Natural Gas Pinch Points and Why They Matter

TIGER 21 DEN 03 Meeting

December 11, 2023

Mercator Energy

JOHN HARPOLE
PRESIDENT / FOUNDER

Can we live without Fossil Fuels?... Food Facts

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- The goal of fertilizing grains is to increase the yield

There are only four types of grain.

65-70% of the world caloric food intake is related to 4 grains:

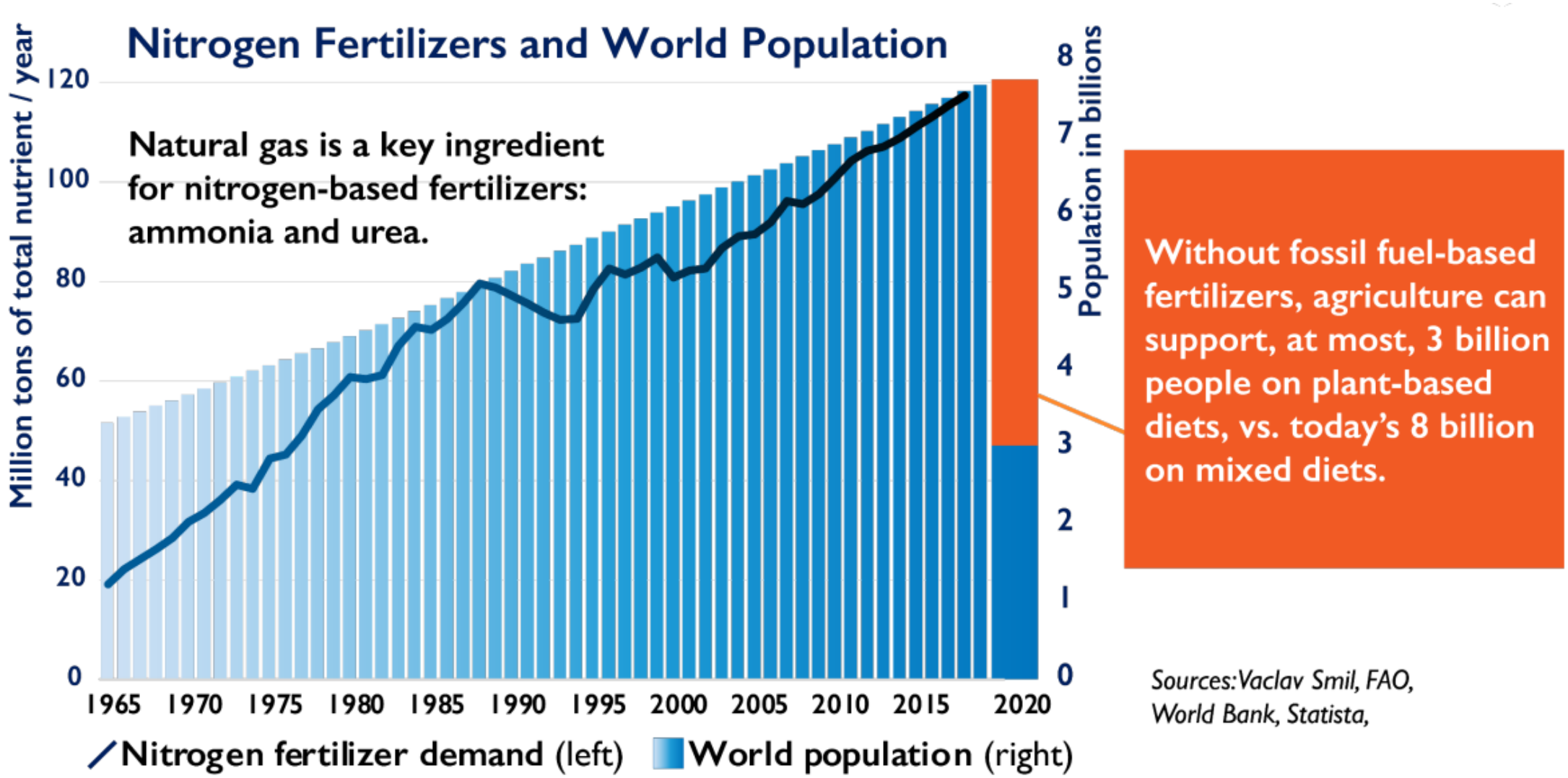
- Wheat
- Rice
- Corn
- Soybeans

All require intense use of nitrogen fertilizers

There are only three types of fertilizers:

- Potash (K) mined
- Phosphate (P) mined
- Nitrogen (N) man-made

Food for Thought: Natural Gas is Critical for Global Food Production

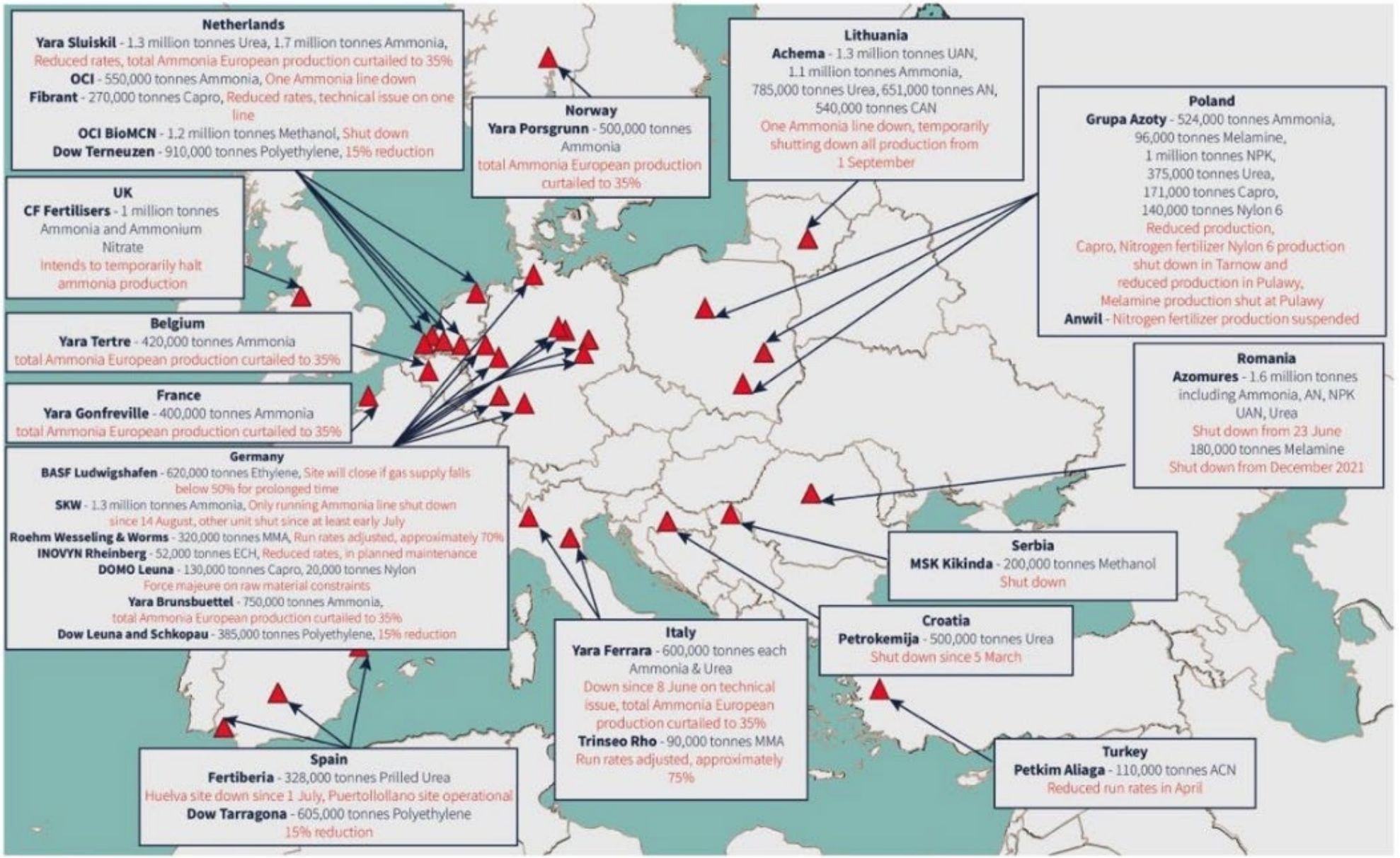


Source: *Chart of the Week #2022-23 Natural Gas and Global Food Production,* Batt Odgerel, Max Pyziur, Lucian Pugliaresi, EPRINC, June 29, 2022

Fertilizer Demand Scale: 11 Bcf/d

If you aggregate the world's daily demand for natural gas (11 Bcf/day) that is converted into fertilizer (through the Haber Bosch process) into one country, that country would rank 10th in the world for daily natural gas demand

Soaring gas prices hit Europe fertilizers, chemicals

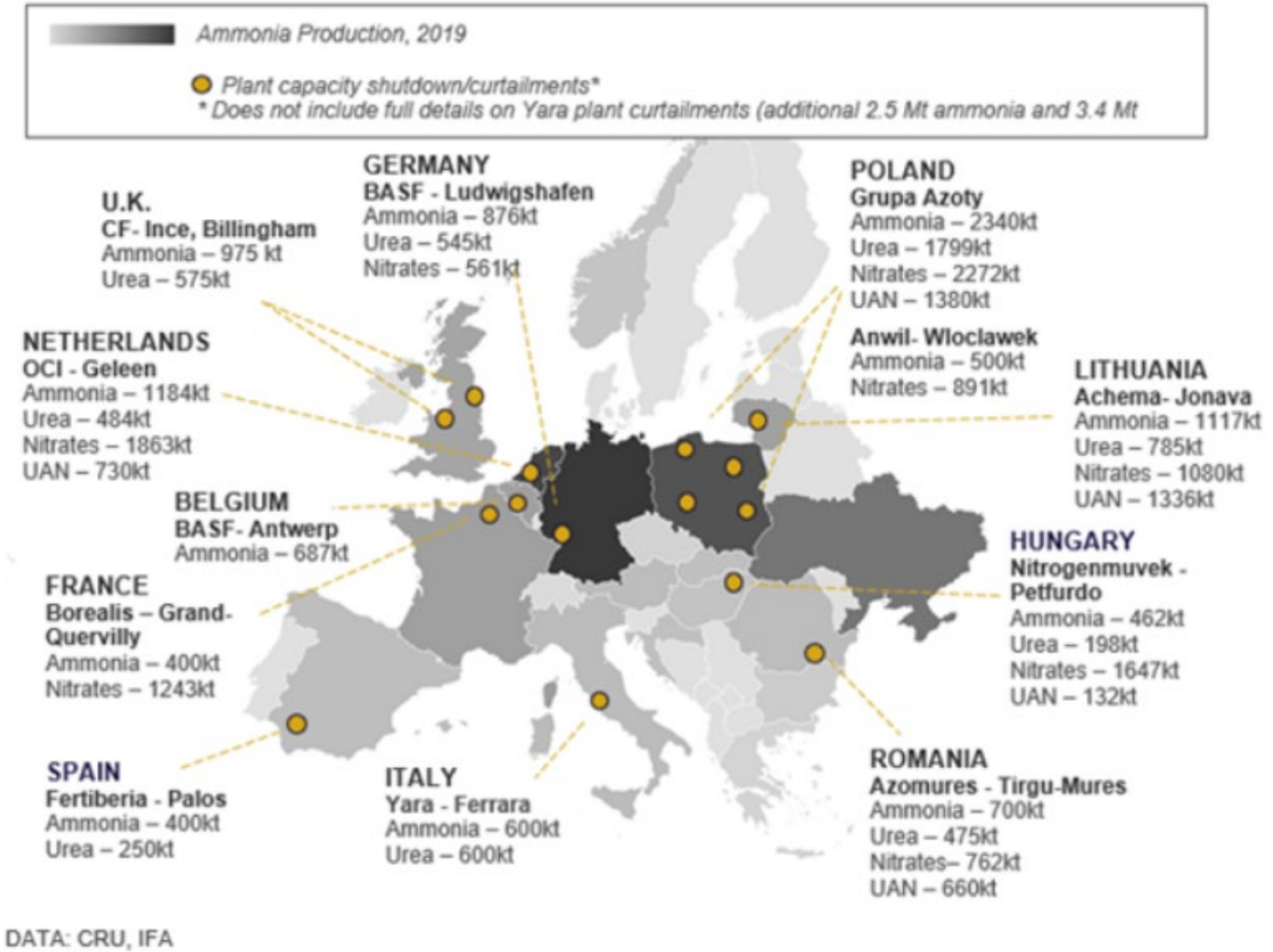


Updated on 25 August 2022

Source: *ICIS, Natural Earth*

70% of Europe's nitrogen fertilizer plants closed during 2022

Figure 1: European nitrogen production shutdowns and curtailments



Source: *Europe nitrogen capacity closure and cost tracker, Chris Lawson,* CRU, August 25, 2022 and *Higher gas prices deepen Europe's fertilizer crunch, threaten food crisis,* Business Standard, Samuel Gebre & Elizabeth Elkin, Bloomberg, August 27, 2022, Fertilizers Europe

Raise your right hand if you have heard of this ship

Source: The Barents Observer, Photo: inttms.com

Balticconnector Pipeline Sabotaged? Act of Warfare?

Finnish police leading the pipeline investigation have named the Hong Kong-flagged container carrier NewNew Polar Bear as the prime suspect in damaging the Balticconnector Finland-Estonia gas pipeline early on Oct. 8.

Source: marinelink.com, October 27, 2023, Andrius Sytas and Nerijus Adomaitis

Attack on NATO's Critical Energy Infrastructure?

