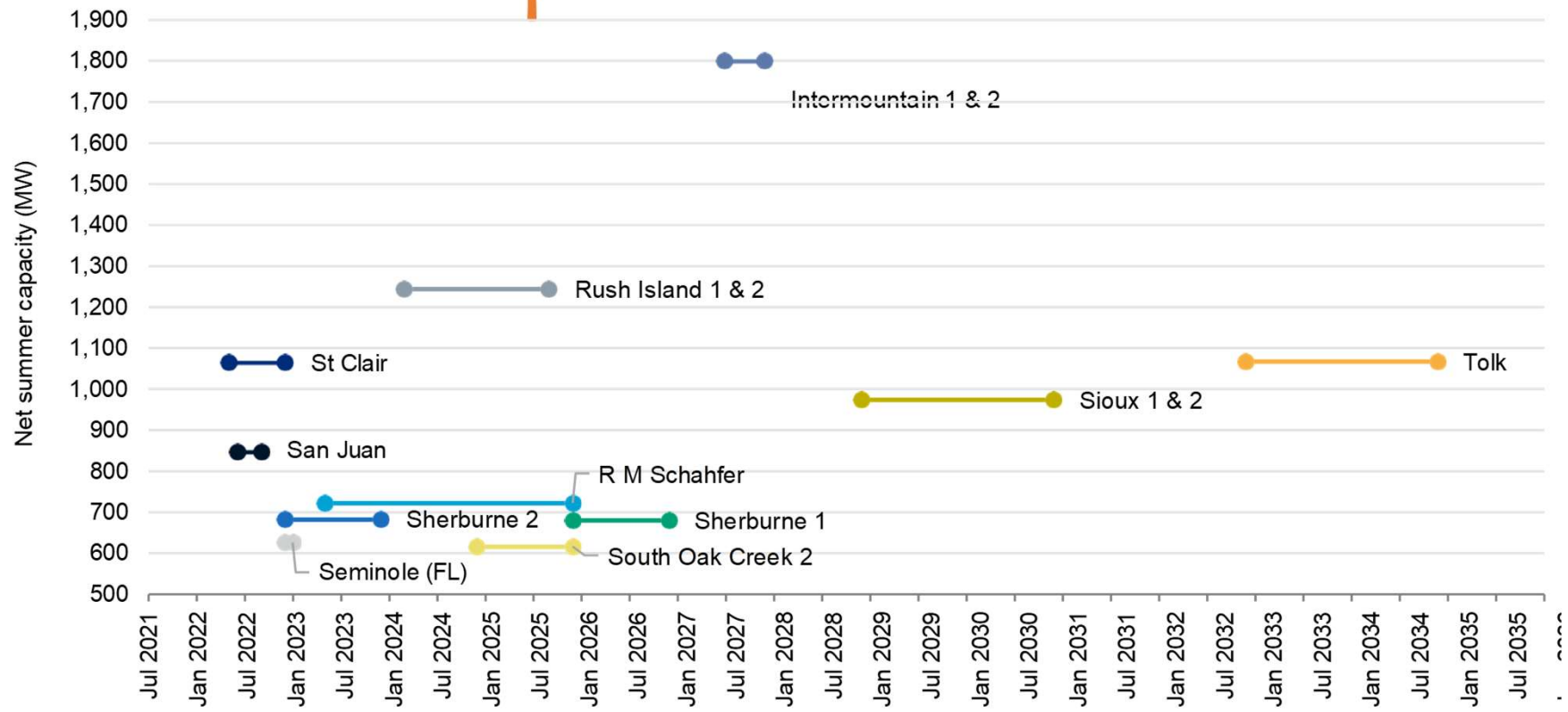
Recent blackouts serve as warning for Ohio power grid

## US coal plant retirement extensions (10 - 600 MW)



- The 40 coal units depicted here represent 16,734 MW of coal-fired generation capacity

US coal plant retirement extensions (>601 MW)



# States Push Back

## **Kentucky –**

- Gives PSC authority to deny closure of a power plant
- Electric Utility must meet 'Rebuttable Presumption'
- Replacement power must be fully dispatchable

## **Utah –**

- Requires the electric utility to promote the sale of the power plant before closing it
- Instructs the state attorney general to sue to protect reliable and dispatchable power
- Provides the electric utility with full recovery of all environmental expenses

# States Push Back

## Montana

- State agencies cannot use Greenhouse gas emissions when evaluation power plant cases

## South Carolina

- Electric utilities IRP should run without CO2 fee added

## Texas

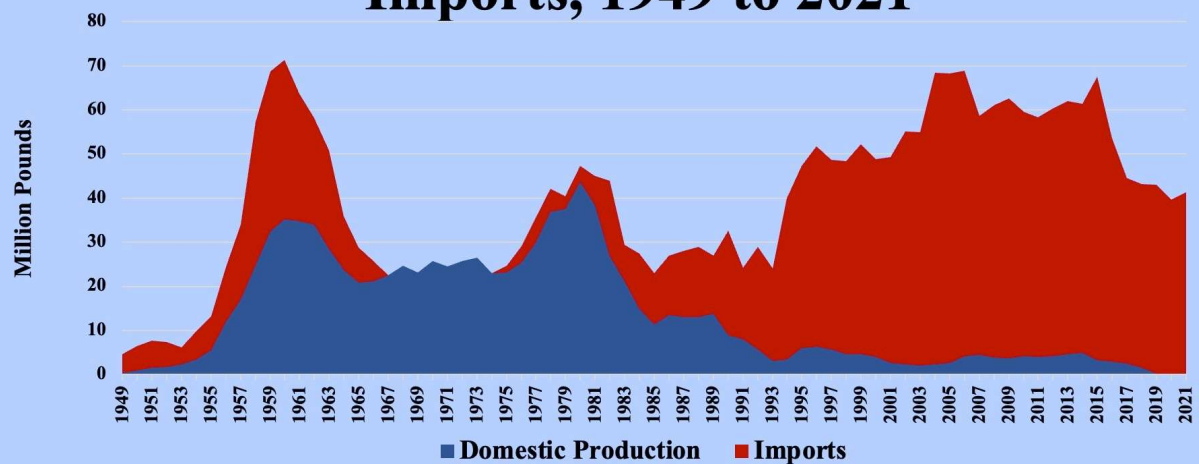
- Market reforms that reward reliability
- All power generators must provide minimum amount of power when called upon

## Wyoming

- Appropriates \$1.2 million for litigation against federal regulation target coal plants

## Pin Hopes on Nuclear

### Got U? US Production Of Uranium Oxide, Vs. Imports, 1949 to 2021



Source: EIA, EPM, <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>, Table 8.2

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# Warning Signs

- Official records proclaim that lack of electricity during Winter Storm Uri's in 2021 cost the lives of **247 people** in Texas. The five-day event caused an estimated **\$100 billion** in economic damage to Texas



- On Christmas eve 2022, electric utilities on the east coast experienced **rolling blackouts** throughout Virginia, North Carolina and Tennessee. Some **4 million** customers were without power for **up to 8 hours**. In New York, official records report 11 residents died due to lack of heat in their apartments.
- After proclaiming it will be the first state to be fossil-fuel free for electricity, California experienced **3 million** of citizens without power during a heat wave in August of 2019.



Questions?