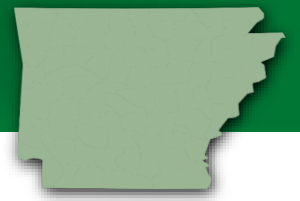
THE POWER OF OUR PEOPLE

Electric Cooperatives of Arkansas Briefing

Buddy Hasten
CEO (AECC-AECI)

Electric Cooperatives of Arkansas



First A Little Bit About Me

- U.S. Nuclear Navy Veteran (1987-2007)
- IOU Experience Alliant Energy (2007-2011)
- Cooperative Experience (2011-2022)
- 30+ years in Energy and Leadership

Electric Cooperatives of Arkansas

Submarine Force Mission Areas

USS SCRANTON – SSN 756

Electric Cooperatives of Arkansas

USS SCRANTON- Panama Canal Transit

USS SCRANTON – North Pole

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USS SCRANTON – North Pole

19 Moves

- Keokuk, IA
- Orlando, FL
- Saratoga Springs, NY
- Auburn, AL
- Newport, RI
- Orlando, FL
- Charleston, SC
- Groton Long Point, CT
- Norfolk, VA
- Portsmouth, NH
- Randolph, VT
- Groton, CT
- Norfolk, VA
- Washington, DC
- Burlington, IA
- Macon, MO
- Springfield, MO
- Rogersville, MO
- **Little Rock, AR**

Electric Cooperatives of Arkansas

Arkansas Electric Cooperative Corporation

Electric Cooperatives of Arkansas

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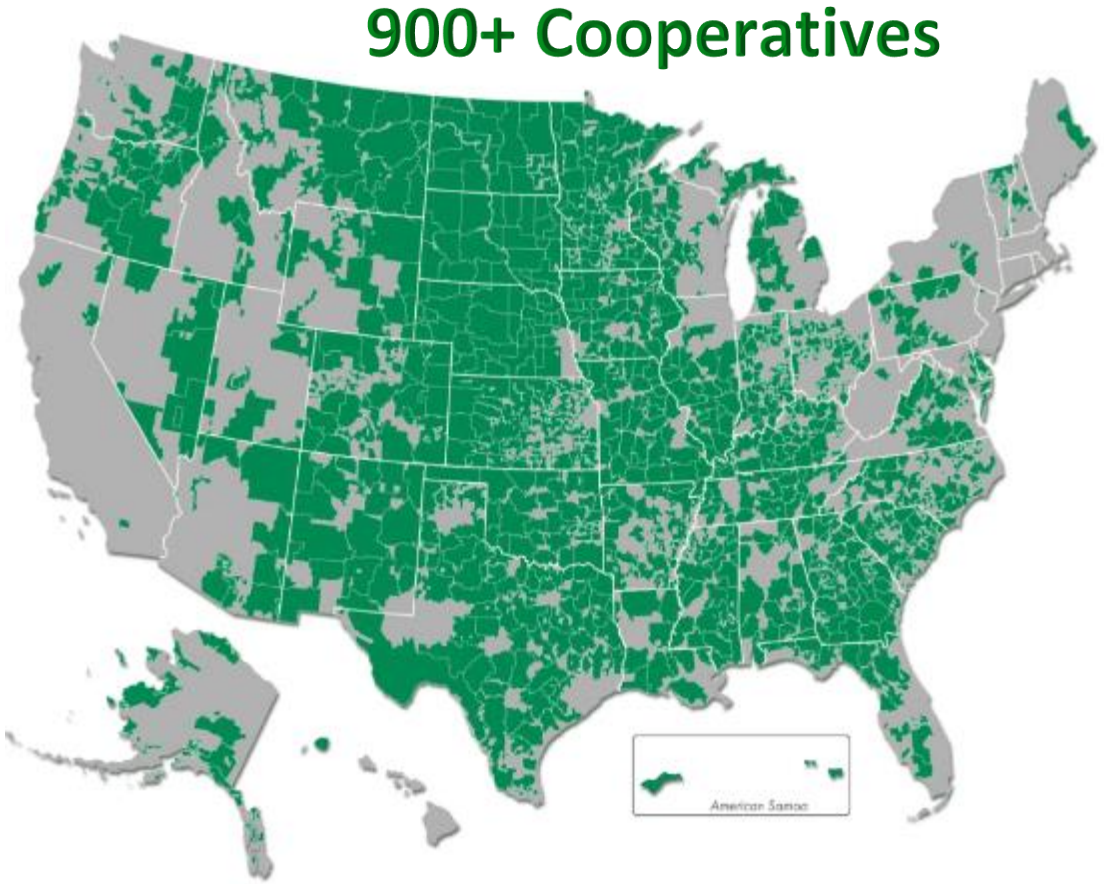
Electric Cooperatives of Arkansas

Electric Cooperative National Impact



- U.S. Sales Output **$881B**
- GDB **$440B**
- Labor Income **$200B**
- Tax Revenues **$112B**
- Jobs **612,000**

Electric Cooperatives of Arkansas

17 Member Cooperatives' Service Territories

2021 Statistics:

- Meters served:
  - ✓ **558,566 System wide**
- Territory served:
  - ✓ **62% of Arkansas land mass**
  - ✓ **33% of the State's consumers**
- Revenue: $1.09B

Electric Cooperatives of Arkansas

Years Analyzed | 2012-2016

Electric Cooperatives of Arkansas

IMPACT ANALYSIS

The Electric Cooperatives of Arkansas comprise 17 electric distribution cooperatives; Arkansas Electric Cooperatives, Inc. (AECI), a Little Rock-based cooperative that provides services to the distribution cooperatives; and Arkansas Electric Cooperative Corp. (AECC), a Little Rock-based generation and transmission cooperative. The distribution cooperatives' service territories cover 60% of the land mass in Arkansas. Electricity is the beginning connection the cooperatives have to improve the quality of life for Arkansans; a conduit for connecting people, fostering community and economic development, furthering business vitality and strengthening the bedrock of the state.

Total Contribution to Gross State Product (GSP) within the 5-year period is more than

$8.8 Billion

or average of $1.76 billion each year

$1.9 Billion

State and Local taxes generated during the 5-year period

Jobs Supported by Infrastructure Investment

28,000

Serving more than

1.2 Million Arkansans

Total Impact of employment and infrastructure spending is

$23 Billion

$131 Million

in direct payments has been returned to members through capital credits

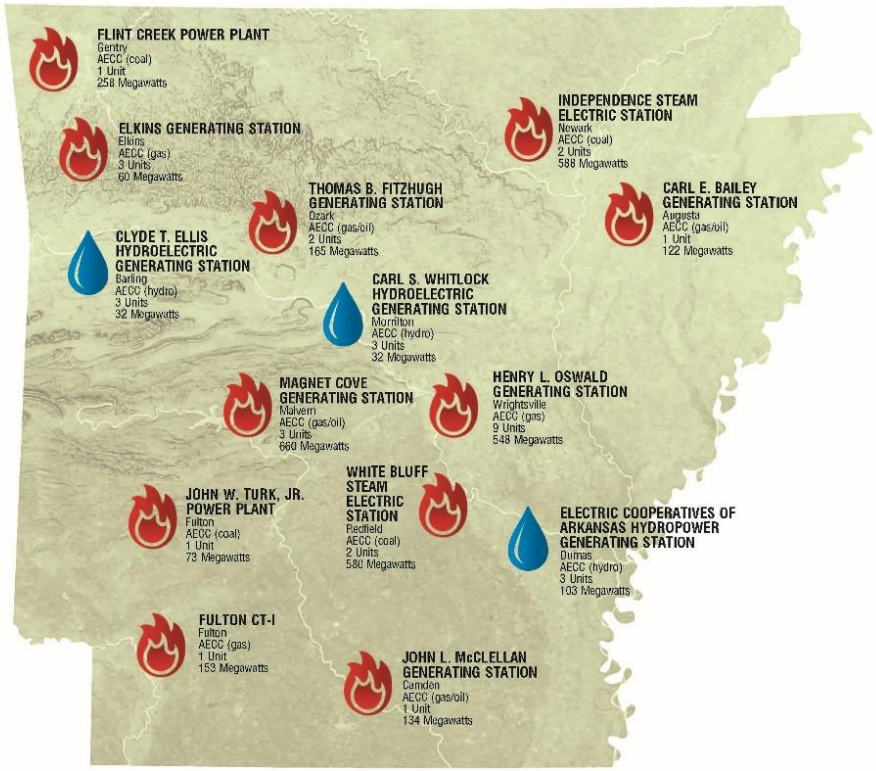
Annual Employment more than

2,000

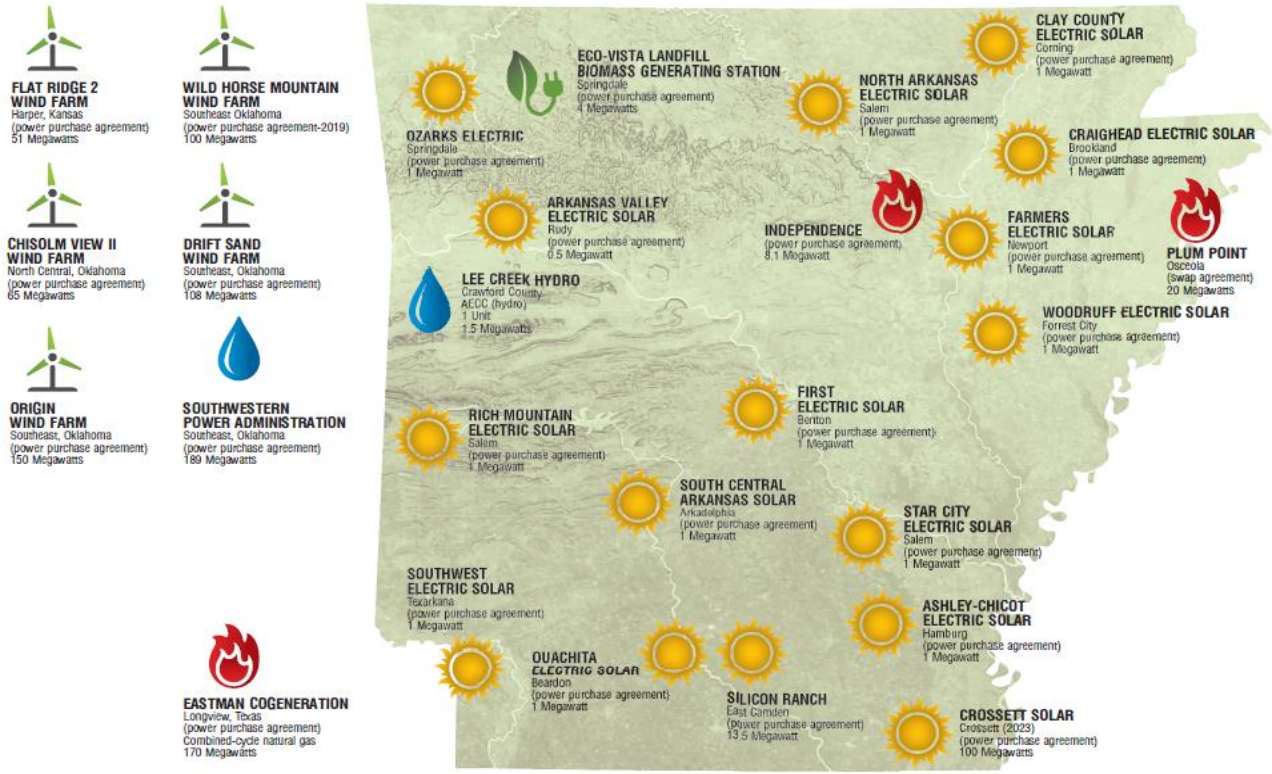
75,155 Miles

of distribution lines

Wholesale Power Resources



Wholly or Jointly Owned



Purchase Power Agreements

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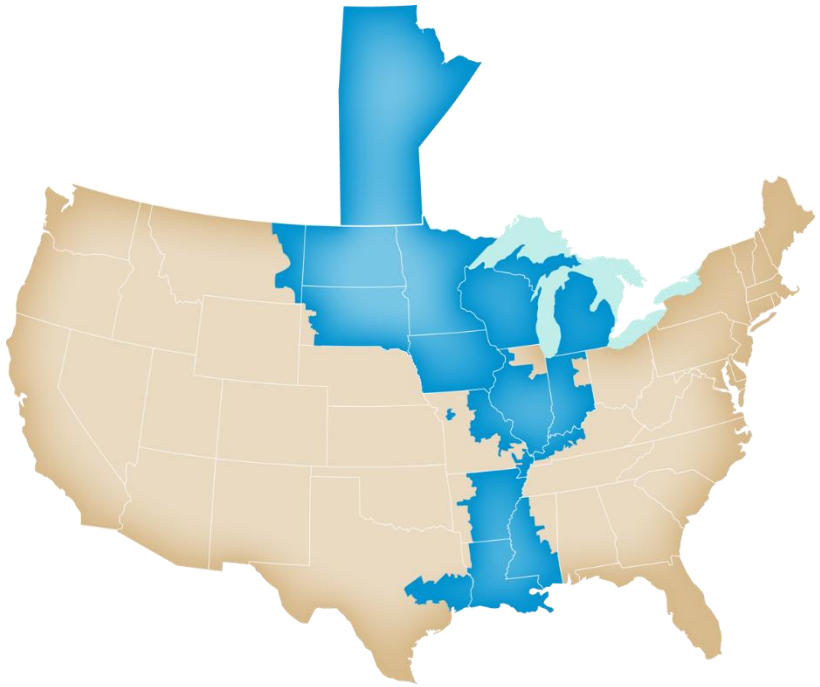
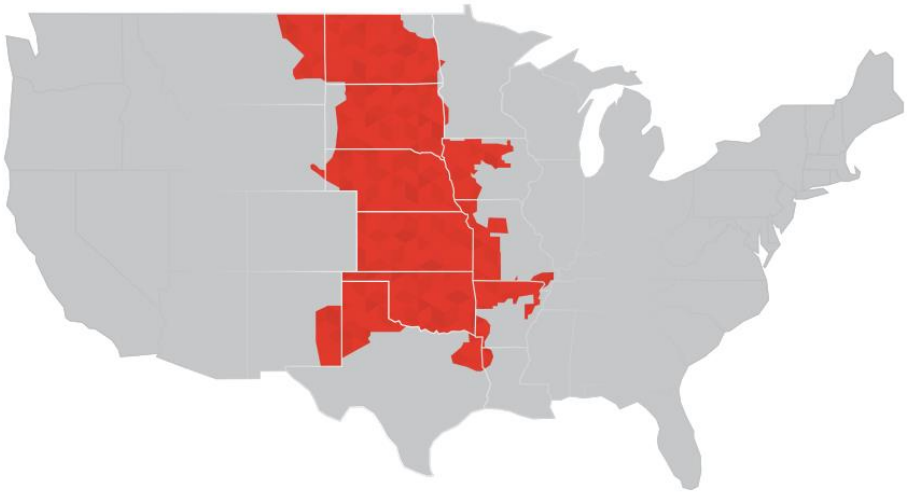
Regional Transmission Organizations