Source: https://euromaidanpress.com/2023/10/11/norsar-balticconnector-pipeline-between-finland-and-estonia-damaged-by-explosion/

Smoking Gun? NewNew Polar Bear Left Something Behind

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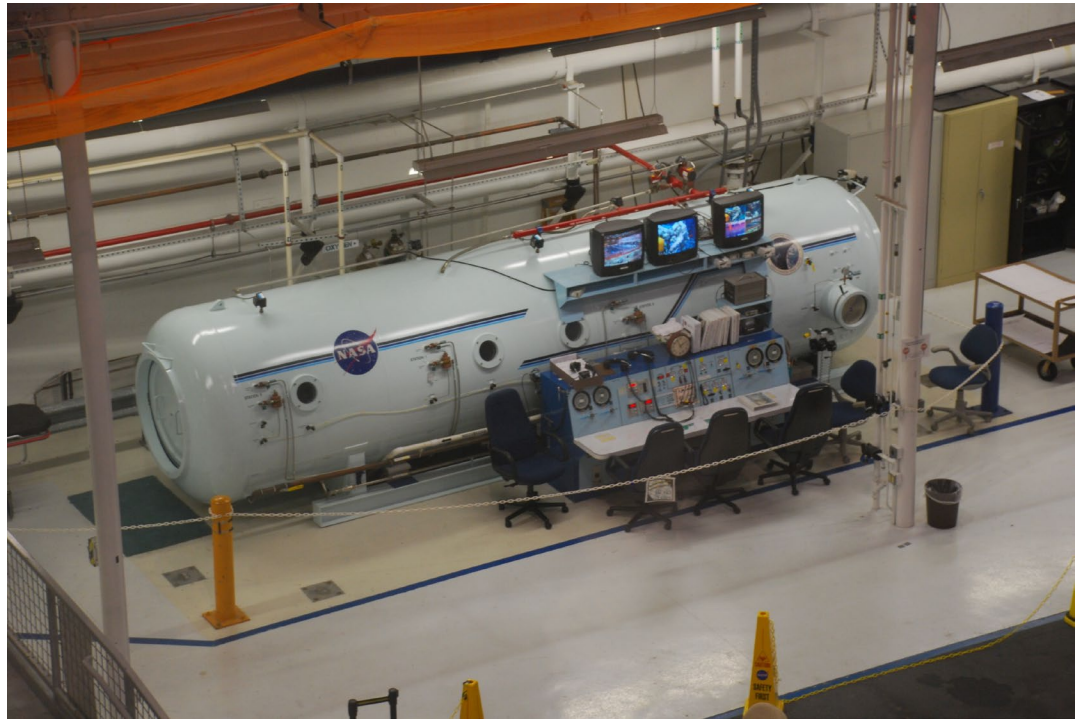
A 6-ton, 12,000 lb. anchor

Source: “Finland recovers ship’s anchor close to damaged Baltic Sea pipeline,” The Guardian, John Henley, October 24, 2023, Photograph: NBI/Reuters

Do you recall a year ago?

Nord Stream Update – Still under investigation (?)

- Washington Post from a week ago blames a Ukrainian Colonel who “rented a yacht” and placed the explosives
- That theory has been completely debunked due to diving physics
- At least a 45-minute dive at a depth of 120 feet
- Requires significant recompression
- How do you fit a recompression chamber (not a small device) on a yacht?



Source: wikipedia

Who Blew up Nord Stream?

"Danish Armed Forces confirmed to Reuters that a patrol vessel had taken 26 photos of a Russian submarine rescue vessel named SS-750 near the Nord Stream blast site on Sept. 22 last year, just days before the explosions happened."

"SS-750 was among six Russian Navy ships operating in the area according to Defence Command… these ships had their transmitters turned off"

Source: Reuters, Wikipedia

Who Blew up Nord Stream?

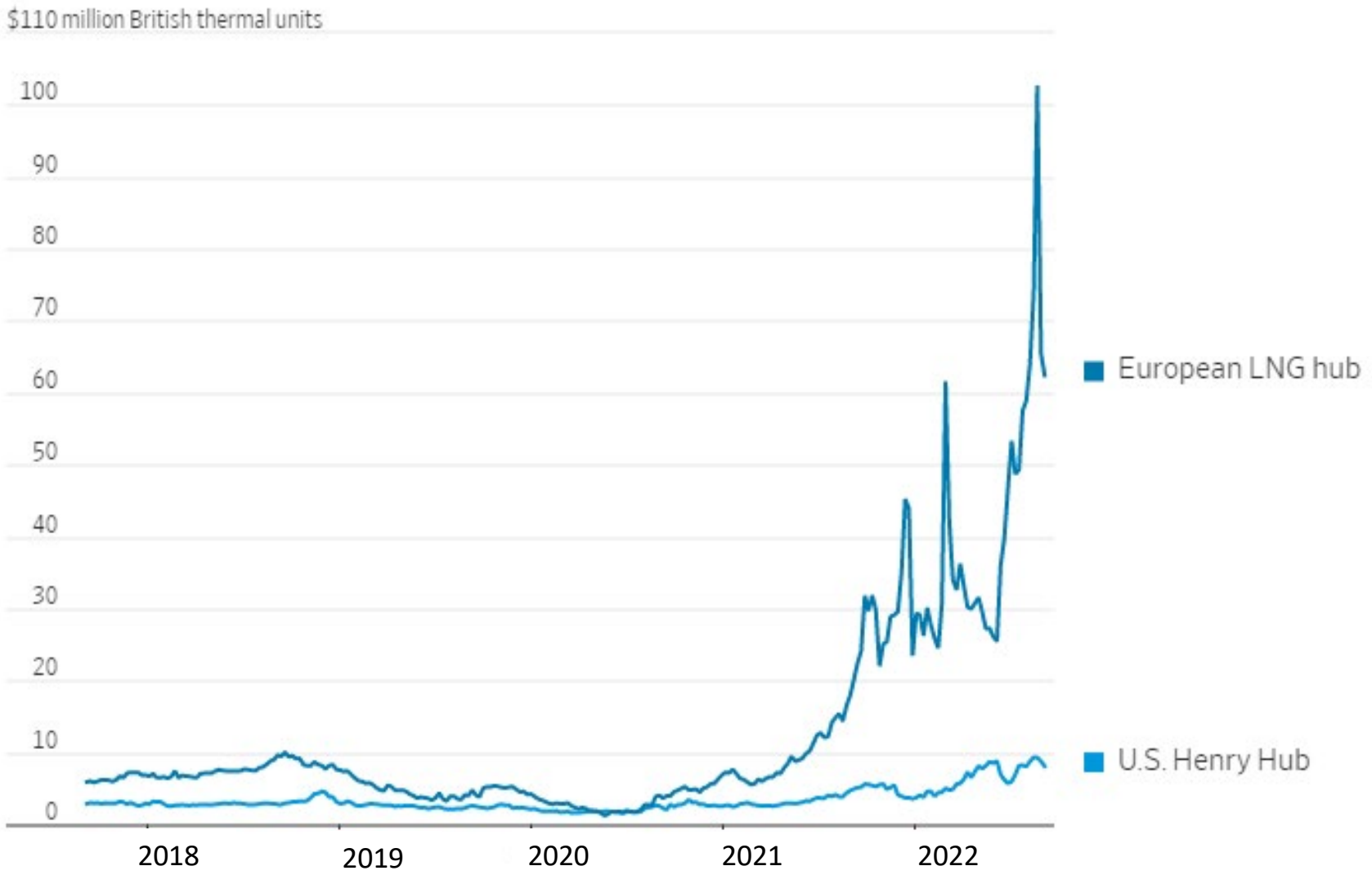
Russian Ship SS-750

Source: https://mil.in.ua/en/news/russian-ship-with-a-mini-submarine-confirmed-to-be-near-the-nordic-streams-a-few-days-before-the-explosions/

TTF 2-Year Historical Price/U.S. Dollars

Source: yahoo finance

Natural gas price



Source: FactSet

Comparative Forward Strips as of August 26, 2022

One-Year Forward Strip / $ per MMBtu

NYMEX Henry Hub	$ 7.725
LNG Delivered Price to Europe	$97.993

Source: *cmegroup.com and CIMA Daily Weather and Market Report, August 26, 2022*

Geopolitical Risk Premium

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One-Year Forward Strip

NYMEX Henry Hub	$ 3.22
LNG Delivered Price to Asia	$15.88
LNG Delivered Price to Europe	$14.99

Three-Year Forward Strip

NYMEX Henry Hub	$ 4.16
LNG Delivered Price to Asia	$14.43
LNG Delivered Price to Europe	$13.87

* Comparative Forward Natural Gas Price Strips, Settled price as of November 10, 2023, prices in $/MMBtu

Source: *cmegroup.com and CIMA Daily Weather and Market Report, November 13, 2023*

European LNG infrastructure – Do you remember my concern?

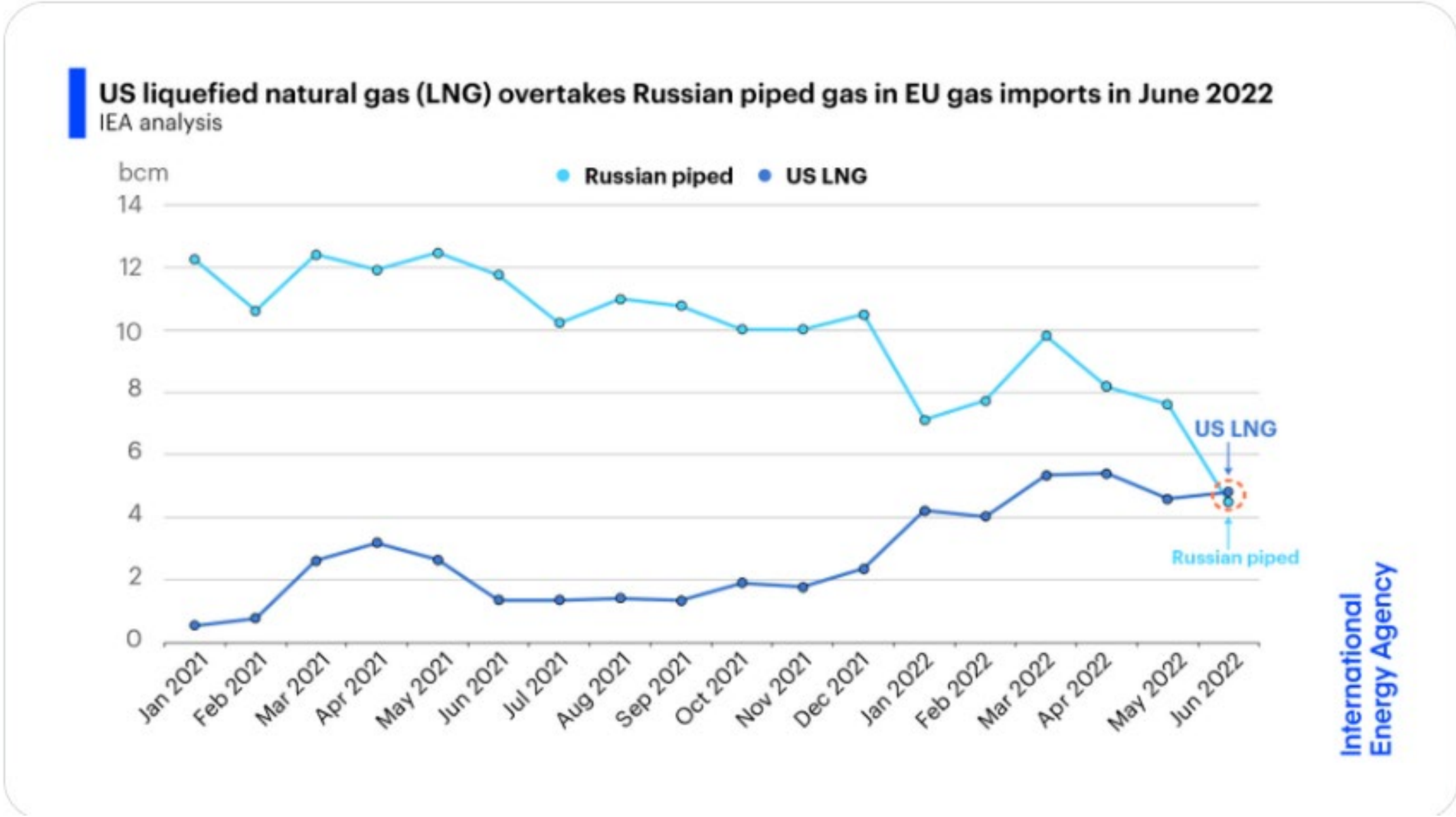
Source: *European Commission 2022, Clean Energy Wire*

Opinion I Russia, A Chinese Cargo Ship and the Sabotage of the Balticconnector Pipeline

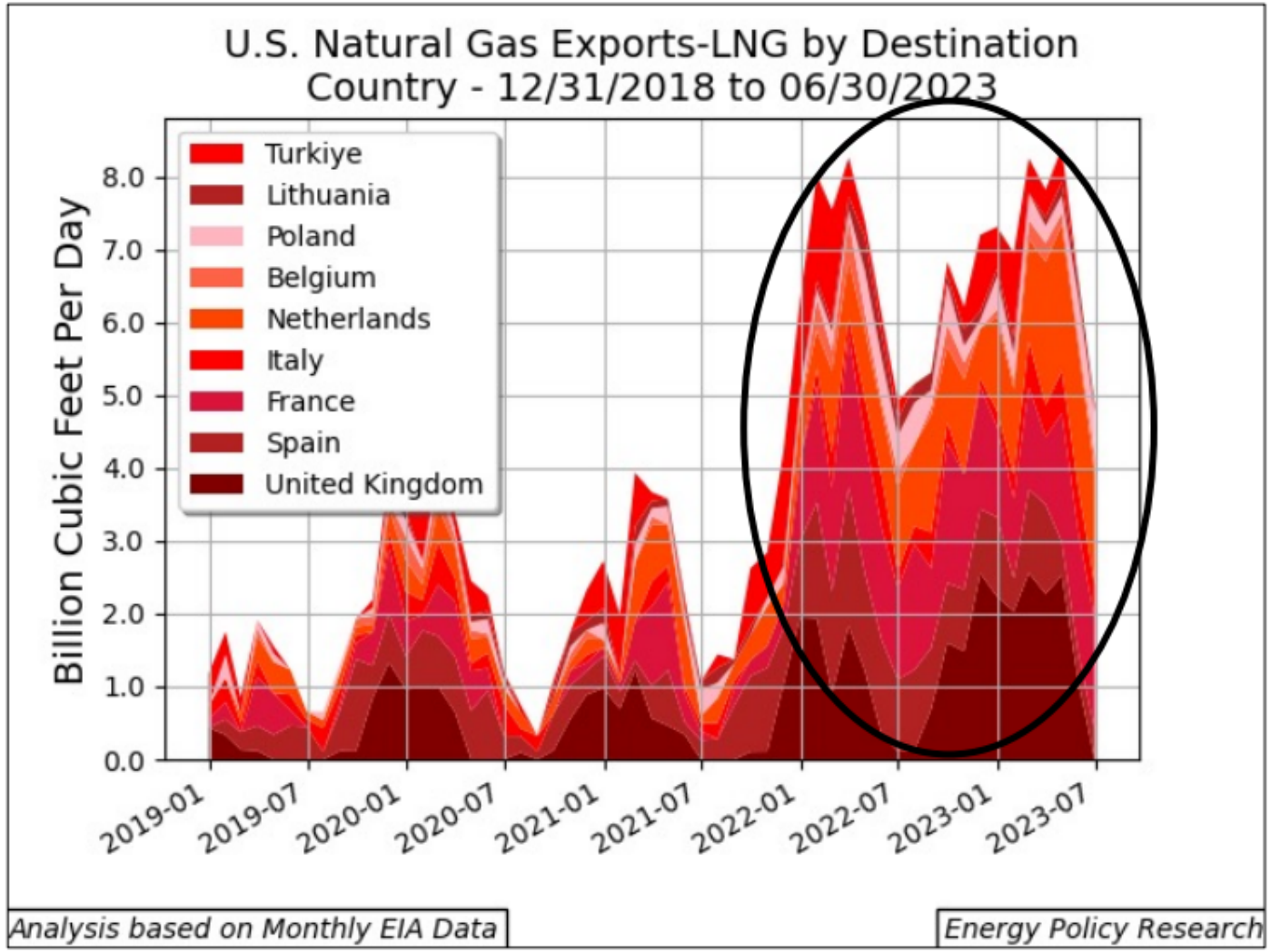
"The deliberate targeting of subsea cables and gas pipelines during peacetime is a tactic that falls in the grey zone – actions that are coercive, effective, and aggressive, yet fall below the threshold of armed conflict – even if it can be proved."

Source: Baird Maritime, Mercedes Page, November 1, 2023, Photo: The Guardian, Finnish Border, Guard/Reuters

U.S. LNG to the Rescue



European Receipts of U.S. LNG Exports by Destination - Revisited



	Jan 2022-Jun 2023 Avg BCF/d
Turkiye	0.5
Lithuania	0.2
Poland	0.4
Belgium	0.2
Netherlands	1.3
Italy	0.4
France	1.5
Spain	1.0
United Kingdom	1.4

With the winter 2021-2022 shortfall in natural gas supplies from Russia, Europe increased and maintained its purchases of U.S. LNG at the rate of 8 BCF/d through June 2023.

(includes Turkiye)

Source: "European Receipts of U.S. LNG Exports by Destination – Revisited," Energy Policy Research Foundation, Chart of the Week #2023-42, Max Pyziur, November 1, 2023

A Case Study: Germany and Europe

Are there lessons to be learned by what happened in Germany/Europe?

The Former Chancellor Who Became Putin's Man in Germany

"Germany's reliance on Russian gas surged to 55 percent before Russia's attack on Ukraine began in February, from 39 percent in 2011, amounting to 200 million euros, or about $220 million, in energy payments every day to Russia."

Source: *The Former Chancellor Who Became Putin's Man in Germany, Katrin Bennhold, The New York Times, April 23, 2022*

The Russia-Ukrainian Conflict Greatly Affecting the Global Natural Gas & Greater Energy Market

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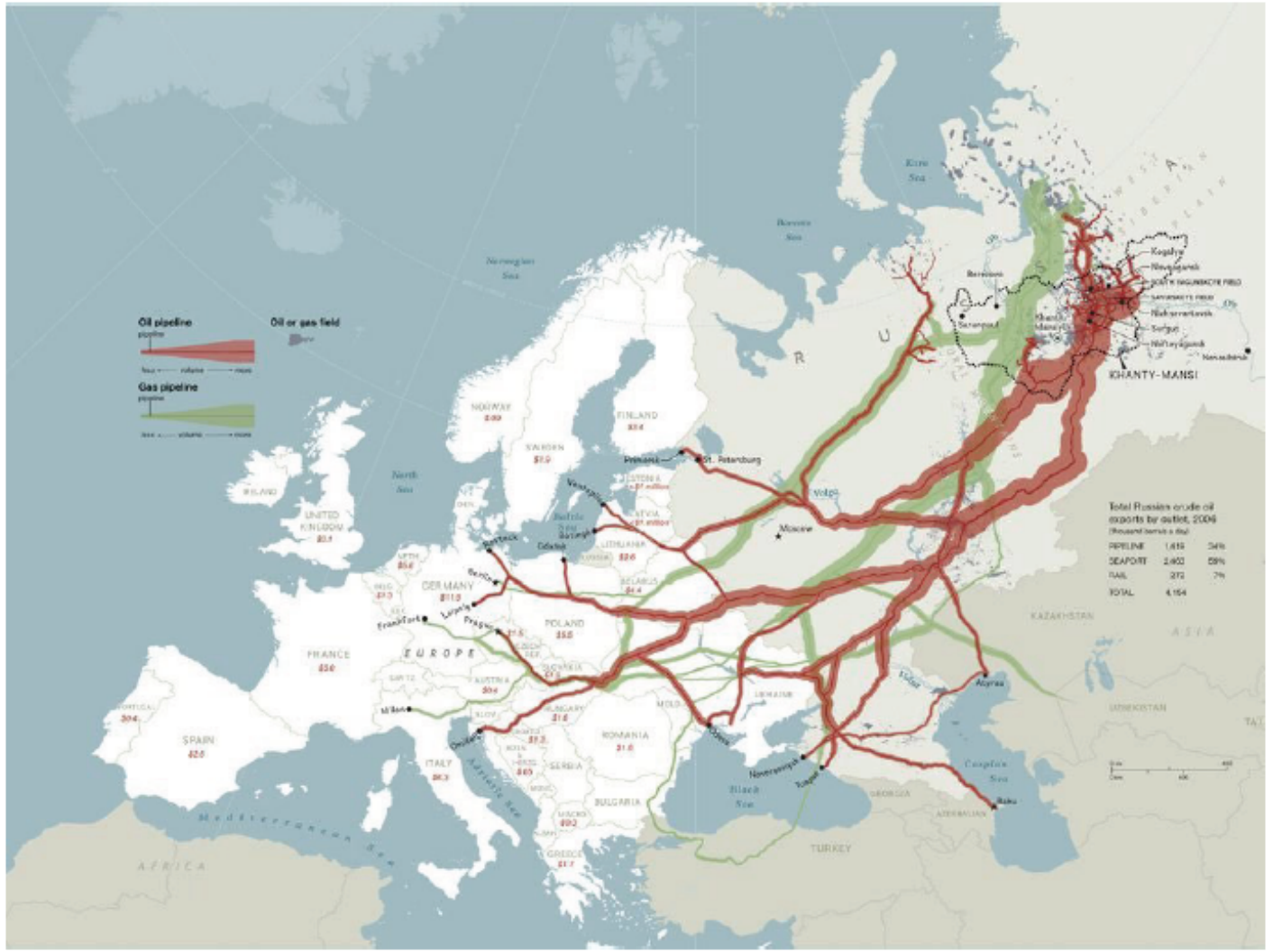
Russian Energy Figures

- Natural gas production: 70 Bcf/d (2nd largest)
- Natural gas pipe exports: 19 Bcf/d (1st largest)
- Oil production: 10.6 MMBpd (3rd largest)
- Oil exports: 7.5 MMBpd (2nd largest)

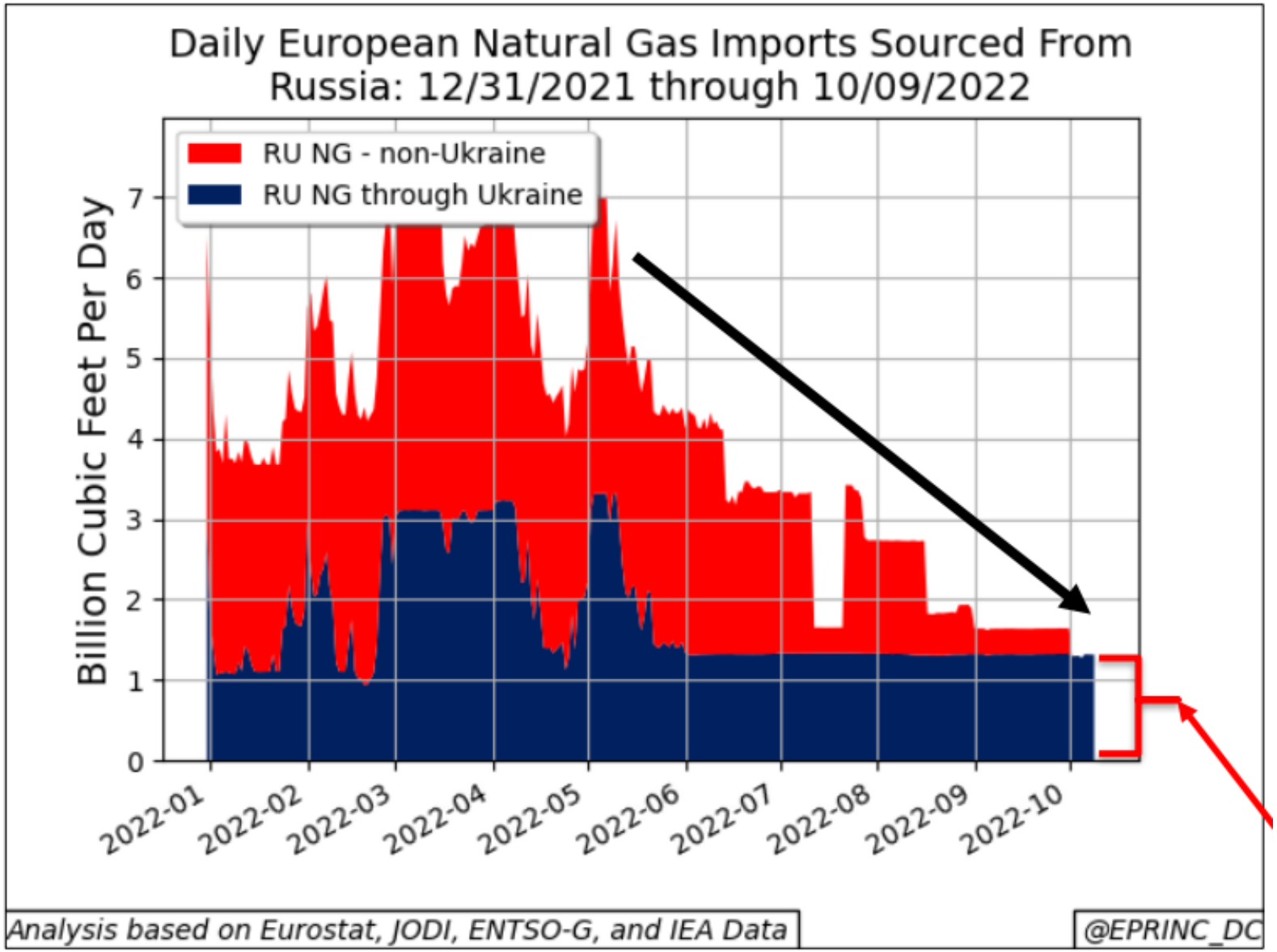
Europe's Reliance on Russian Energy

- ~40% of EU's gas demand met by Russia
- ~45% of EU's coal imports from Russia
- ~30% of EU's oil imports met by Russia



Source: *Sempra Infrastructure, "Evolving energy for an evolving world," September 27, 2022, WoodMac; Photo Credit: National Geographic*

Europe – Daily Natural Gas Receipts During 2022



Source: *Energy Policy Research Foundation*

European supply diversification away from Russia takes **17 BCF/d** out of **50 BCF/d** market

Source: *Wood Mackenzie, "Wellhead to LNG: Producers & Export Deals," September 2022, Image: Reuters*