MISO



SPP Southwest Power Pool

Electric Cooperatives of Arkansas

- Bailey Power Plant - Ceased Operations July 10, 2020

~~122 MW~~

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Woodruff County – 122 MW Solar Facility

Commercial Operation- Summer 2023

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- White Bluff Power Plant – Scheduled to Cease Operations 2028

~~581 MW~~

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- Independence Power Plant – Scheduled to Cease Operations 2030

587 MW

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Future Power Supply?

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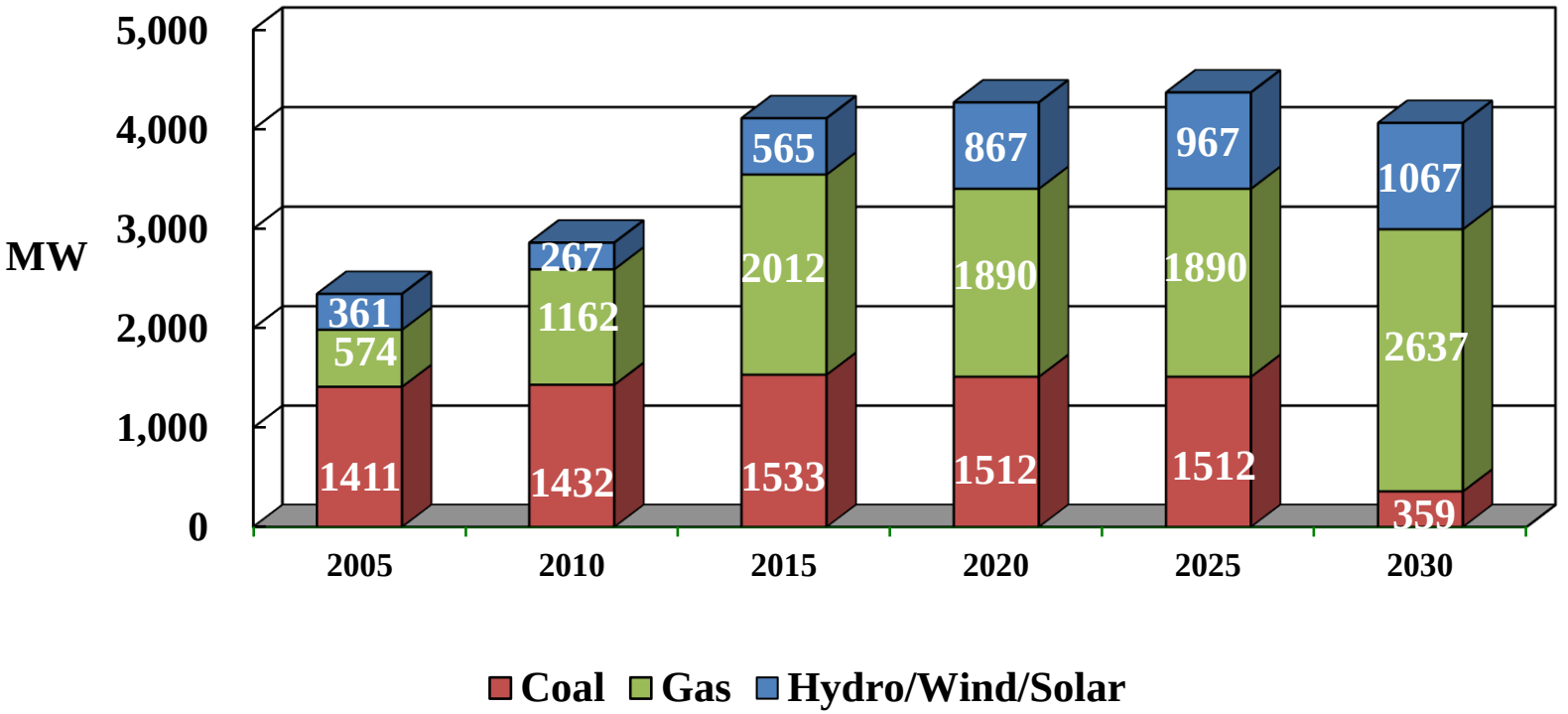
Power Supply Capacity Resources



	2020	2030
Hydro/Wind Solar	20%	26%
Gas	45%	65%
Coal	35%	9%

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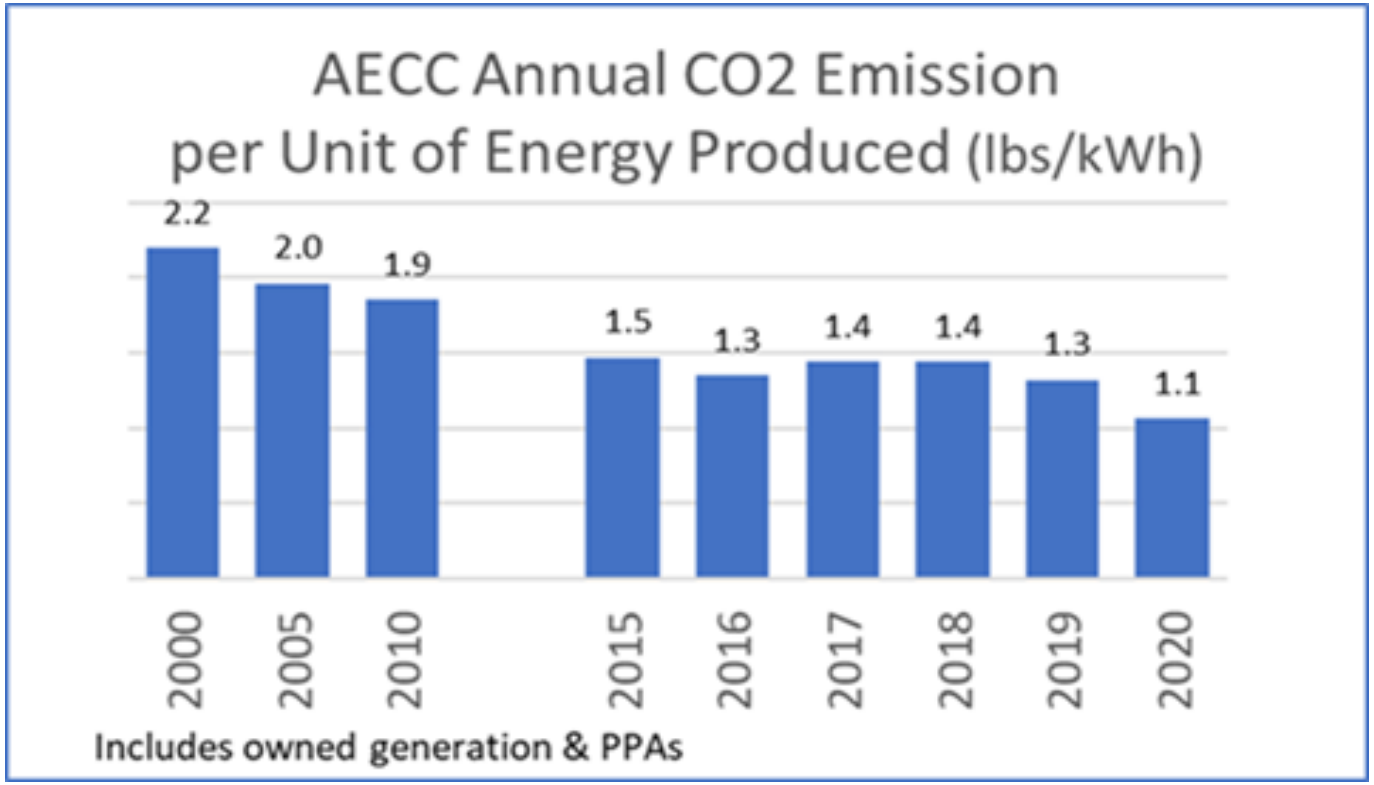
Carbon Reduction (2000-2020)



Carbon intensity has decreased by 50% in the last 20 years

Electric Cooperatives of Arkansas

Truth Serum- Winter Storm Uri 2021

California – Reliability Challenges

European Energy Policy – Crisis 2022

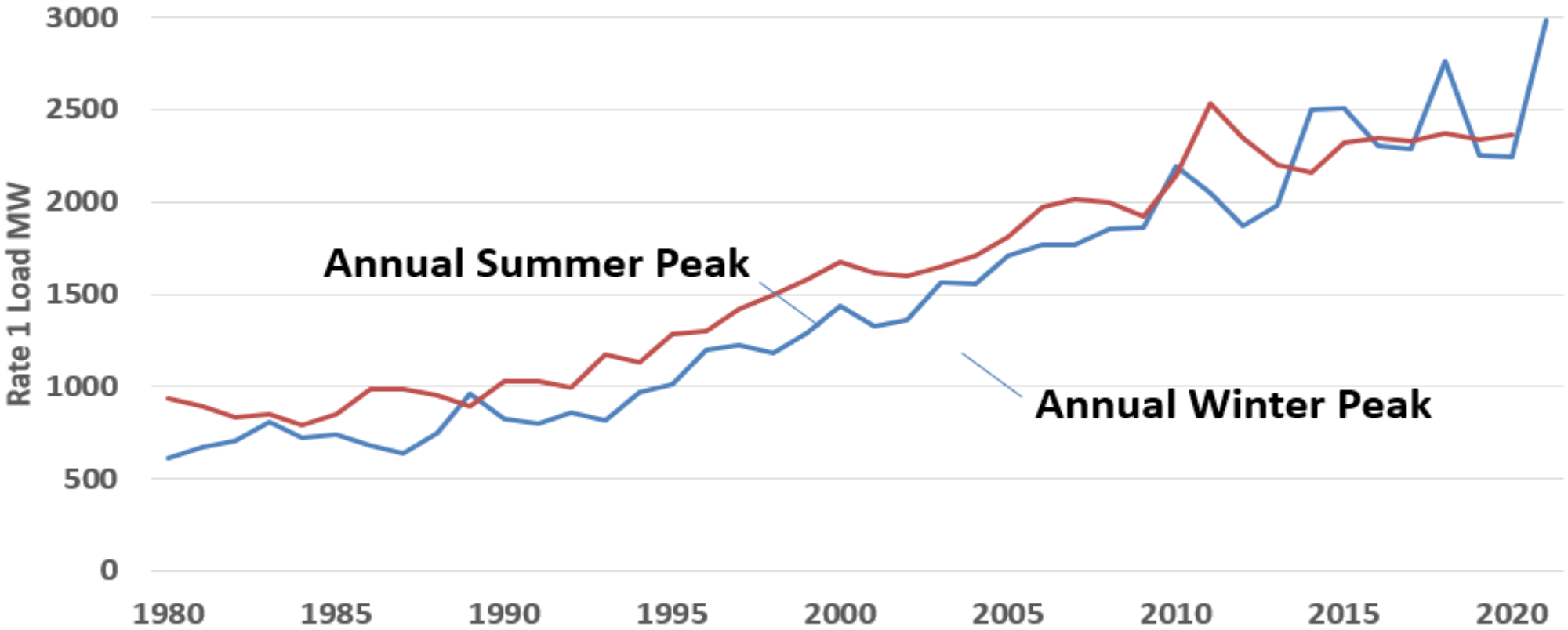
The Great Plains Arctic Blast of 2021

February 15th Record Lows

	Temp(°F)	Previous Record (Year)
Hibbing/Chisholm, MN	-38	-32 (1939)
Valentine, NE	-33	-28 (2007)
North Platte, NE	-29	-23 (1881)
Sioux City, IA	-28	-20 (1936)
Sioux Falls, SD	-26	-21 (1909)
Goodland, KS	-23	-13 (2007)
La Crosse, WI	-19	-16 (1905)
Colorado Springs, CO	-16	-8 (1895)
Lincoln, NE	-16	-11 (1978)
Omaha, NE	-15	-12 (1936)
Dodge City, KS	-14	-10 (1881)
Kansas City, MO	-10	-6 (1936)
Amarillo, TX	-10	-6 (1895)
Topeka, KS	-9	-7 (1936)
Wichita, KS	-8	-5 (1936)
Oklahoma City, OK	-6	7 (1909)
Wichita Falls, TX	-3	18 (2007)
Lubbock, TX	0	8 (1951)
Dallas/Fort Worth,TX	5	15 (1909)
Dallas (Love Field), TX	7	23 (1951)
Austin, TX	8	20 (1909)
San Antonio, TX	9	21 (1909)
Victoria, TX	14	22 (1909)
Houston, TX	17	18 (1905)
Corpus Christi, TX	17	25 (1895)