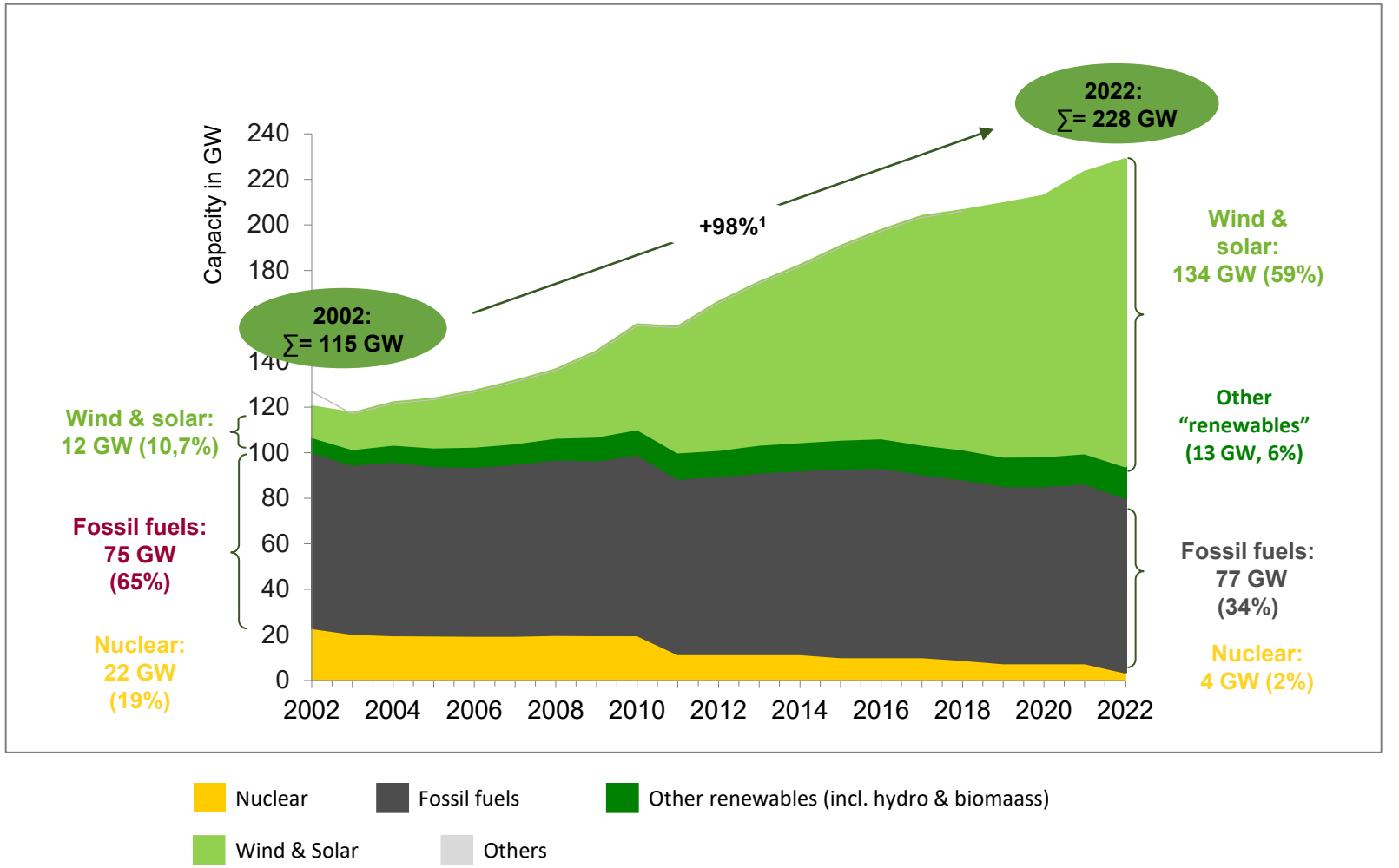
Laying in Wait?

This was a trap laid by Vladimir Putin 20 years in the making.

4 mistakes made by the European Union (& more specifically, Germany)

- Over reliance on renewables
- Retired coal plants too early
- Retired nuclear plants too early
- Under reliance on fossil fuels

Installed Net Power Generation Capacity in Germany (2002-2022)



Source: Schernikau on Energy Policy

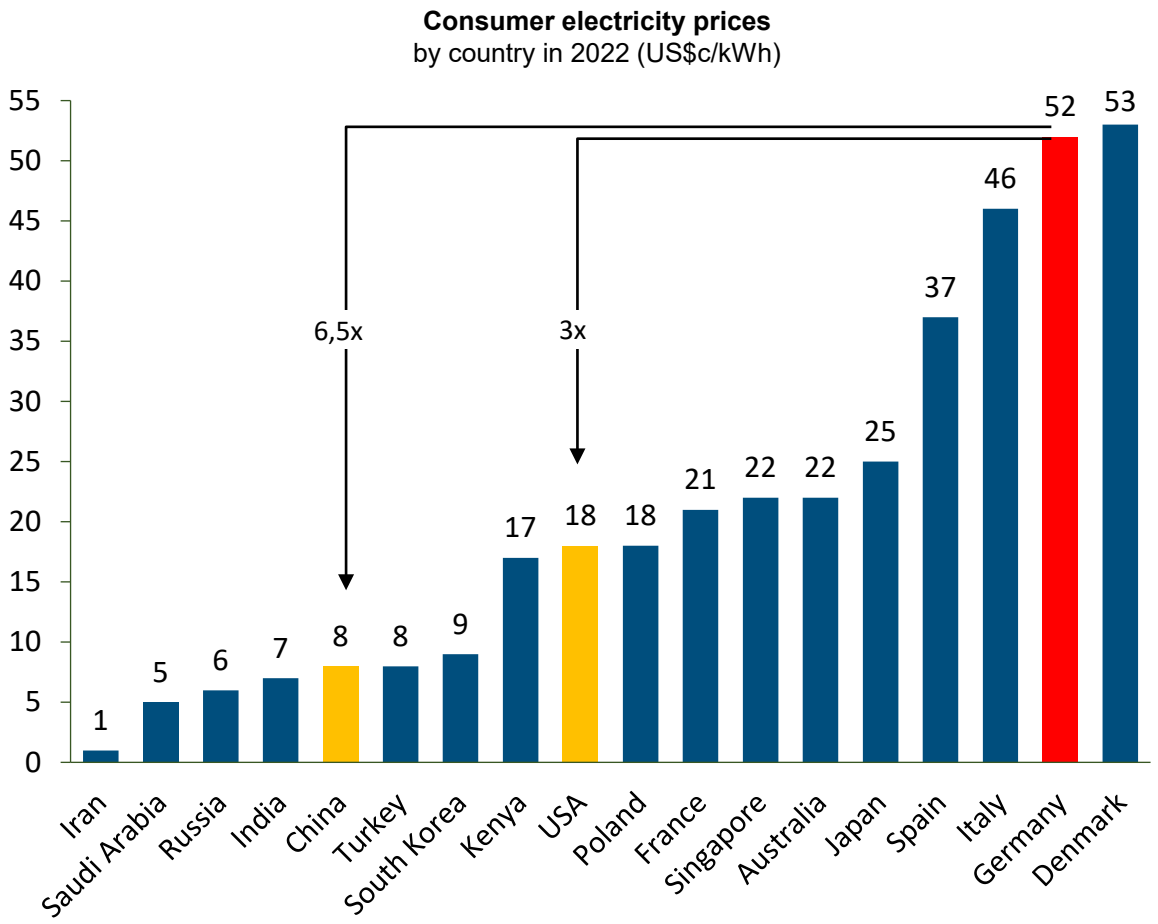
(1) CAGR: +3,5%; (2) CAGR: +0,1%; (3) CAGR -0,9%; (4) Including hydro & biomass

Sources: Schernikau Research and Analysis based on Frauenhofer Institute (link), Agora Energiewende (https://static.agora-energiewende.de/fileadmin/Projekte/2022/2022_01_DE-JAW2021/A-EW_247_Energiewende-Deutschland-Stand-2021_WEB.pdf), AG Energiebilanzen (https://ag-energiebilanzen.de/daten-und-fakten/primaerenergieverbrauch/ and https://ag-energiebilanzen.de/daten-und-fakten/zusatzinformationen/); Statista for industrial power prices https://www.statista.com/statistics/1050448/industrial-electricity-prices-including-tax-germany/

Germany 2022: Renewable Installed Capacity vs. Power Generation and Primary Energy

Germa Industrial Electricity Prices:

2002: 7 ct / kWh
2023: 40 ct / kWh



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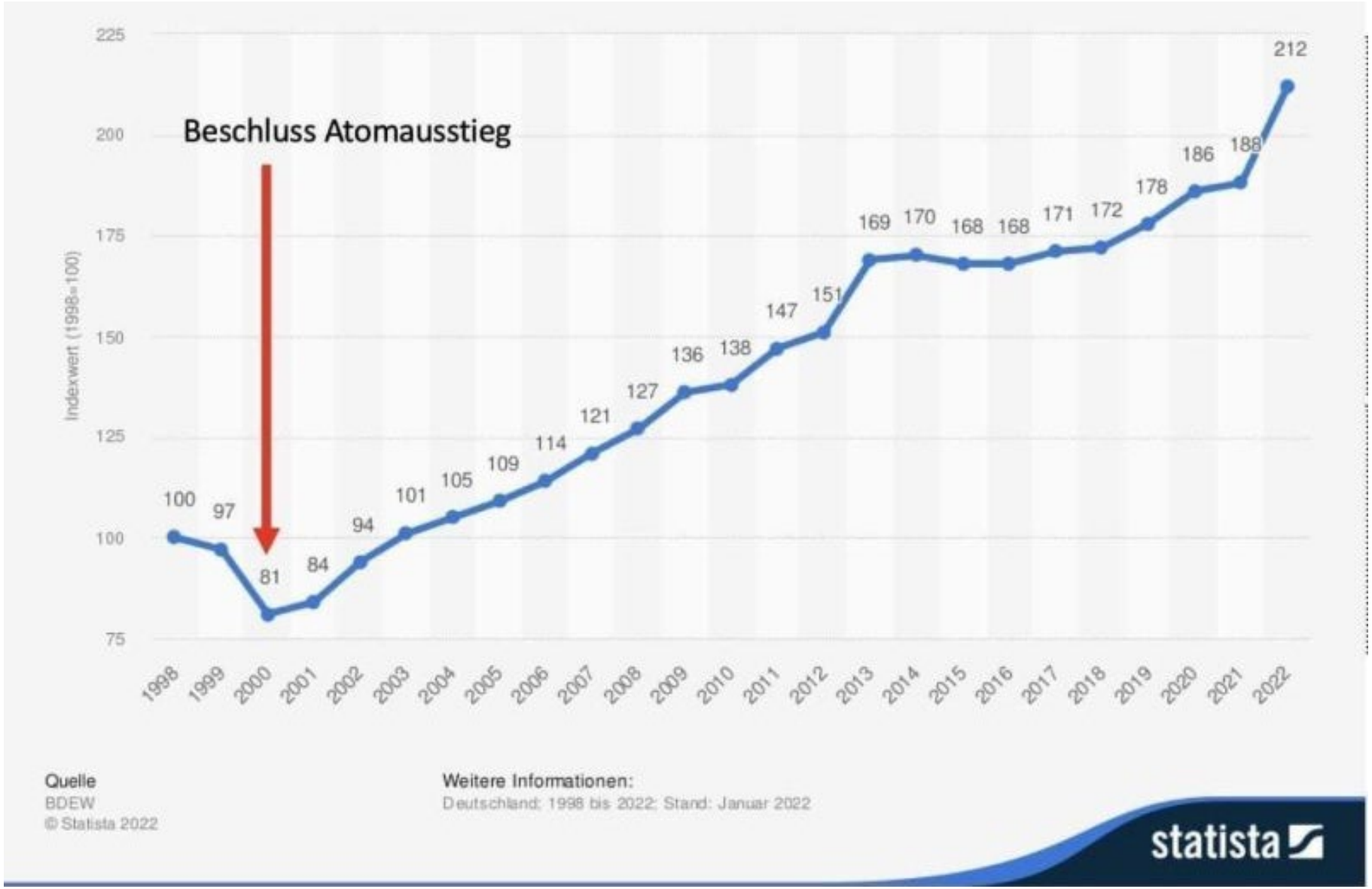
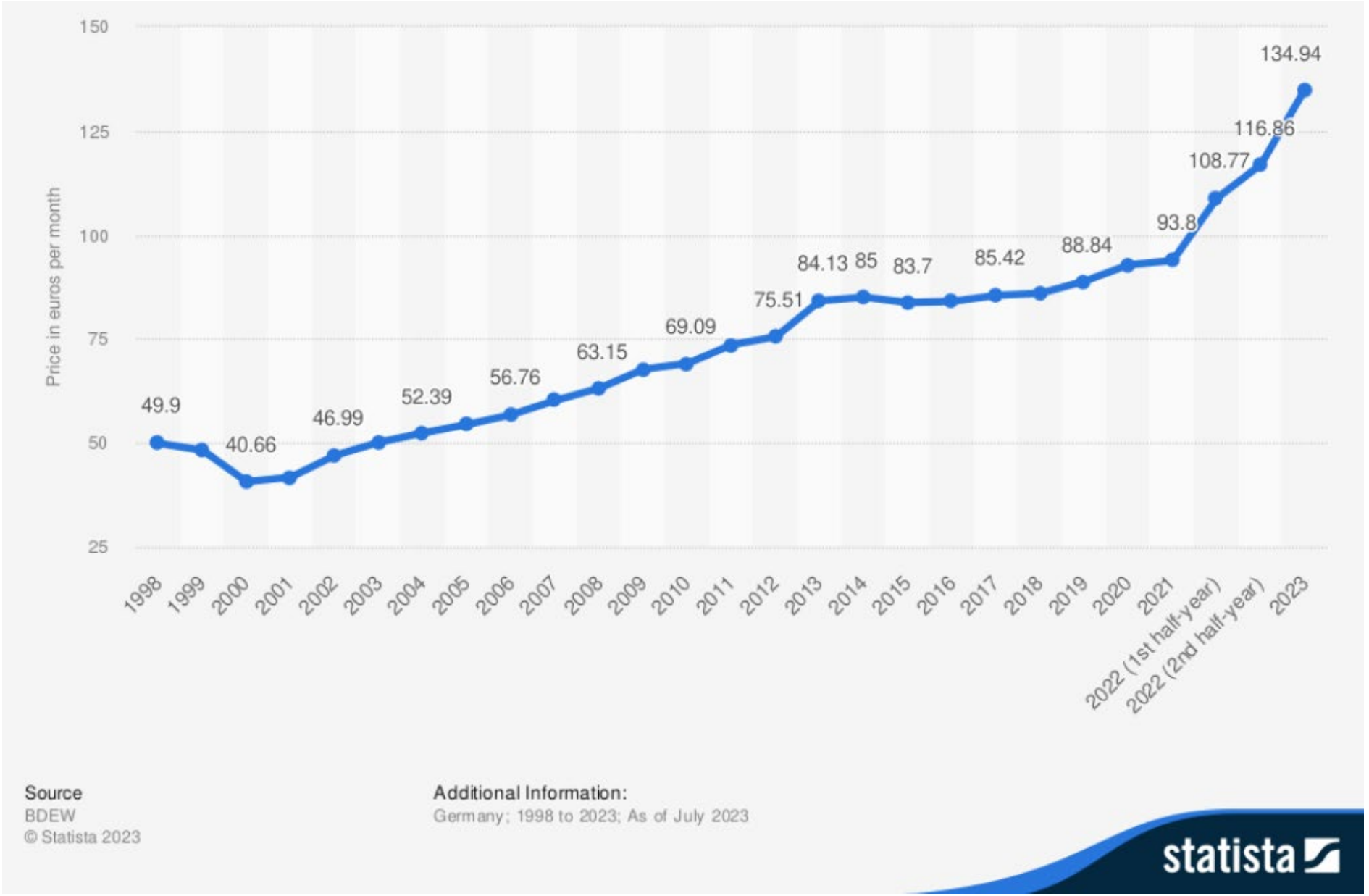
Sources: Schernikau Research and Analysis based on Frauenhofer Institute (link), Agora Energiewende (https://static.agora-energiewende.de/fileadmin/Projekte/2022/2022_01_DE-JAW2021/A-EW_247_Energiewende-Deutschland-Stand-2021_WEB.pdf), AG Energiebilanzen (https://ag-energiebilanzen.de/daten-und-fakten/primaerenergieverbrauch/ and https://ag-energiebilanzen.de/daten-und-fakten/zusatzinformationen/); Statista for industrial power prices https://www.statista.com/statistics/1050448/industrial-electricity-prices-including-tax-germany/

Electricity price index in Germany from 1998 to 2022.