Winter Storm Uri

AECC Rate 1 Peak Demands



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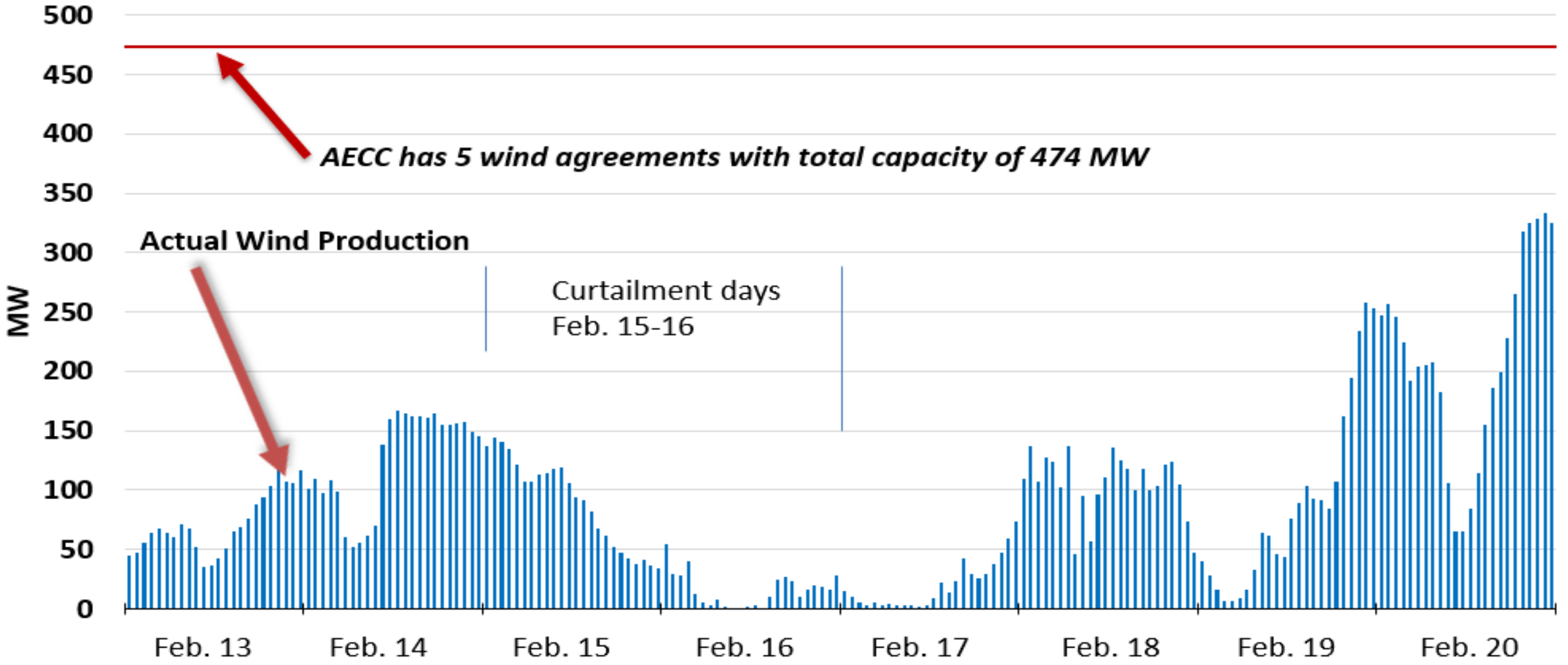
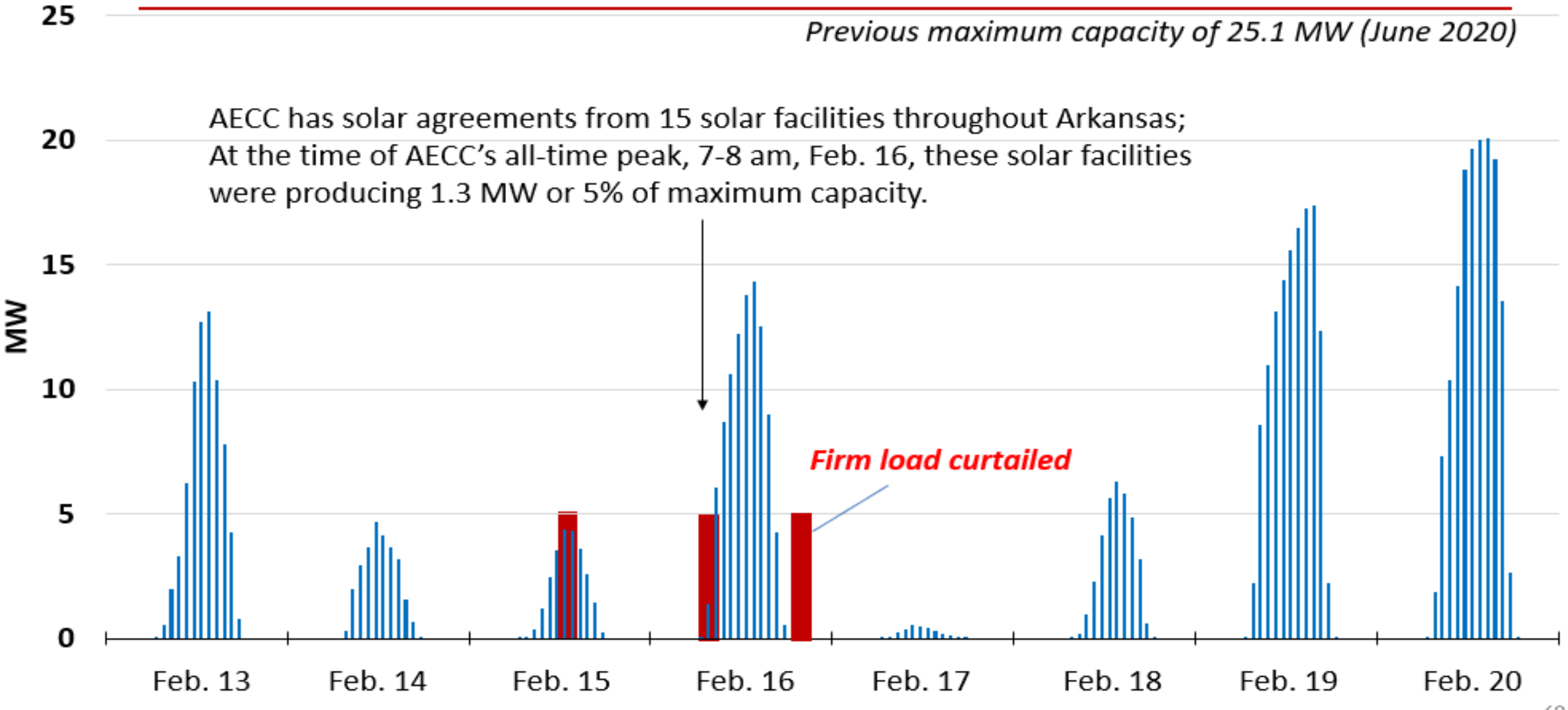
AECC Wind Production, Feb. 13-20



AECC Solar Production, Feb. 13-20



Uri Generation Emergency Event- Impacts

Reliability

13,081 of our member owners' power was cut on Feb. 16

Affordability

$101 million cost for fuel and purchase power

(* $10 billion in Texas)

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California Energy Policy

- ✓ Close Coal Plants
- ✓ Close Nuclear
- ✓ Install Weather Dependent Renewables

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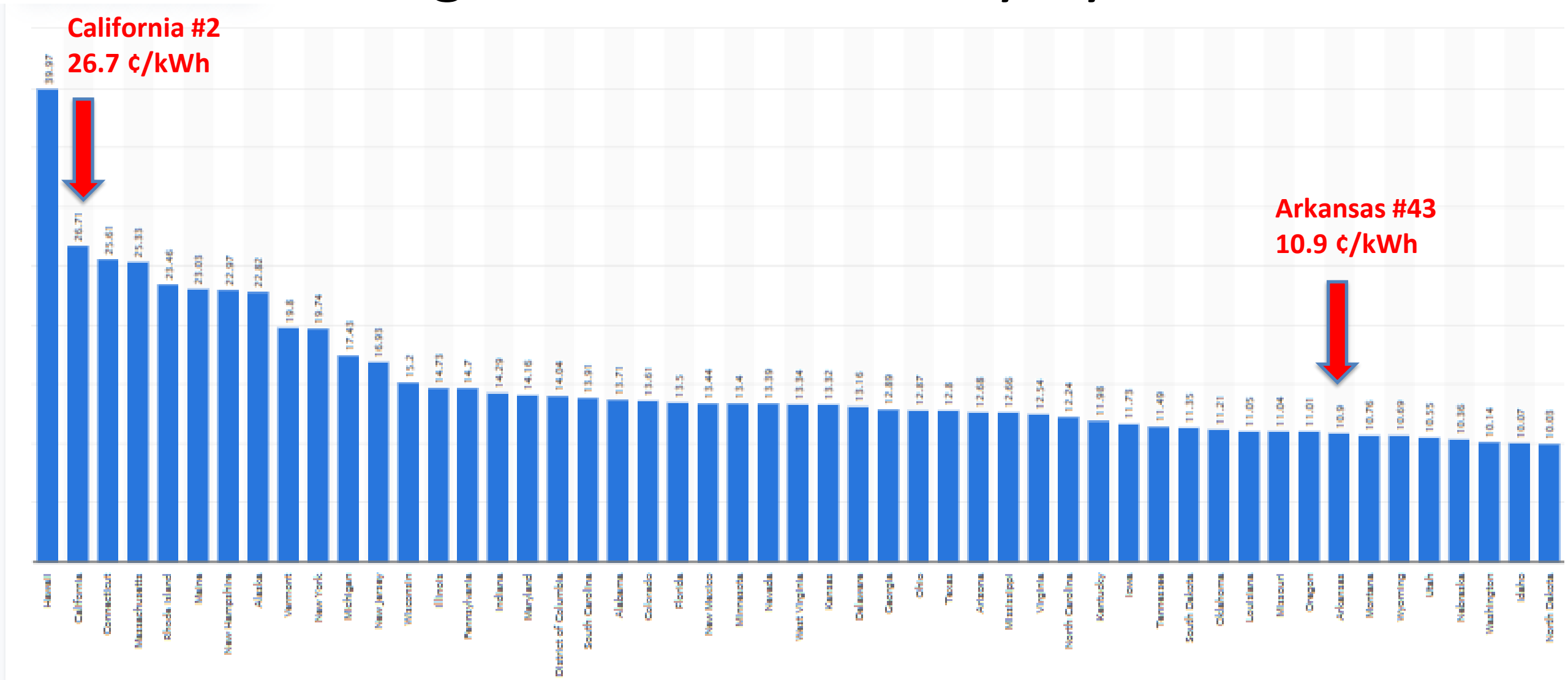
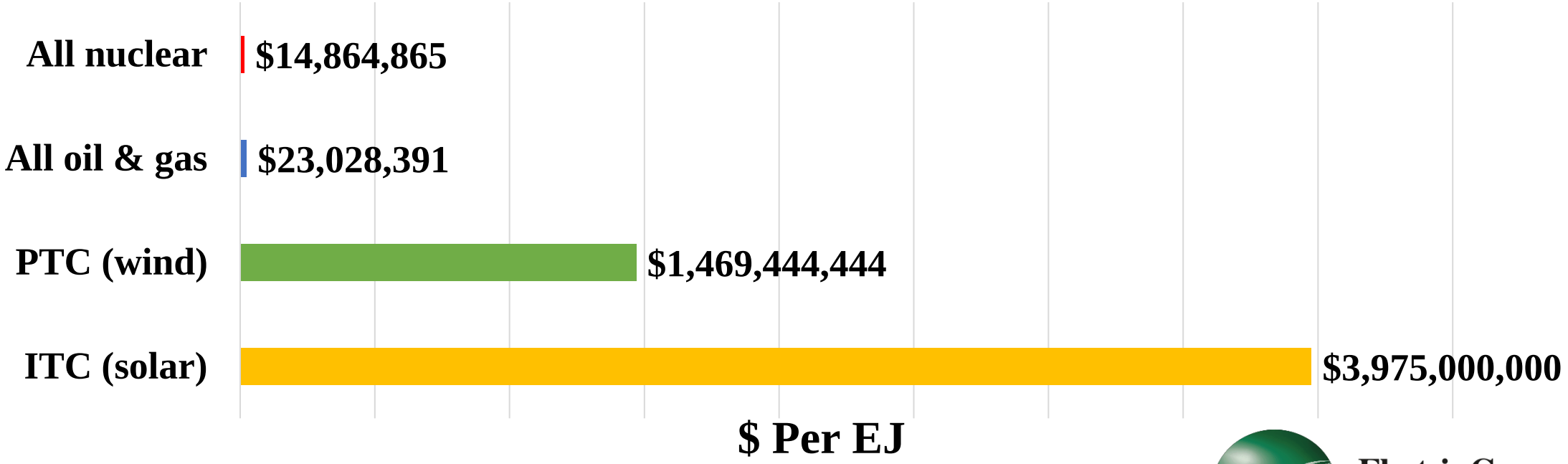
Average Cost of Electricity by State



Follow the Money

Federal Tax Incentives Per Unit of Energy Produced, 2021: Solar Got 267x More Than Nuclear, Wind Got 99x More!



Source: BP, US Treasury, https://home.treasury.gov/policy-issues/tax-policy/tax-expenditures

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California Expresses Frustration as Blackouts Enter 4th Day

The agency that manages the state's electric grid says rolling blackouts are needed to balance supply and demand. But the governor said regulators were not prepared.

Give this article

The California Independent System Operator ordered utilities to shut off power to hundreds of thousands of customers across the state during a heat wave. Jim Wilson/The New York Times

By Ivan Penn

Published Aug. 17, 2020 Updated Aug. 19, 2020

ENERGY

California could see blackouts as heat wave taxes the power grid

September 5, 2022 - 9:22 PM ET

EMMA BOWMAN

Electrical grid towers are seen during a heat wave where temperature reached 105 degrees Fahrenheit, in Pasadena, Calif. on Wednesday.

Net Metering Subsidies Paid by Non-Participants

- Federal incentives
- Rate Design – Demand + Energy + Customer Charge = Retail Rate
- Overcompensation – 1:1 vs Avoided Cost
  - Free use of utility system
- Time Shift of Energy Use
  - Generation “credits” used in shoulder and winter
  - Impact of seasonal operations using NEM
- Taxes- net metering customers do not pay taxes on energy produced or provided back

Arkansas Progressive Net Metering Subsidies

- **Full Retail Rate** is the Energy (kWh) rate which includes Generation and portions of Transmission and Distribution costs.
- **Avoided Cost** is Generation only and is the cost the utility avoided for not having to purchase additional generation. Avoided cost is neutral and does not favor one seller over another.
- Of the Southern states, Arkansas has the most liberal net metering rate at full 1:1 retail swap on all kWhs – Other states have moved away from the "full retail rate"
  - Arkansas - full retail rate (10 cents/kwh)
  - California - 2-3 cents below full retail and moved to a time-of-use rate in 2016.
  - New York Residential - avoided cost
  - Missouri - avoided cost
  - Mississippi - avoided cost plus 2.5 cents
  - Louisiana avoided cost
  - Oklahoma at avoided cost
  - Tennessee does not have a NEM law

Net Metering Overcompensation

Cooperative Residential Average Retail Rate	Distribution Cooperative Subsidy	AECC Average Purchased Solar Rate
10 Cents per kWh*	5.4 Cents kWh	3 Cents per kWh

This creates a perverse subsidy where the non-participating customers, both residential and commercial, are paying for those that have the means to install solar.

Customers not participating in solar programs are hit twice:

1. With the 1:1 full retail swap for Net Metering kWhs, the Net Metering Customer is being overcompensated by more than 3 times that of solar energy AECC can otherwise purchase. (Notably, the Commission would not approve as prudent a purchase power agreement for solar at 10 cents per kWh).
2. As part of that overcompensation, Net Metering Customers are getting a free ride on the utility's infrastructure that all other customers are paying for.

*Not including the Availability Charge

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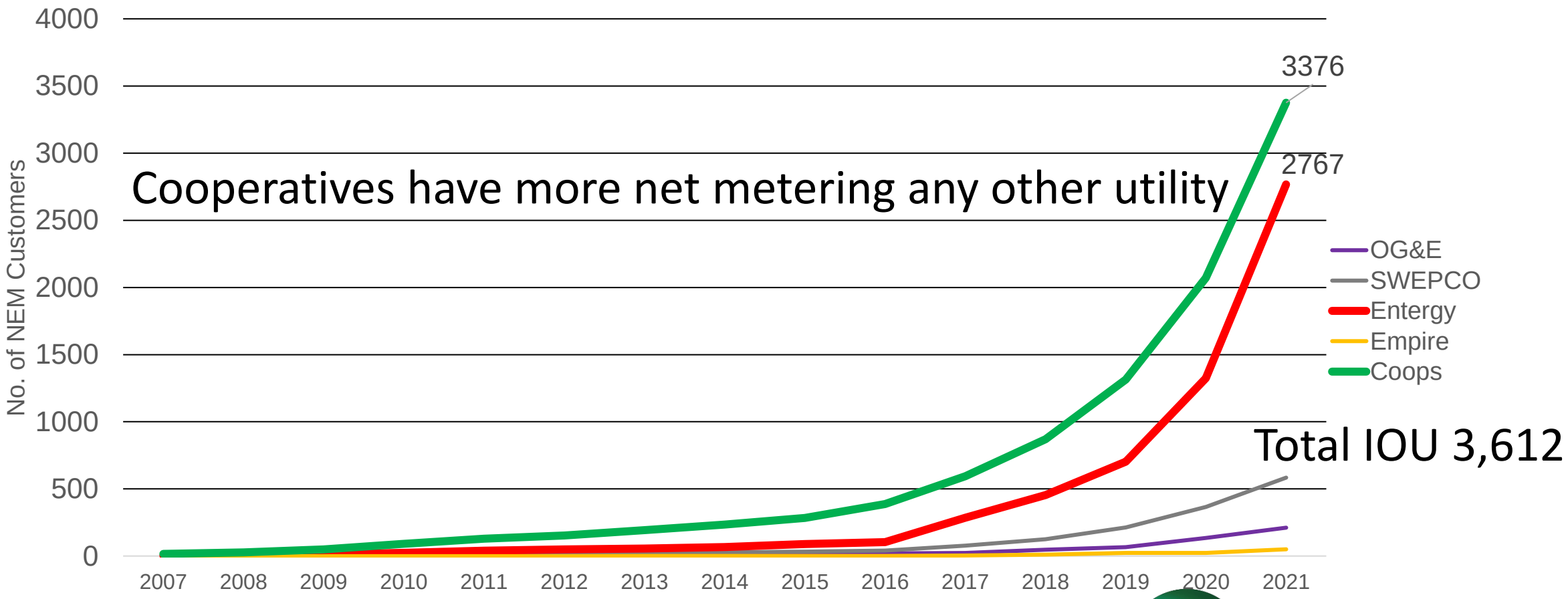
Total Net Metering Customers



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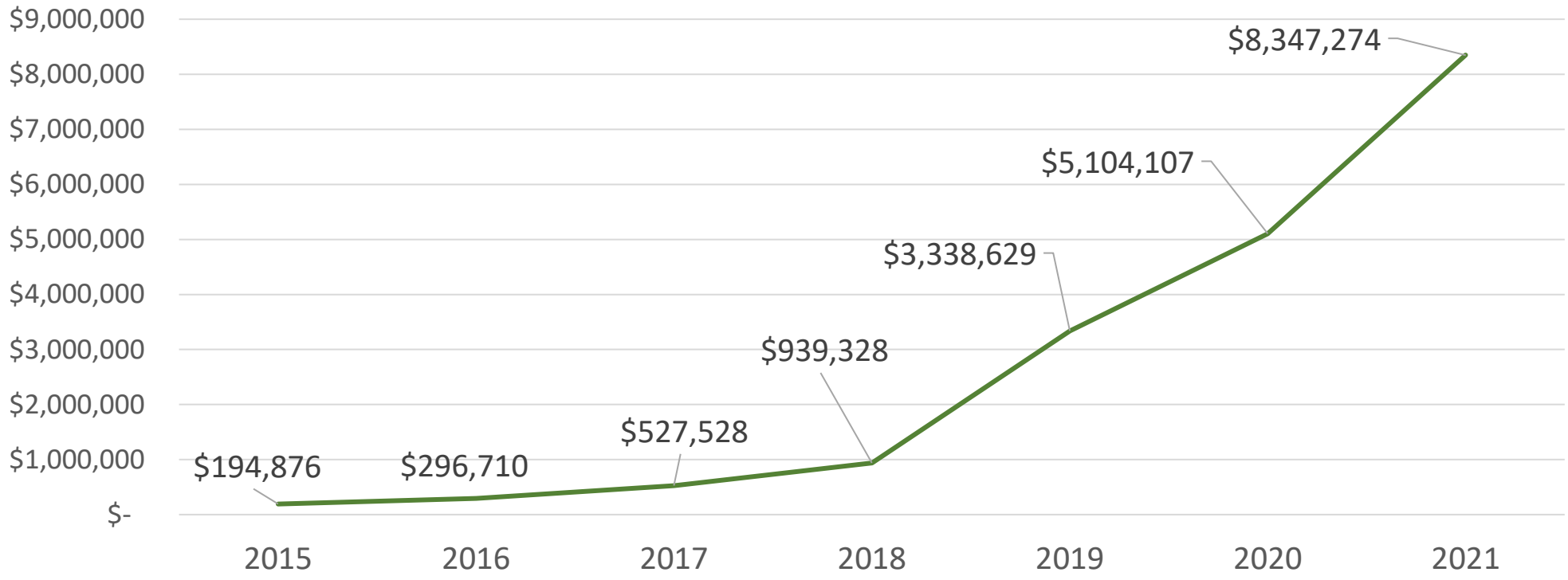
Cost to Cooperative Members

As a Member-Owned utility, this represents an amount not returned to Members



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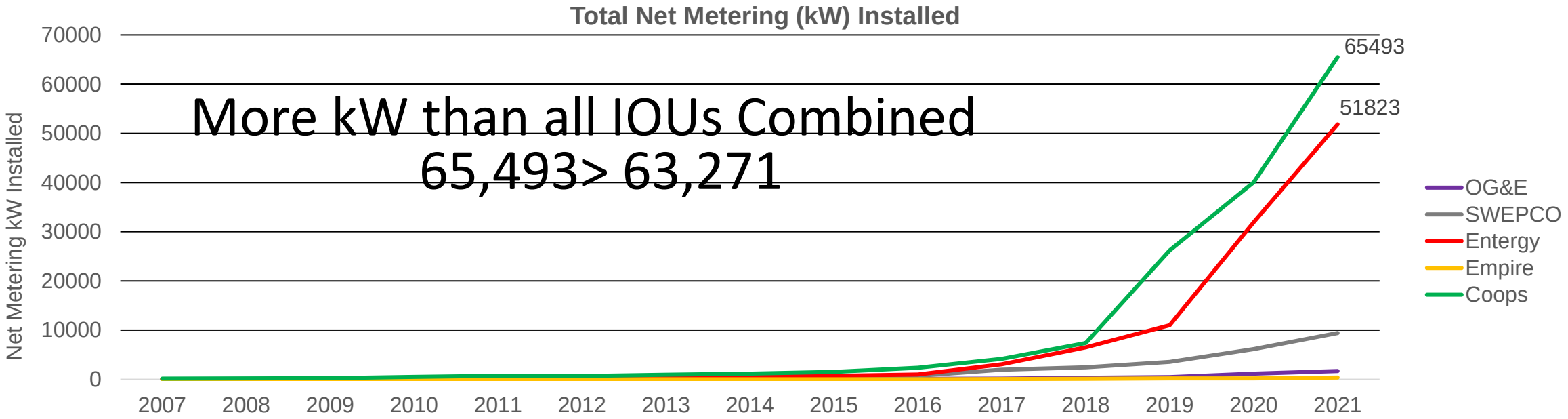
Arkansas Progressive Net Metering Policy - Capacity

- Arkansas allows NEM facilities up to 20 MW –
  - PURPA (federal law)– mandatory purchase obligation 5 MW
  - Other states are 2 MW or less:
    - California PG&E 1 MW
    - Hawaii 100 kW or less
    - New York 2 MW
    - Washington 100 kW
    - Louisiana & Oklahoma 300 kW
- Arkansas allows meter aggregation across an entire utility footprint regardless of class – Other states do not; if allowed, it is not full 1:1 retail rate. (Example: California requires meters to be on contiguous property)
- California in part is suffering grid issues because of its Net Metering Policy. Recently California has issued plans to transition to EV only sales, while simultaneously its grid operator asked for Californians not to charge their vehicles because of system emergency.

Saturation

- December 2021, Cooperatives were at 2.5% net metering solar penetration.
- At the current growth rate, it will reach 5% in 2024.
- Mississippi has capped solar penetration at 3% of a utility's peak.



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European Energy Policy – the proverbial canary in a mine shaft

Europe is halfway into closing all coal power plants by 2030

Photo: Nedu503 from Pixabay

Published
March 25, 2021

Country
Region/EU

Author
Igor Todorović

Fifty percent of coal-fired thermal power plants are closed or planned to be shut down by the end of the decade, according to data compiled by Europe Beyond Coal. Operators of the facilities are under pressure from rising prices of CO2 emission allowances, environmental regulations and the drop in costs for renewable energy production.