Source: Statista

Average electricity bill for a 3-person household in Germany from 1998 to 2023
(in euros per month)



Source: Statista

Germany drove their car into a ditch and then took the wheels off*

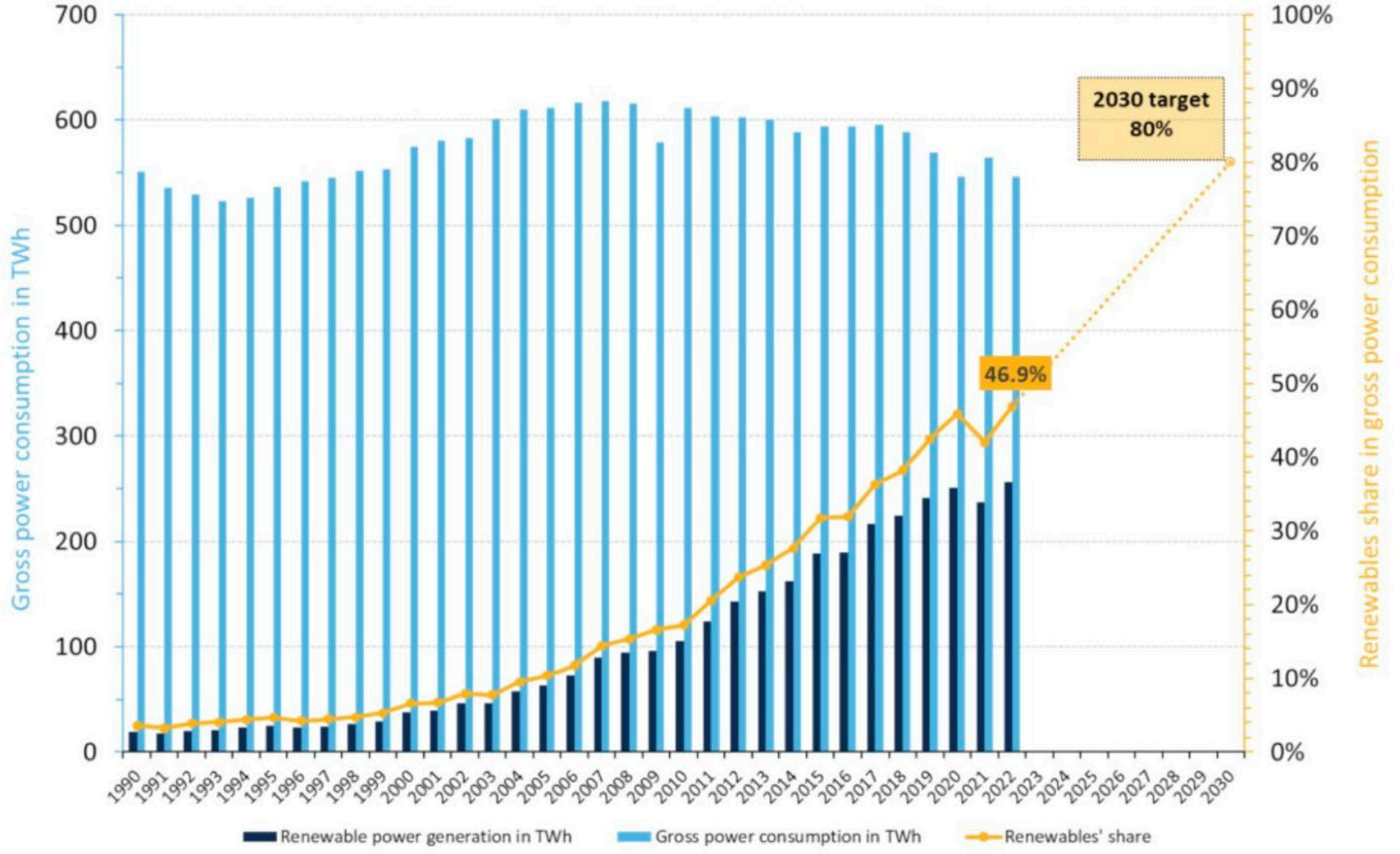
“Over and out: Germany switches off its last nuclear plants”

Apr 15, 2023 – Germany has switched off its three remaining nuclear power plants as part of a long-planned transition toward renewable energy.

- AP News

*Robert Bryce quote

Renewables' share in gross power consumption in Germany 1990-2022



Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Germany Headlines

Germany's Shrinking Economy Sparks a Struggle for Solutions

- WSJ, August 29, 2023

Russian Gas Cuts Threaten World's Largest Chemical Hubs

- WSJ, June 27, 2022

Germany faces a looming threat of deindustrialization

- Economist, September 11, 2022

Rust Belt on the Rhine: The Deindustrialization of Germany

- Politico, July 13, 2023

Germany went from envy of the world to the worst-performing major developed economy. What happened?

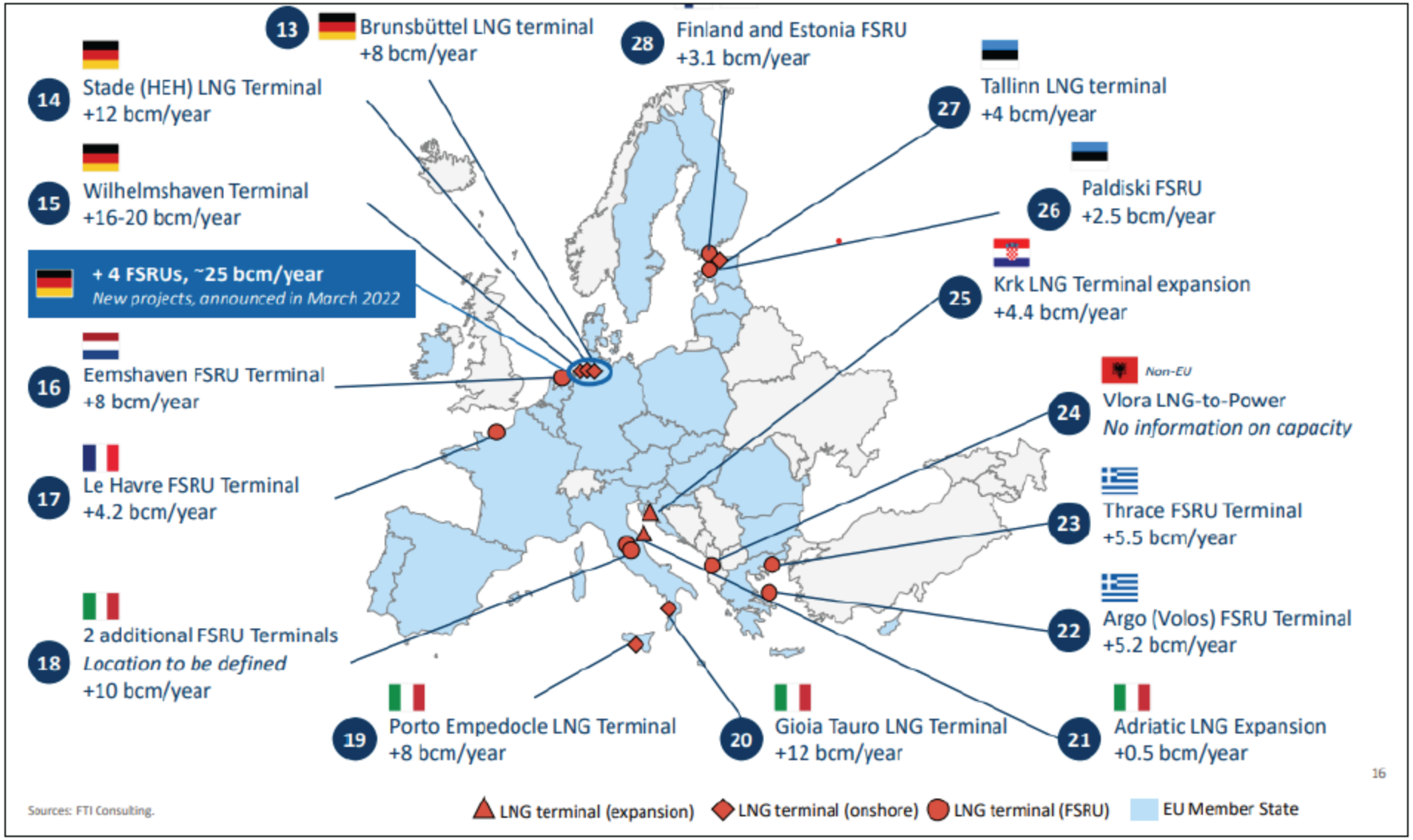
- ABC News, September 19, 2023

Gas crisis forces Germany to flatten wind farm for coal mine

Source: The Times, Oliver Moody, October 22, 2022

The Response?

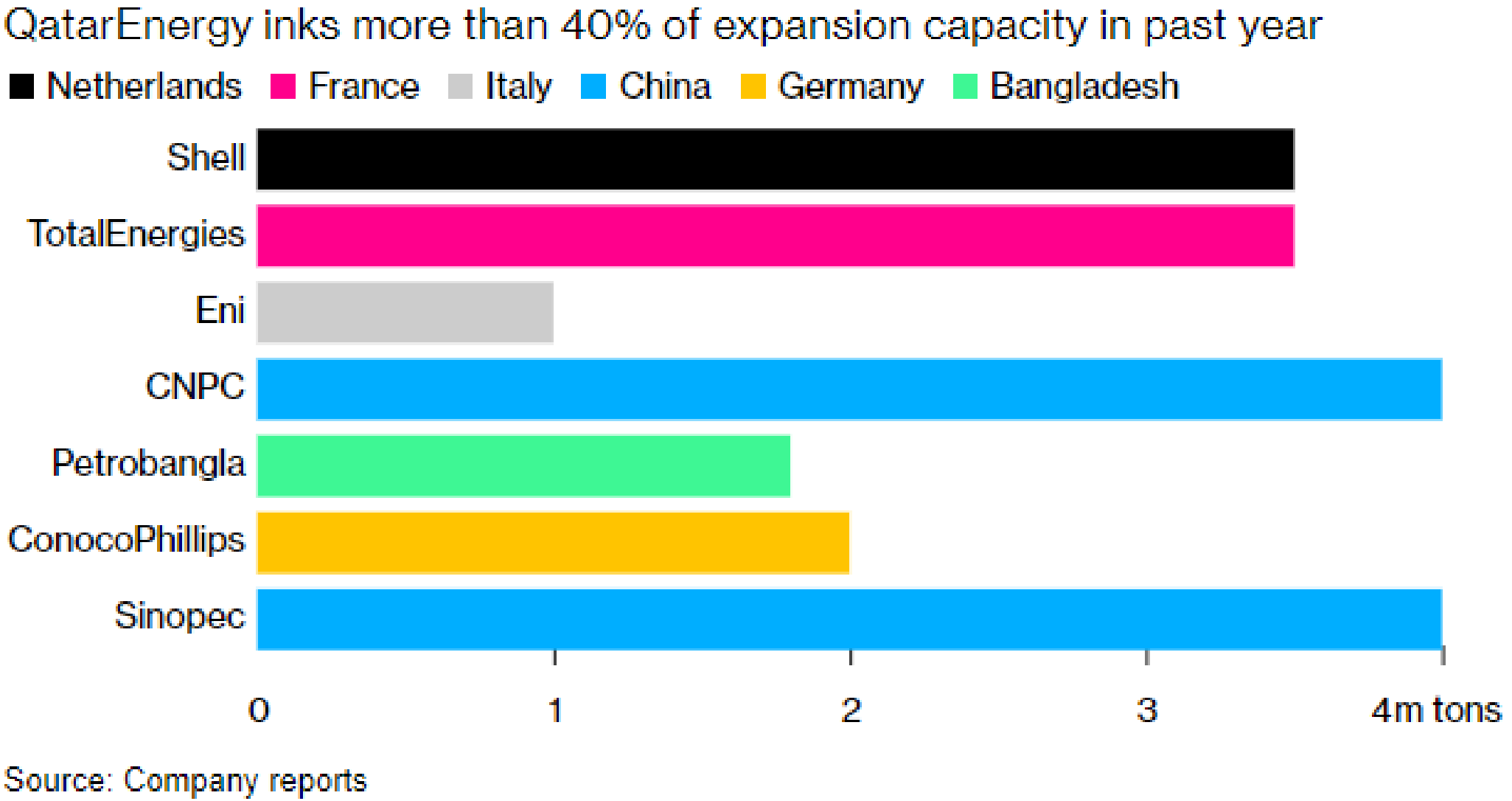
Europe has authorized 21 new LNG projects



https://www.fticonsulting.com/-/media/files/emea--files/insights/white-papers/2022/may/new-lng-regasification-terminals-europe.pdf