EDF Energy has announced it would decommission its West Burton A coal-fired thermal

17 May 2021, 09:59 Kerstine Appunn

Shutting down nuclear and coal – can Germany maintain supply security on renewables alone?

#Grid

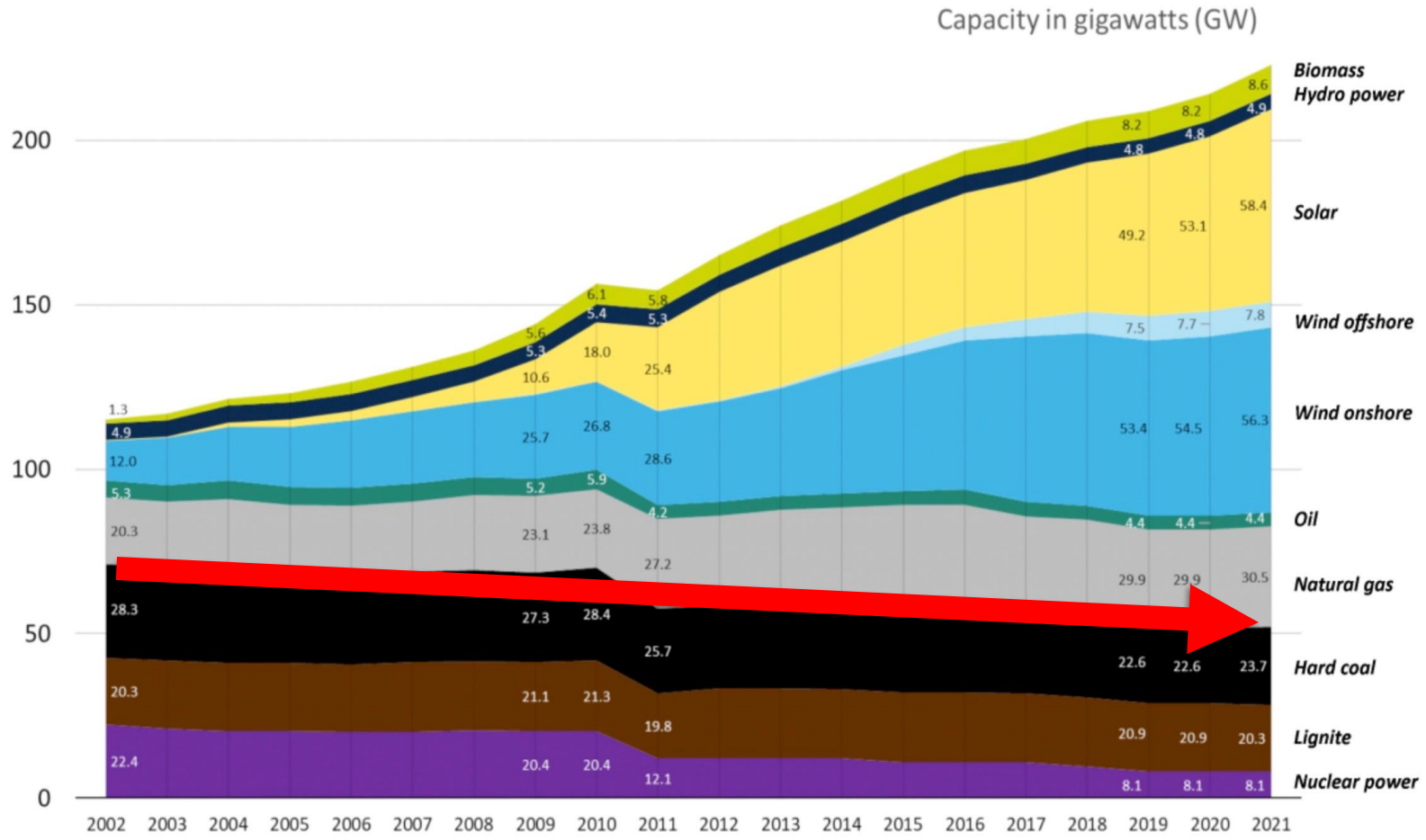
Is Germany Making Too Much Renewable Energy?

The energy transition of Europe's biggest economy is running up against questions with no easy answers.

By Paul Hockenos, a Berlin-based journalist.

Wind turbines are seen on a plain near Bremerhaven, Germany on Dec. 26, 2017. PATRIK STOLLARZ/AFP VIA GETTY IMAGES

Germany's Installed Generation Capacity, 2002 to 2021



Total Capacity Doubled

- 20 GW Coal & Nuclear

+ 90 GW Renewables

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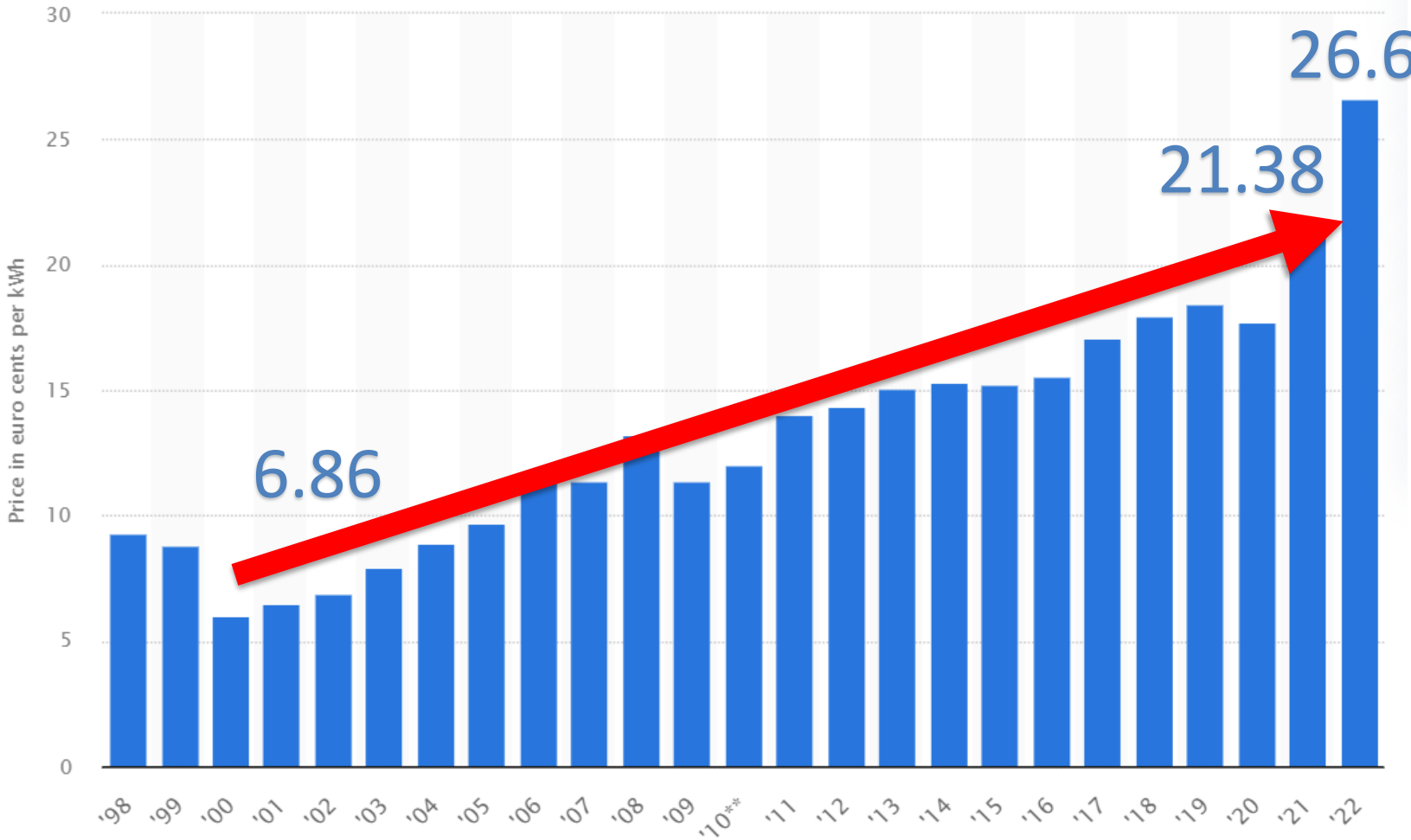
Annual electricity prices (including electricity tax) for industrial businesses in Germany from 1998 to 2022 (in euro cents per kilowatt hour)*



- Prices more than tripled
- Data before Ukraine Invasion

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Why Energy
Security
Matters

Russia cuts gas flows further as Europe urges energy saving

By Christoph Steitz and Nina Chestney

Gas prices jump as Russia cuts German supply

By Noor Nanji
Business reporter, BBC News

Putin's new gas squeeze condemns Europe to recession and a hard winter of rationing

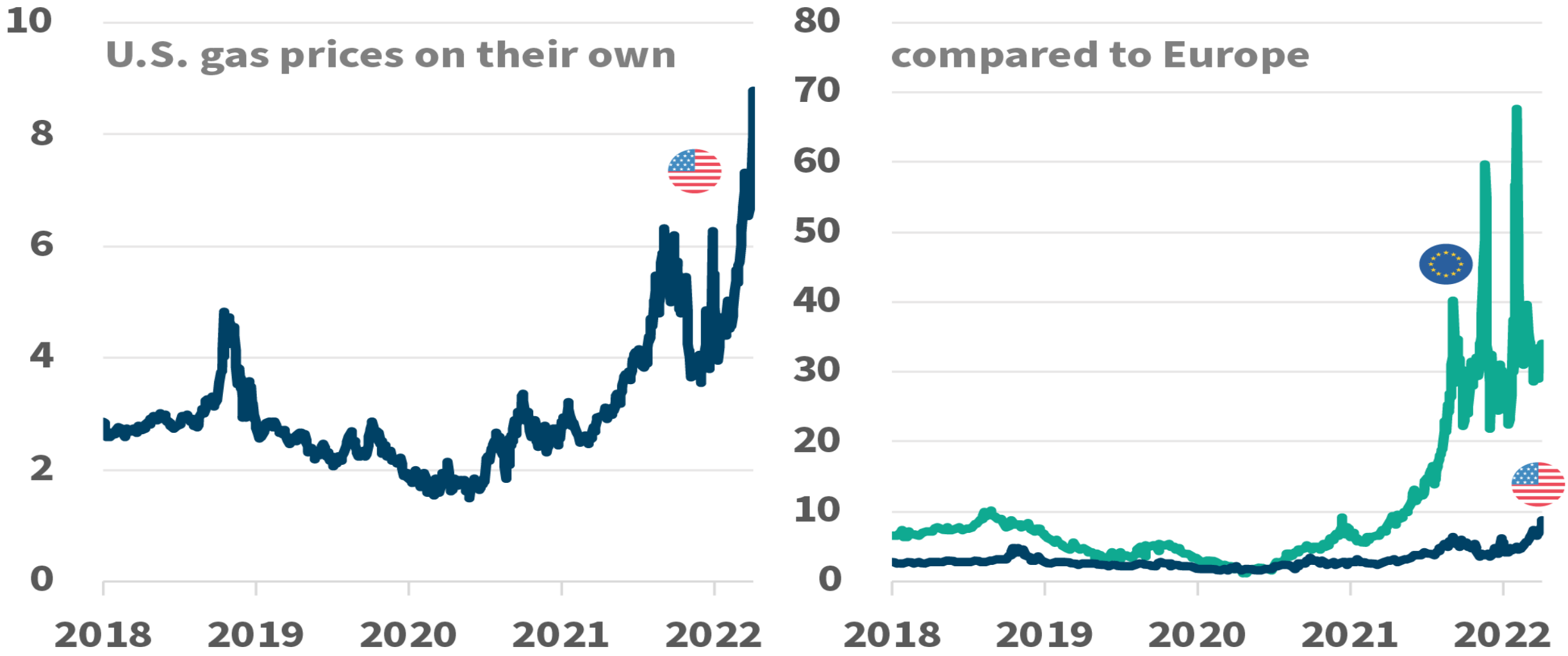
PUBLISHED WED, JUL 27 2022•1:49 AM EDT | UPDATED WED, JUL 27 2022•9:22 AM EDT