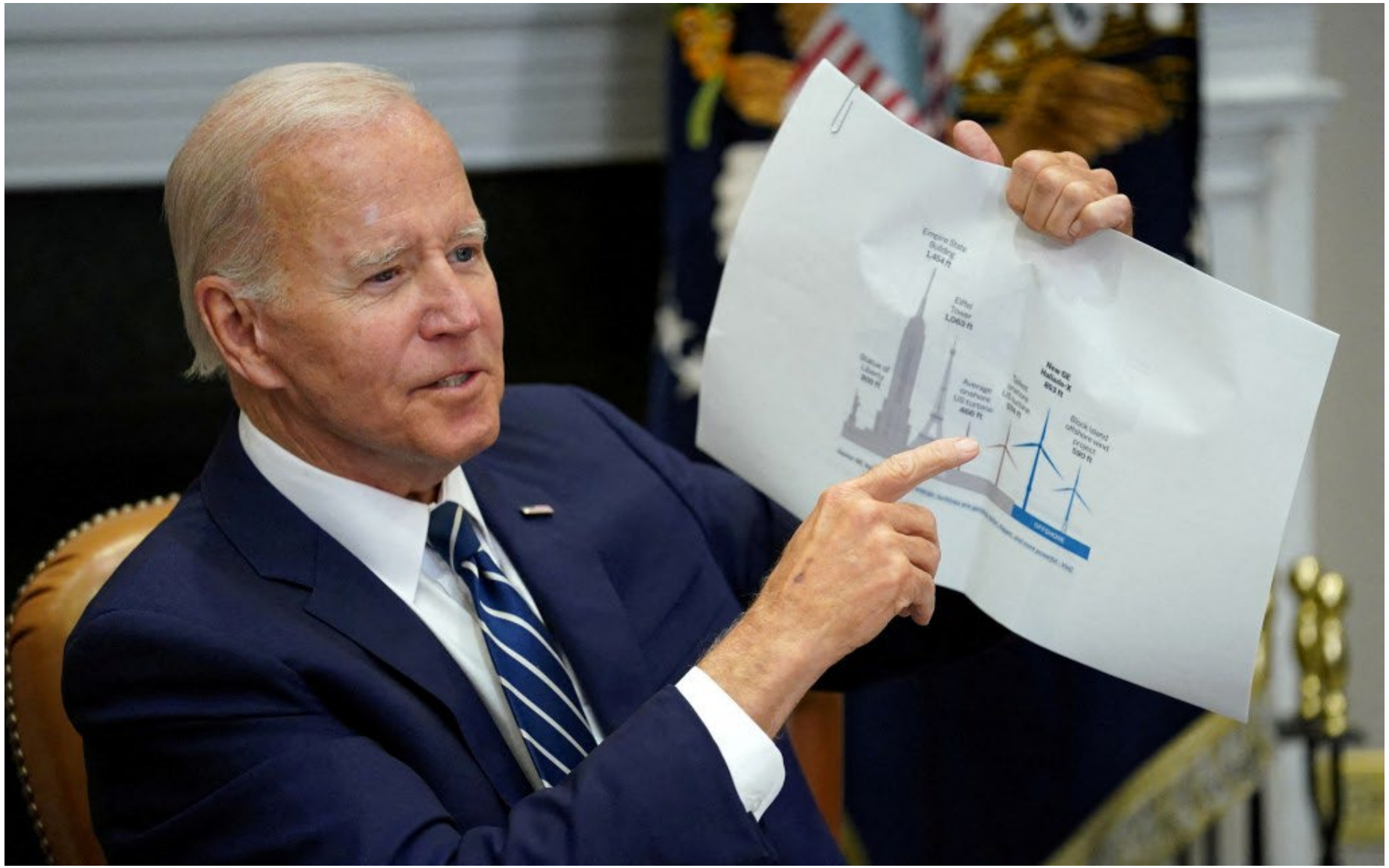
Source: WGC2022 28th World Gas Conference, May 2022

Qatar Dealmaking Continues With LNG Supply Push



Source: Eni and Qatar Sign 27-Year LNG Supply Deal for Italy, Bloomberg, Elena Mazneva, October 23, 2023

Is the U.S. Headed Down the Same Path as Germany and the EU?

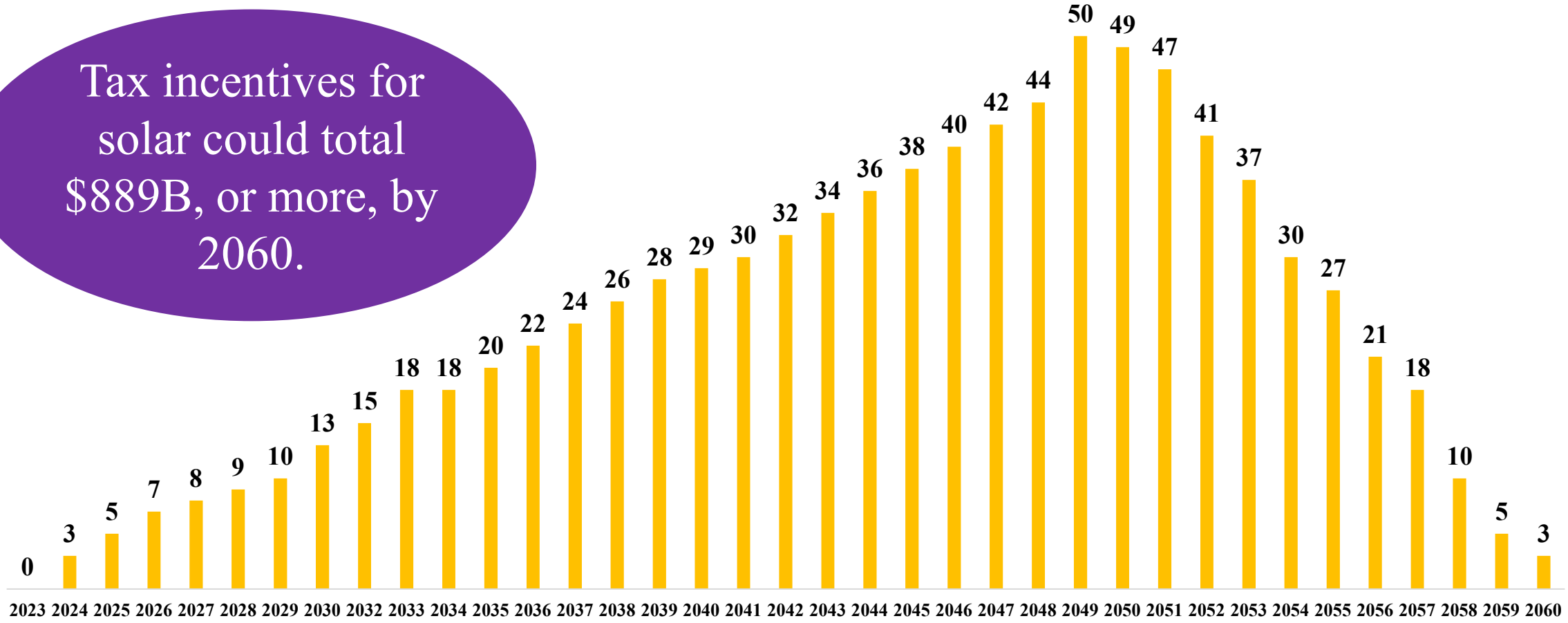


Thumb on the Scale for Renewables

The Inflation Reduction Act

Solar Subsidies Under Inflation Reduction Act Could Total $900B

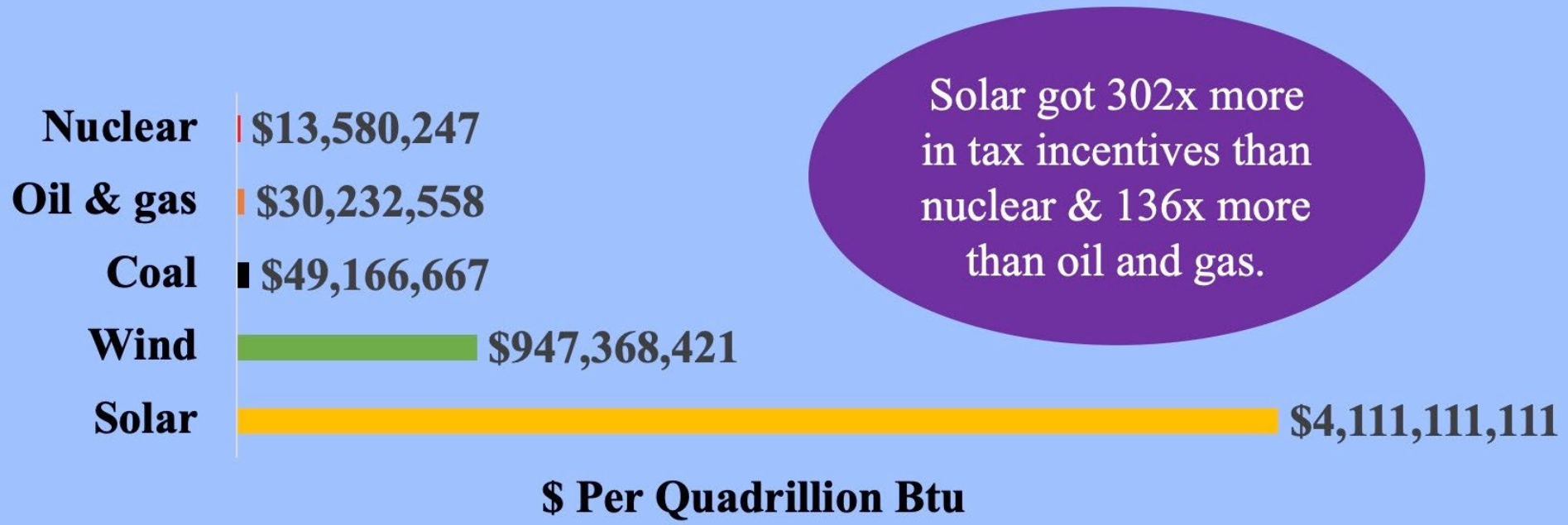
Tax incentives for solar could total $889B, or more, by 2060.



Tax incentives, $Billion per year

Source: Wood Mackenzie, https://www.woodmac.com/news/opinion/IRA-tax-credits-for-renewables/

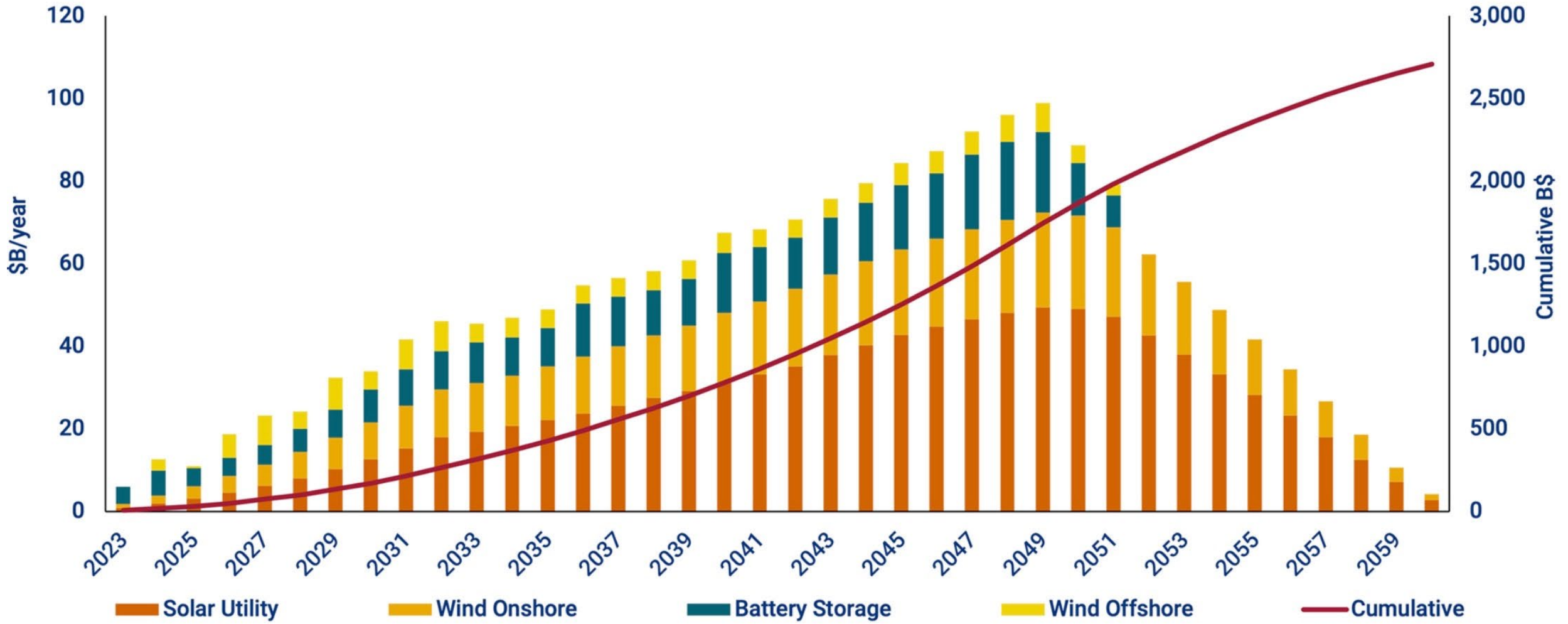
EIA Data: Tax Incentives For Solar, Wind, Coal, Oil & Gas, & Nuclear, Per Unit of Energy Produced, 2022



Source: EIA, https://www.eia.gov/analysis/requests/subsidy/pdf/subsidy.pdf#page=31 , https://www.eia.gov/analysis/requests/subsidy/pdf/subsidy.pdf#page=22, author calculations