Holly Ellyatt
@HOLLYELLYATT

SHARE

Natural gas prices in the United States and Europe

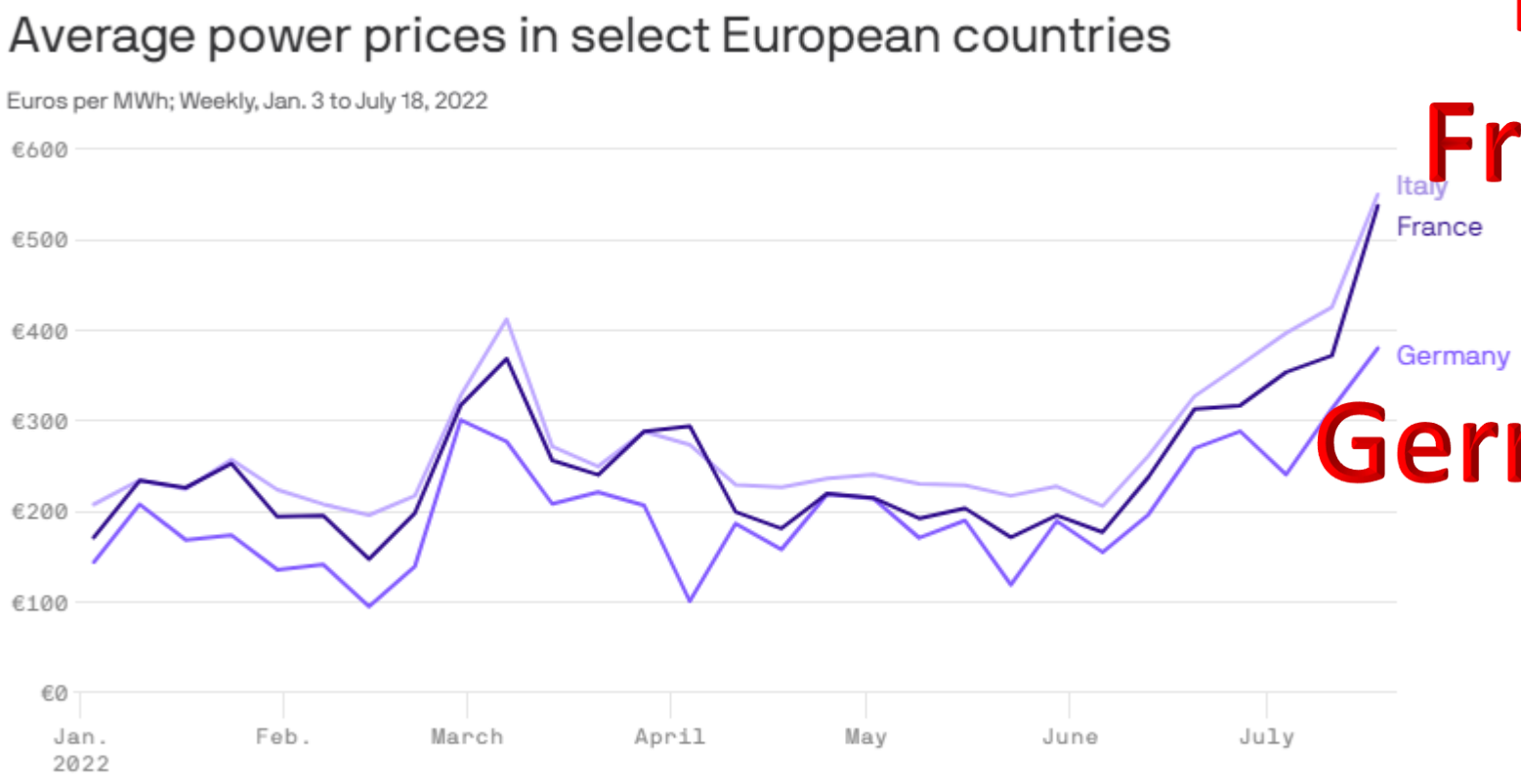
U.S. dollars per million British thermal units (MMBtu)



Source: Bloomberg. Prompt month contract prices to May 5, 2022. Henry Hub for the United States. Title Transfer Facility (TTF) for Europe.

Markets

Europe's Benchmark Power Price Breaks 1,000 Euros for First Time



Data: Rystad Energy; Chart: Thomas Oide/Axios

Italy $550/MWh

France $525/MWh

$1000 (2023)

Germany $395/MWh

$993 (2023)

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RENEWABLES

Wind farm in Germany is being dismantled to expand coal mine

Photo: RWE

Published
October 25, 2022

Country
Region/EU

A wind farm in Germany is being dismantled to expand the Garzweiler lignite mine. One of eight turbines installed at the location in 2001 has already been removed. Nevertheless, the German state of North Rhine-Westphalia said it would phase out coal by 2030, as did RWE, the company that owns the mine.

MOST POPULAR

October 25, 2022

Wind farm in Germany is being dismantled to expand coal mine

October 12, 2022

France joins Germany in accusing US of using Ukraine war to overcharge for gas

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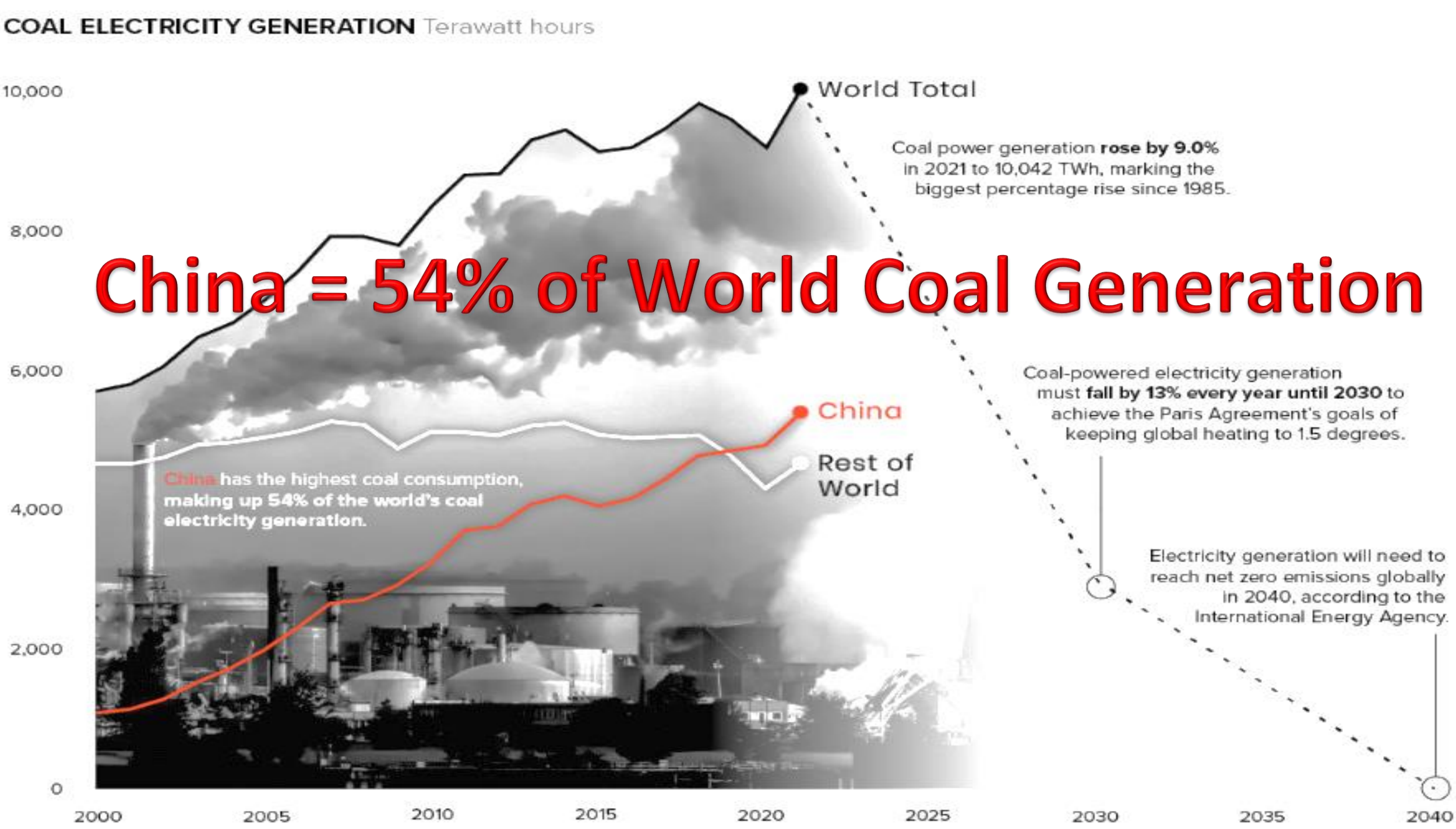
US – China Energy Policy


COAL ELECTRICITY GENERATION Terawatt hours
10,000
8,000
6,000
4,000
2,000
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
World Total
Coal power generation rose by 9.0% in 2021 to 10,042 TWh, marking the biggest percentage rise since 1985.
China = 54% of World Coal Generation
China
Rest of World
China has the highest coal consumption, making up 54% of the world's coal electricity generation.
Coal-powered electricity generation must fall by 13% every year until 2030 to achieve the Paris Agreement's goals of keeping global heating to 1.5 degrees.
Electricity generation will need to reach net zero emissions globally in 2040, according to the International Energy Agency.

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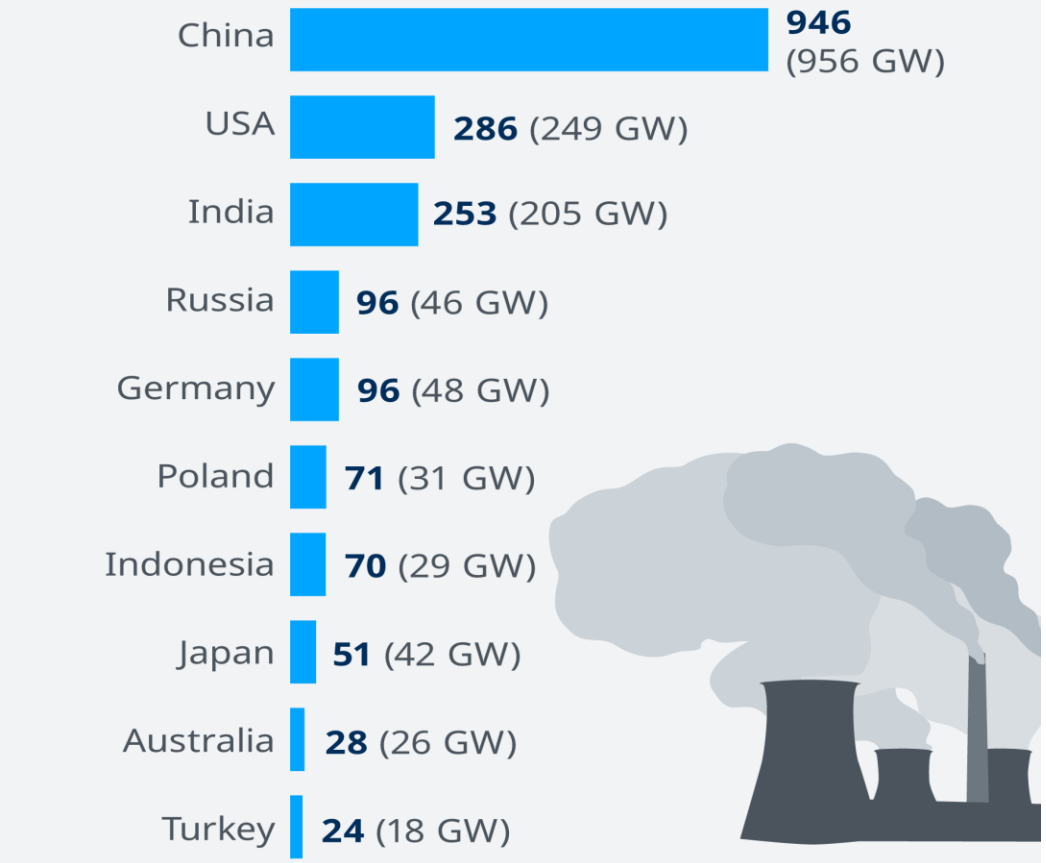
The ten countries with the most coal-fired power plants

Number of plants (capacity in Gigawatts)



Source: World Resources Institute, June 2021

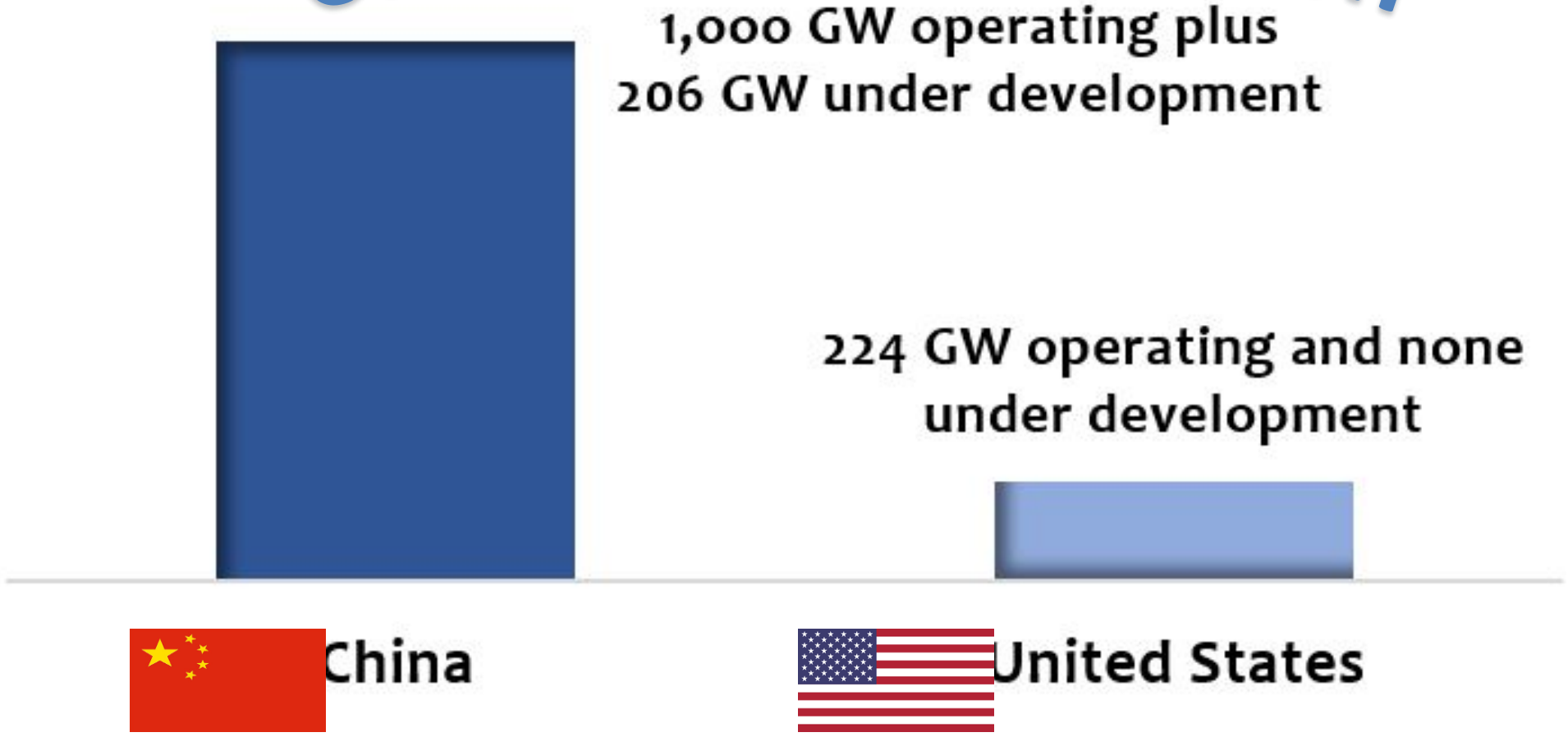
The Countries Still Strongly Committed to Coal