Source: Robert Bryce, Substack

Cost of the Inflation Reduction Act



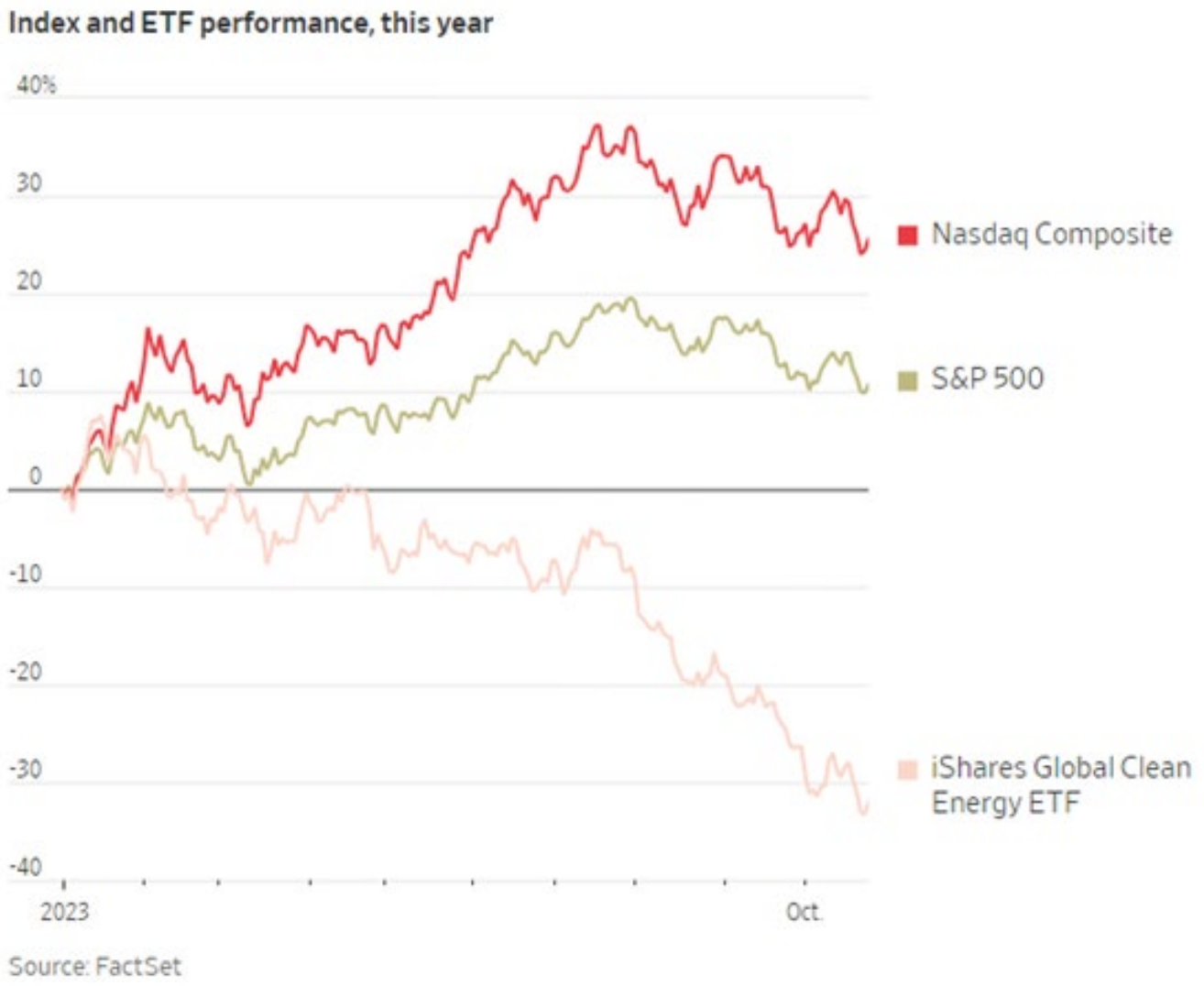
Final Cost = $3 Trillion

Source: Robert Bryce, Substack

Biden-backed wind power company cancels New Jersey projects despite $1B in subsidies

Source: New York Post, Victor Nava, November 1, 2023

The Shine Has Come Off Clean Energy Stocks



Source: The Wall Street Journal, Anna Hirtenstein, October 25, 2023

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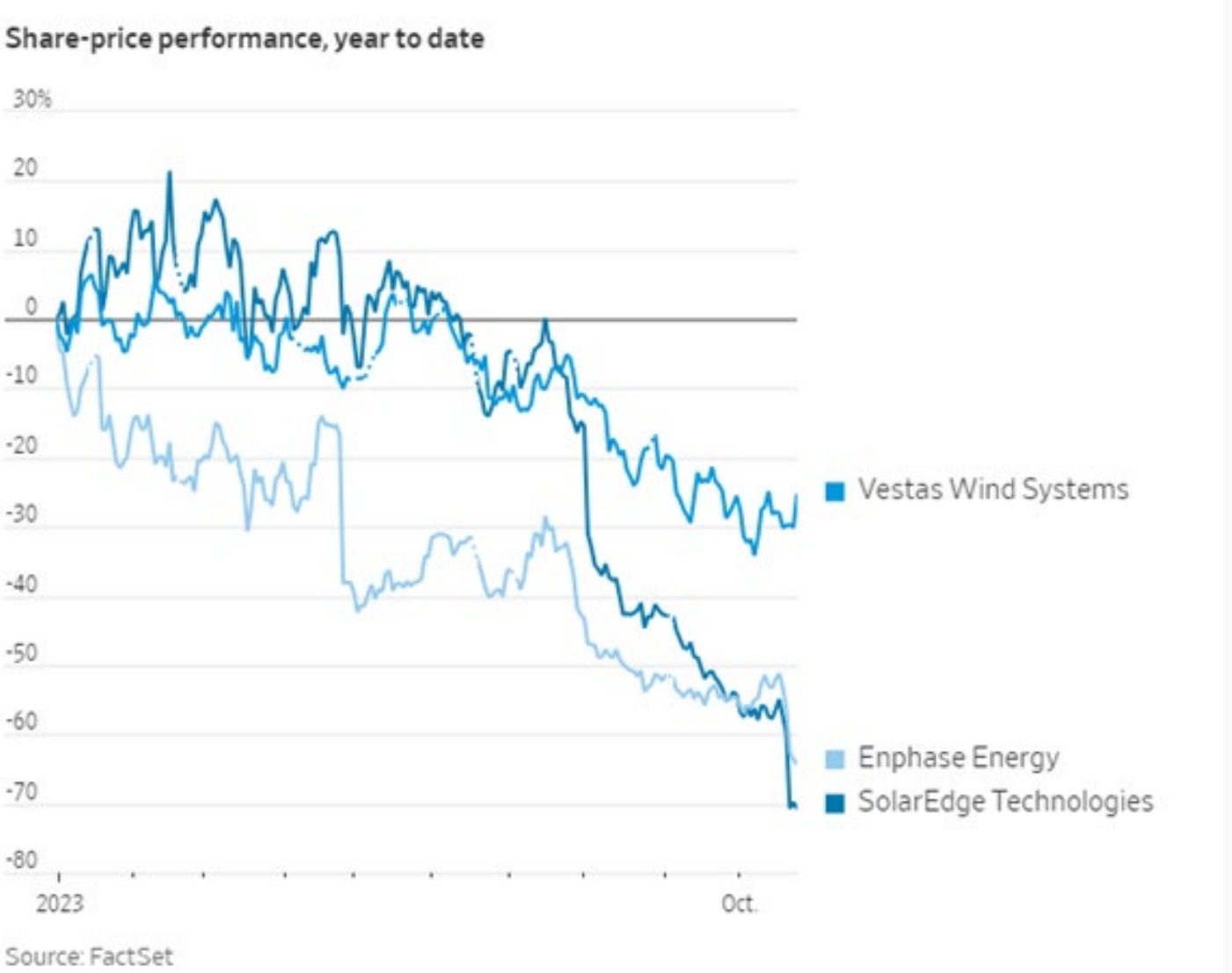

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Source: robertbryce.substack.com

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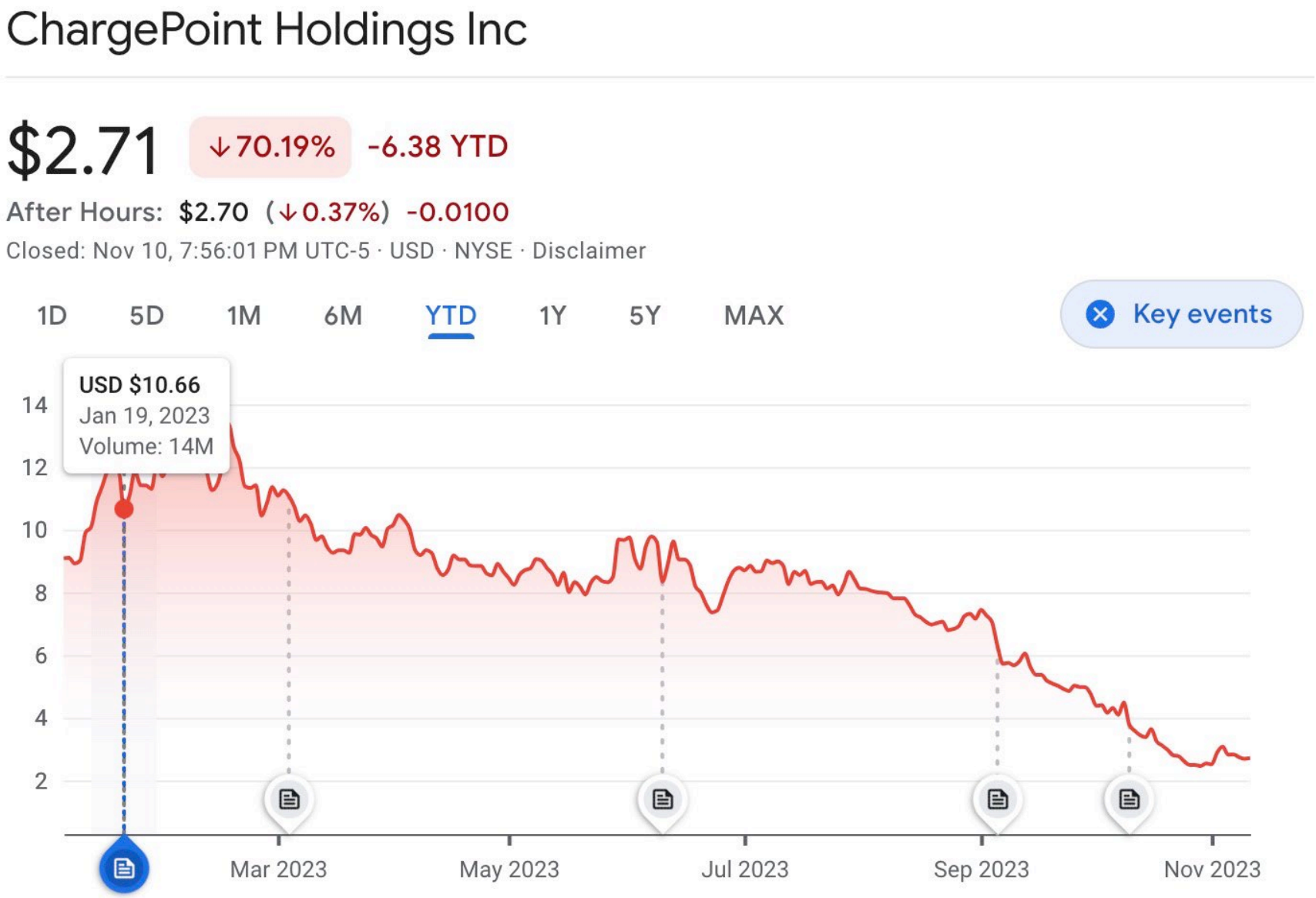

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A Different Story for Fossil Fuel-Based Stocks and Funds

Source: robertbryce.substack.com

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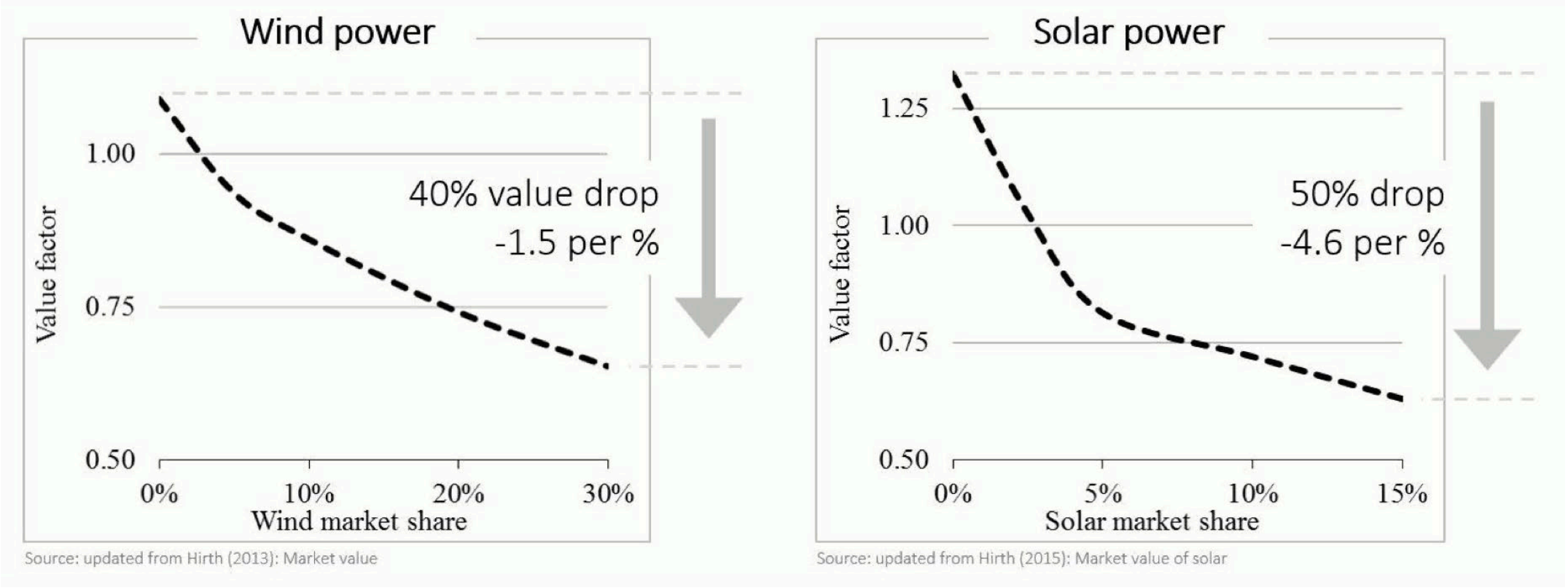
Value of Wind & Solar Decline