Countries with the most coal power plants in (pre-)construction as of July 2021

Source: Global Energy Monitor

statista

Coal Plant Comparison



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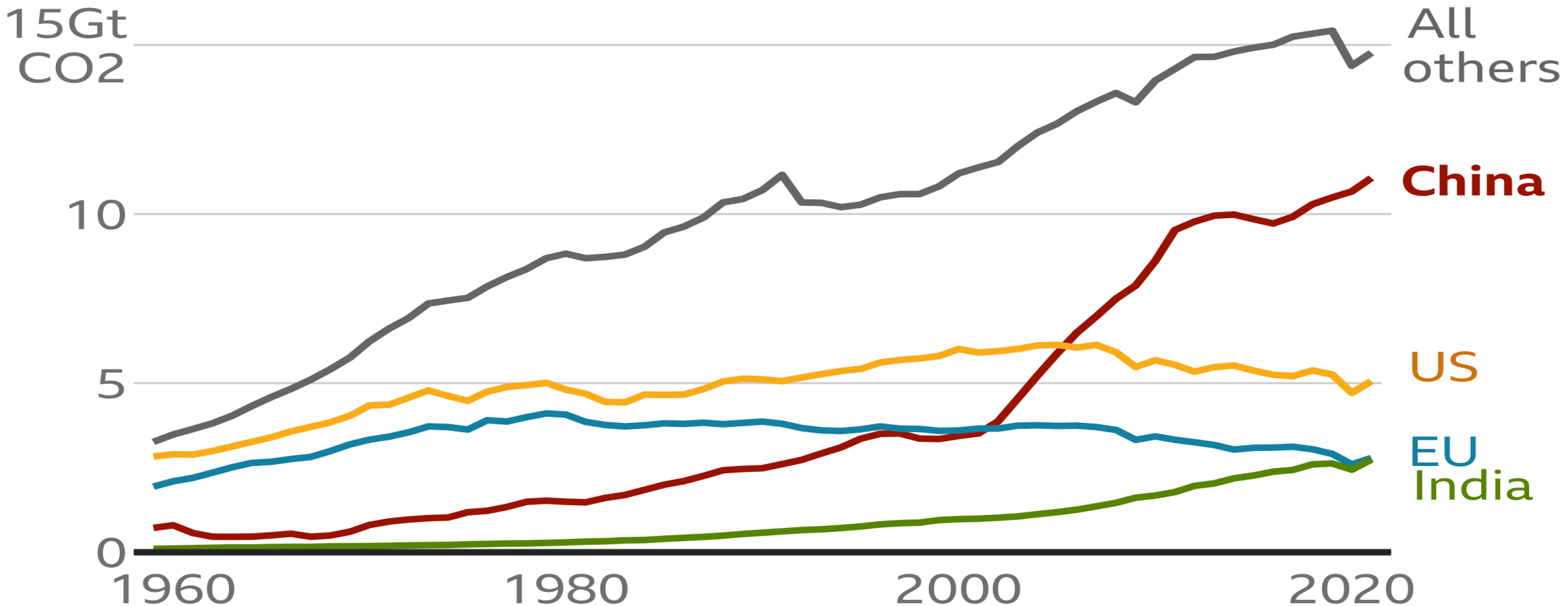
China's emissions are still rising

Annual CO2 emissions in gigatonnes



One gigatonne = one billion tonnes
Figures for 2021 are projections

Source: Global Carbon Budget 2021

BBC

The Countries With the Most Nuclear Reactors

Number of operational reactor units by country in 2021

		Change since 2011
United States	93	-11
France	56	-2
China	52	+39
Russia	38	+6
South Korea	23	+2
India	21	+1
Canada	19	+1
Ukraine	15	-4
United Kingdom	13	-2
Japan	9	-39

Source: World Nuclear Industry Status Report 2021

Last 10 Years

-11

+39

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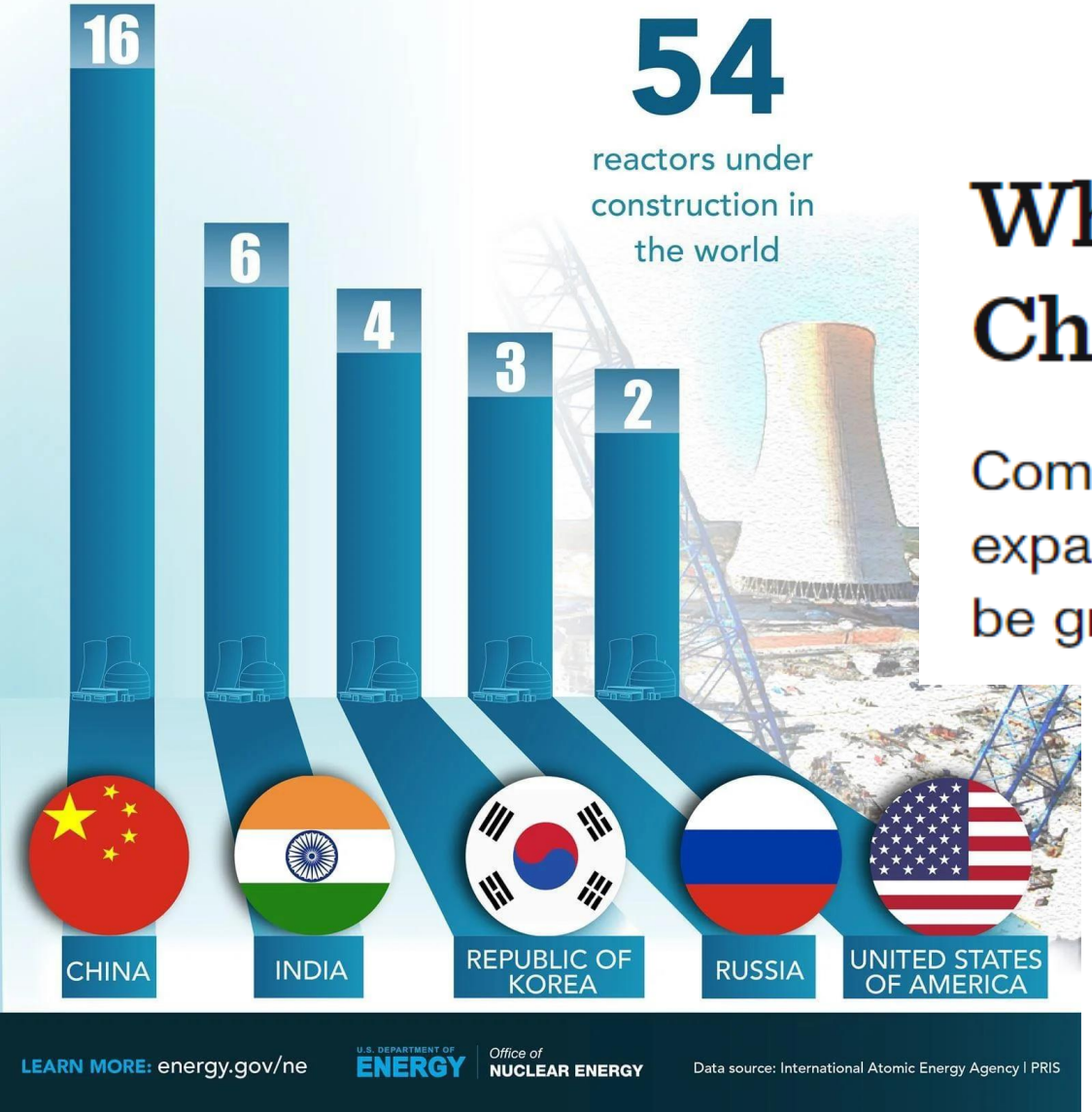
Who's Building Reactors?

Number of reactors under construction



What the US could learn from China's nuclear power expansion

Commentary: China is embarking on the biggest expansion of nuclear power in human history. That could be great news.

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Green | Energy & Science

China's Climate Goals Hinge on a $440 Billion Nuclear Buildout

China is planning at least 150 new reactors in the next 15 years, more than the rest of the world has built in the past 35.

By Dan Murtaugh and Krystal Chia

November 2, 2021 at 3:00 PM CDT

China is the world's largest investor in nuclear power, with estimations suggesting it will pay up to 440 billion dollars towards building new nuclear power plants over the next 15 years, **allowing it to overtake the U.S. as the world's top generator of nuclear electricity**.

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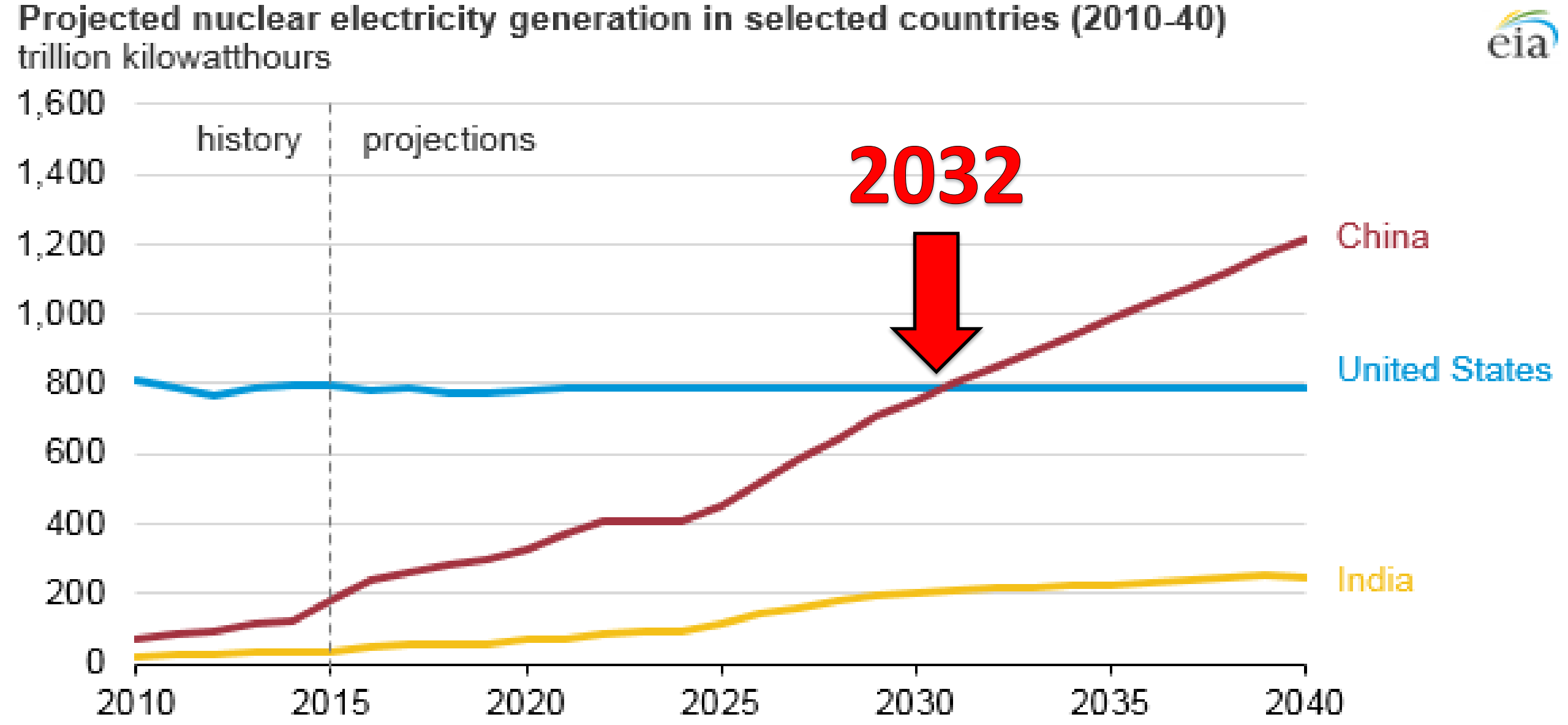
Projected nuclear electricity generation in selected countries (2010-40)
trillion kilowatthours
eia
1,600
1,400
1,200
1,000
800
600
400
200
0
history
projections
2032
China
United States
India
2010
2015
2020
2025
2030
2035
2040

China Shows How to Build Nuclear Reactors Fast and Cheap

*It seems as though **5 years and about $2 billion per reactor** has become routine for China. If that can be maintained, then China will be well-positioned as the world's nuclear energy leader about the time their middle-class swells to over one billion. (Forbes)*

*China keeps the exact costs a state secret, but analysts including BloombergNEF and the World Nuclear Association estimate **China can build plants for about $2,500 to $3,000 per kilowatt**, about one-third of the cost of recent projects in the U.S. and France. (Bloomberg)*

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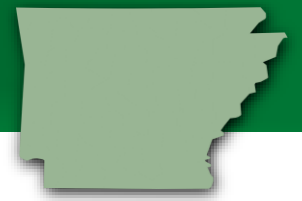
ASIA SOCIETY POLICY INSTITUTE

China's Doubling Down on Energy Security May Slow its Climate Progress

Chinese President Xi Jinping has remarked that decarbonization "***should be neither too fast nor too slow; rather, it should progress steadily***." He has indicated that **China must not dismantle its existing energy sources before new, cleaner sources are fully built out**.



BALANCE OF POWER

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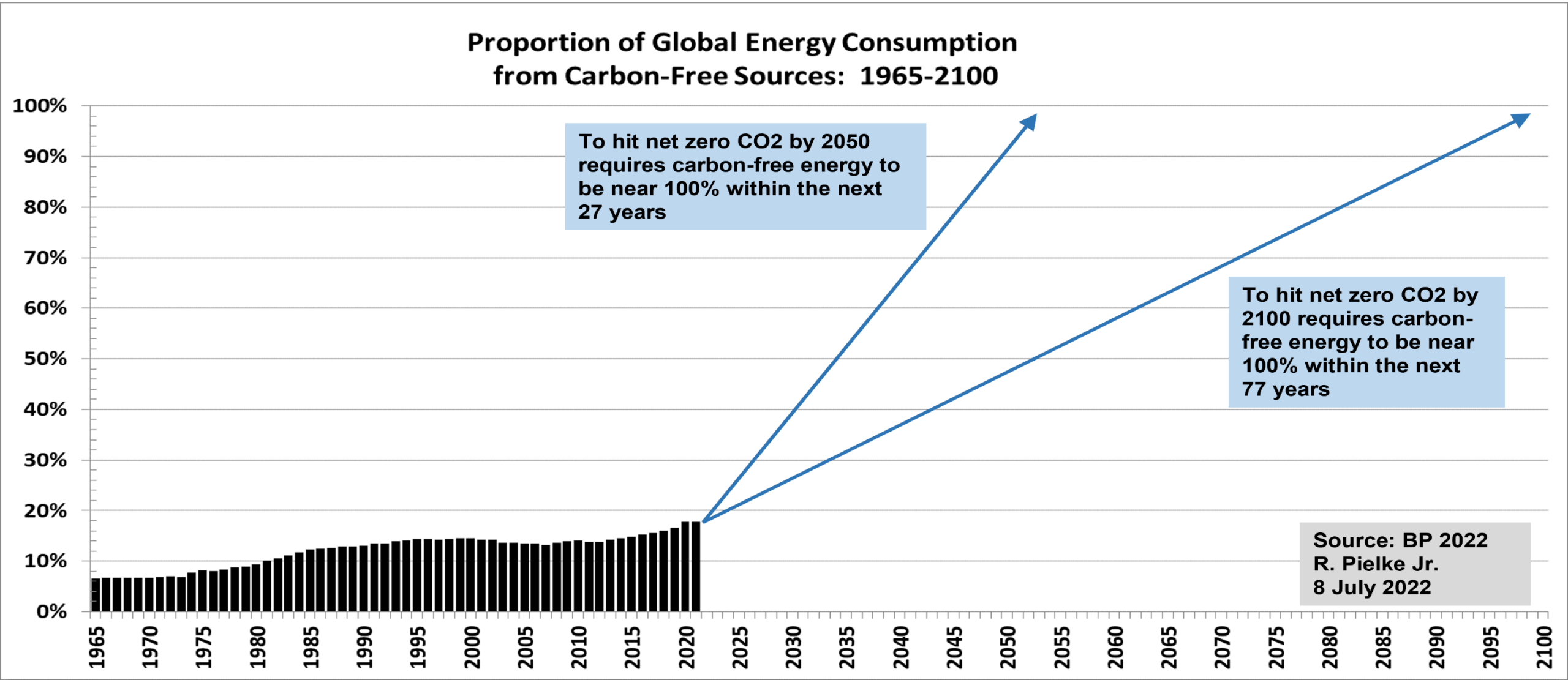
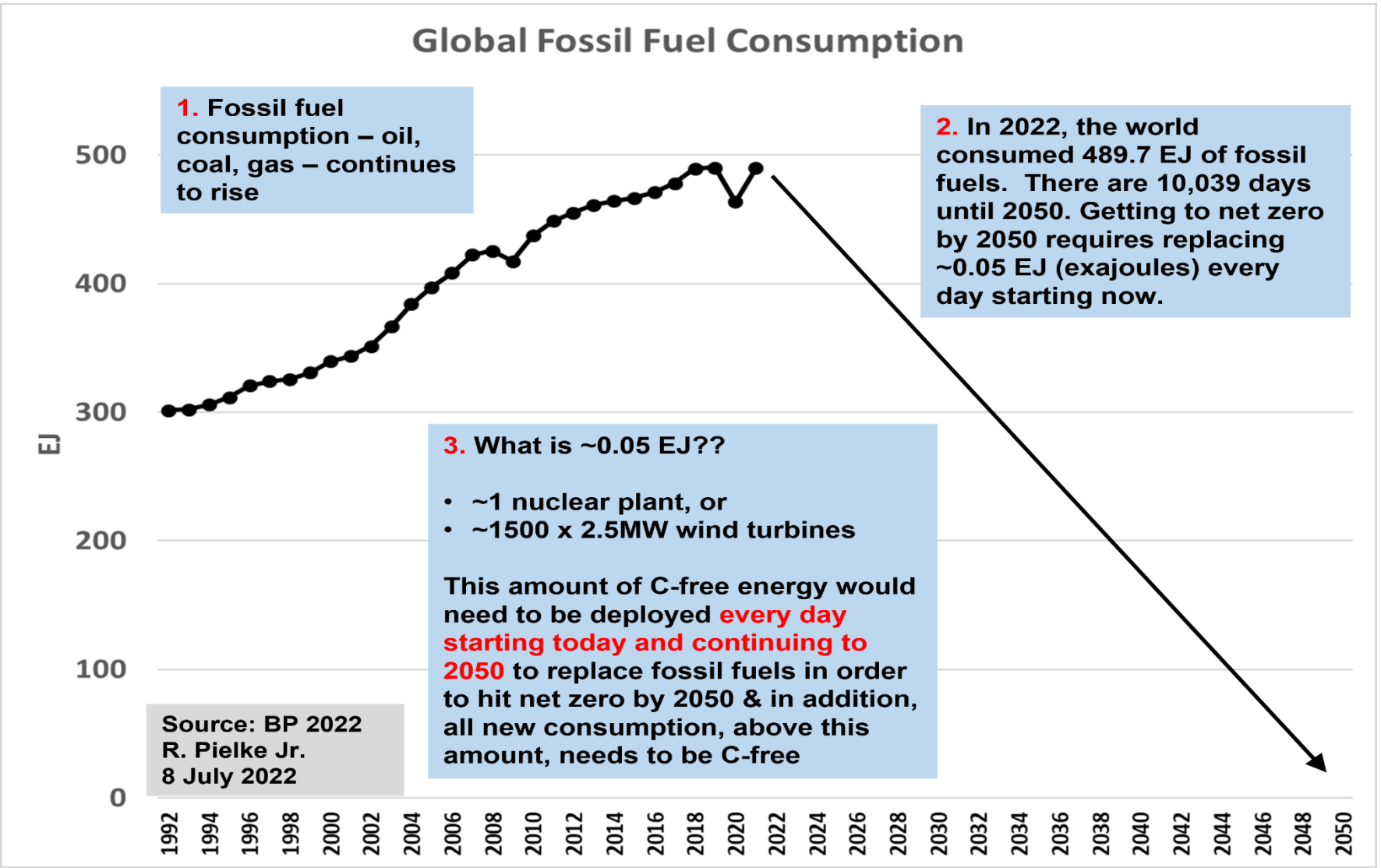
Clean Energy Transition Lessons Learned

- Overreliance on gas-fired generation can be expensive
- On-site fuel is key: coal and nuclear most reliable
- Weather-dependent resources won't deliver in crisis
- Diversity of generation is the key to an affordable and reliable power grid

Net Zero- A Question of Scale



Net Zero- A Question of Scale



To achieve Net Zero Must Install

1,750 MW Nuclear Plant

Or

1500 2.5 MW Wind Turbines

2050- every Day for 27 years

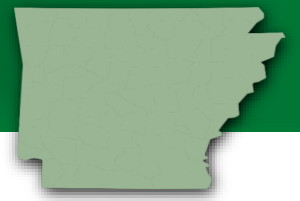
2100- every 3 days for 77 years

Electric Cooperatives of Arkansas

To meet aggressive carbon proposals...

- **Technology:** Potential solutions are being studied that may one day be reliable and affordable for member-consumers. It is not a reality today or near-term.
- **Transmission:** Roadblocks can only be addressed with expensive and extensive upgrades to the existing transmission system.
- **Time:** Both technology development and transmission system upgrades will take significant time.

THE POWER OF OUR PEOPLE



Arkansas Electric
Cooperative Corporation

Reliable · Affordable · Responsible

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October 22, 2021

The Honorable Asa Hutchinson
Governor of Arkansas
State Capitol, Room 250
500 Woodlane Ave.
Little Rock, AR 72201

Dear Governor Hutchinson:

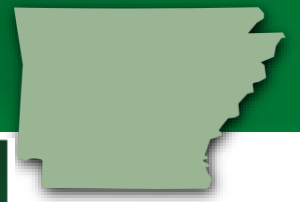
The Electric Cooperatives of Arkansas value our longstanding relationships with our state and federal legislators and regulators and above all we value our relationship with our member owners. The cooperative business model is unique in that we are owned by the members we serve, and Arkansas' not-for-profit electric cooperatives deliver reliable and affordable electricity to approximately 1.2 million Arkansans. In fact, our mission is to deliver **Affordable**, **Reliable**, and **Responsible** electricity and to provide services that improve the quality of life for our members. The Electric Cooperatives of Arkansas prioritize affordability and reliability because we are member-owned, and that's what our members need and expect. Our members expect us to keep their lights on 24 hours a day, 365 days a year at a cost they can afford. Because of the rural nature of many cooperatives, the cost to serve each member is significantly higher than other electric utilities and we serve many of the persistent poverty counties in Arkansas, so affordability of electricity matters.

Recent events in our state and other states where the affordability and reliability of power has been challenged has our full attention and we wanted to ensure it had yours as well. For the first time in our 80-year history, we experienced rolling blackouts and natural gas constraints in February that cost our members over $100 million. The loss of life and economic disaster that we witnessed in Texas last winter should also serve as a warning sign. MIT's Center for Energy and Environmental Policy Research recently released a study, "Challenges and Opportunities for Decarbonizing Power Systems in the U.S. Midcontinent," that provides insights into the cost and reliability challenges associated with decarbonizing the nation's power supply by 2035. The national focus in the energy sector has been all climate based and the mantra seems to be to reduce carbon at any cost and with the acceptance of lesser reliability. We believe that "the mix matters" and that our portfolio of coal, natural gas, hydroelectric, wind, and solar generation provides the best **Responsible** results for our members.

Electric co-ops value flexibility in federal and state policy. However, current policies are resulting in the closure of baseload resources and incentivizing the addition of intermittent resources. Continued closure of baseload generation resources and replacing them with intermittent resources has the effect of increasing costs and lowering reliability and resiliency of our electric power supply. This letter is our

We ask that you support policies, programs, and incentives that support a diverse mix of baseload including carbon capture technology and the development of new nuclear power in addition to renewable resources for our member-owners.

Electric Cooperatives of Arkansas



NUCLEAR COAL NATURAL GAS HYDRO WIND SOLAR

BALANCE OF POWER

reliable, affordable and responsible

Electric Cooperatives of Arkansas

Balance of Power is **NOT** against addressing Climate Change and transitioning to Cleaner and Sustainable Energy it is about the Pace of that Change and the need to ensure that our electric grid remains Reliable, Affordable, and Responsible during that change.

It is not myopically focused on climate. It is focused on a balanced approach to our economy, energy security and diversity, jobs, industry, and national security, which are all critical to Arkansas and America.

Thank you

Electric Cooperatives of Arkansas