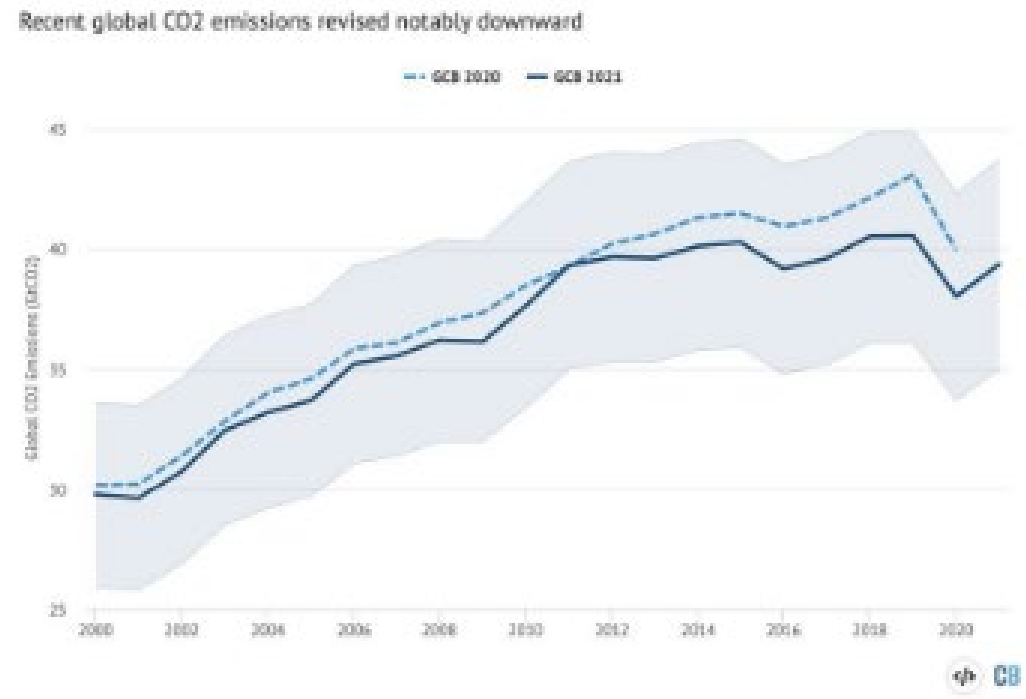
Source: Lion Hirth, "Market Value of Variable Renewables," EUI Working Paper, 2013, http://cadmus.eui.eu/bitstream/handle/1814/27135/RSCAS_2013_36.pdf?sequence

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

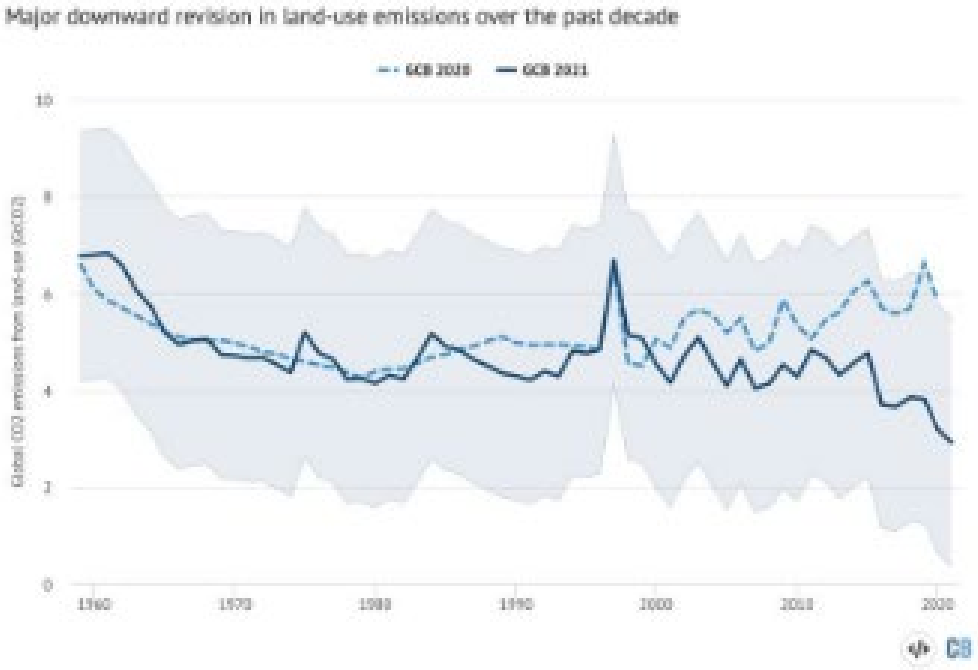
Are we being oversold on the climate change problem?

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Global Emissions in Decline



Annual total global CO2 emissions – from fossil and land-use change – between 2000 and 2021 for both the 2020 and 2021 versions of the Global Carbon Project's Global Carbon Budget. Shaded area shows the estimated one-sigma uncertainty for the 2021 budget. Data from the Global Carbon Project; chart by Carbon Brief using Highcharts.



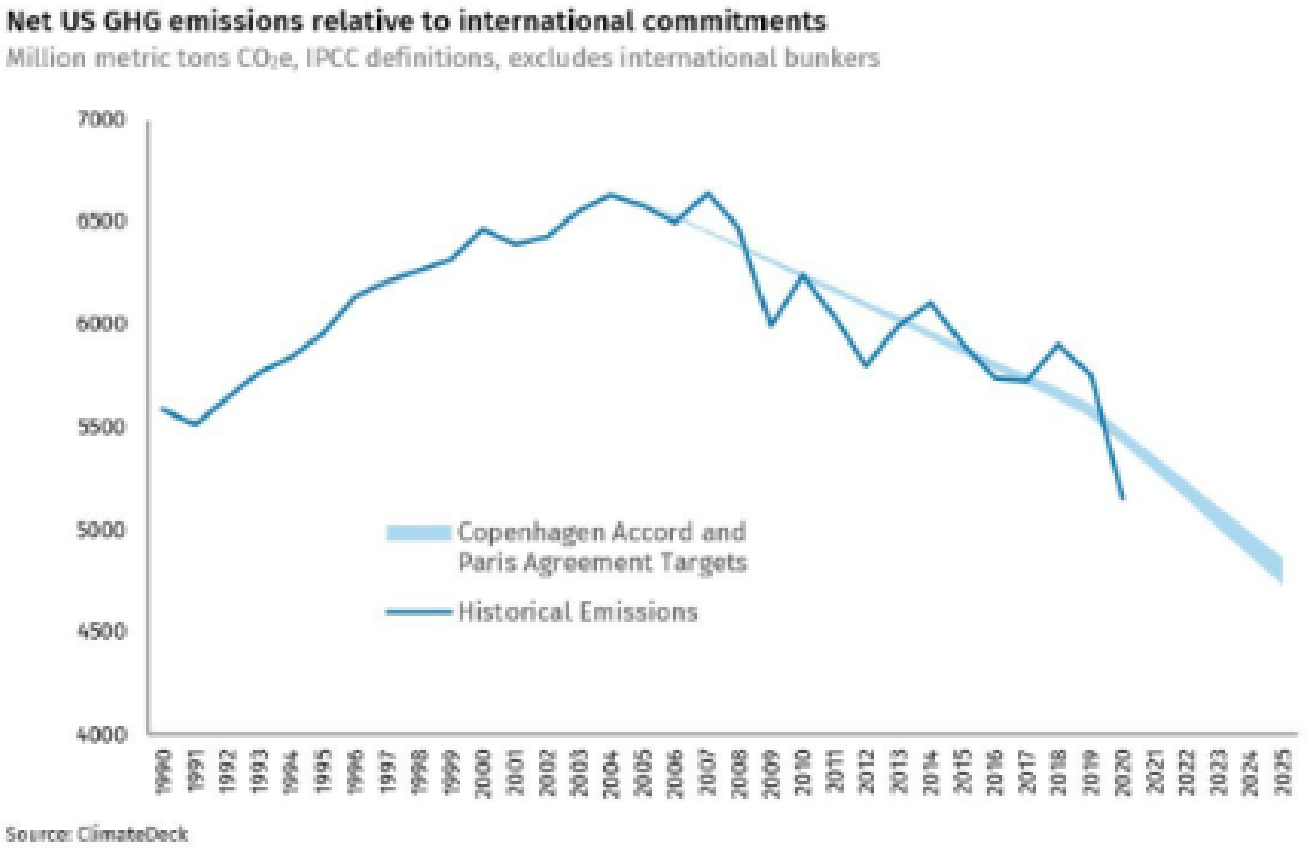
Annual global CO2 emissions from land-use change between 1959 and 2021 for both the 2020 and 2021 versions of the Global Carbon Project's Global Carbon Budget. Shaded area shows the estimated one-sigma uncertainty for the 2021 budget. Data from the Global Carbon Project; chart by Carbon Brief using Highcharts.

Source: Zeke Hausfather, Carbon Brief, November 4, 2021

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

U.S. Is World Climate Leader

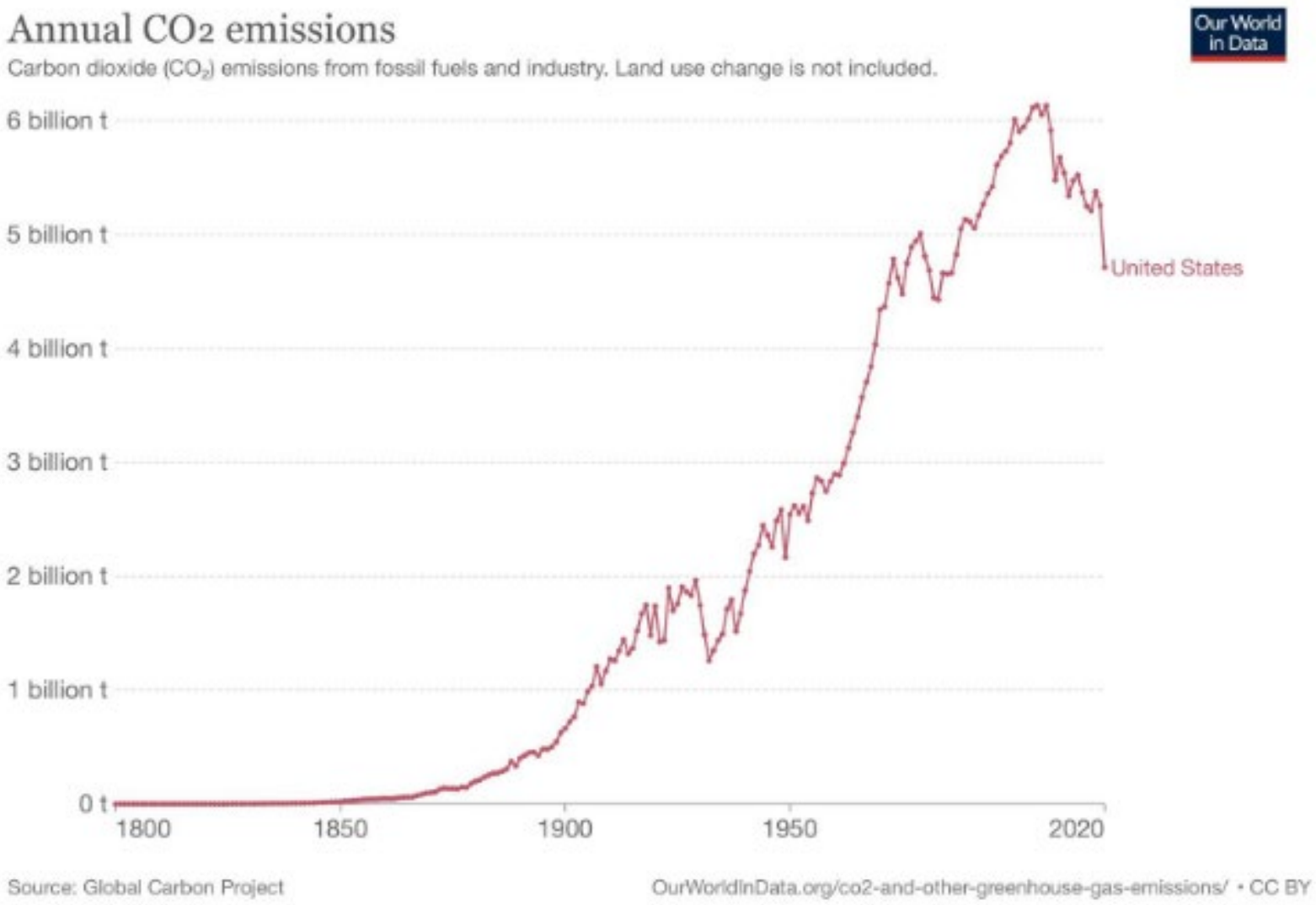
"The U.S. saw the largest decline in energy-related CO_2 emissions in 2019 on a country basis." – International Energy Agency, 2020



Source: Rhodium Group, Jan 12, 2021

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

United States



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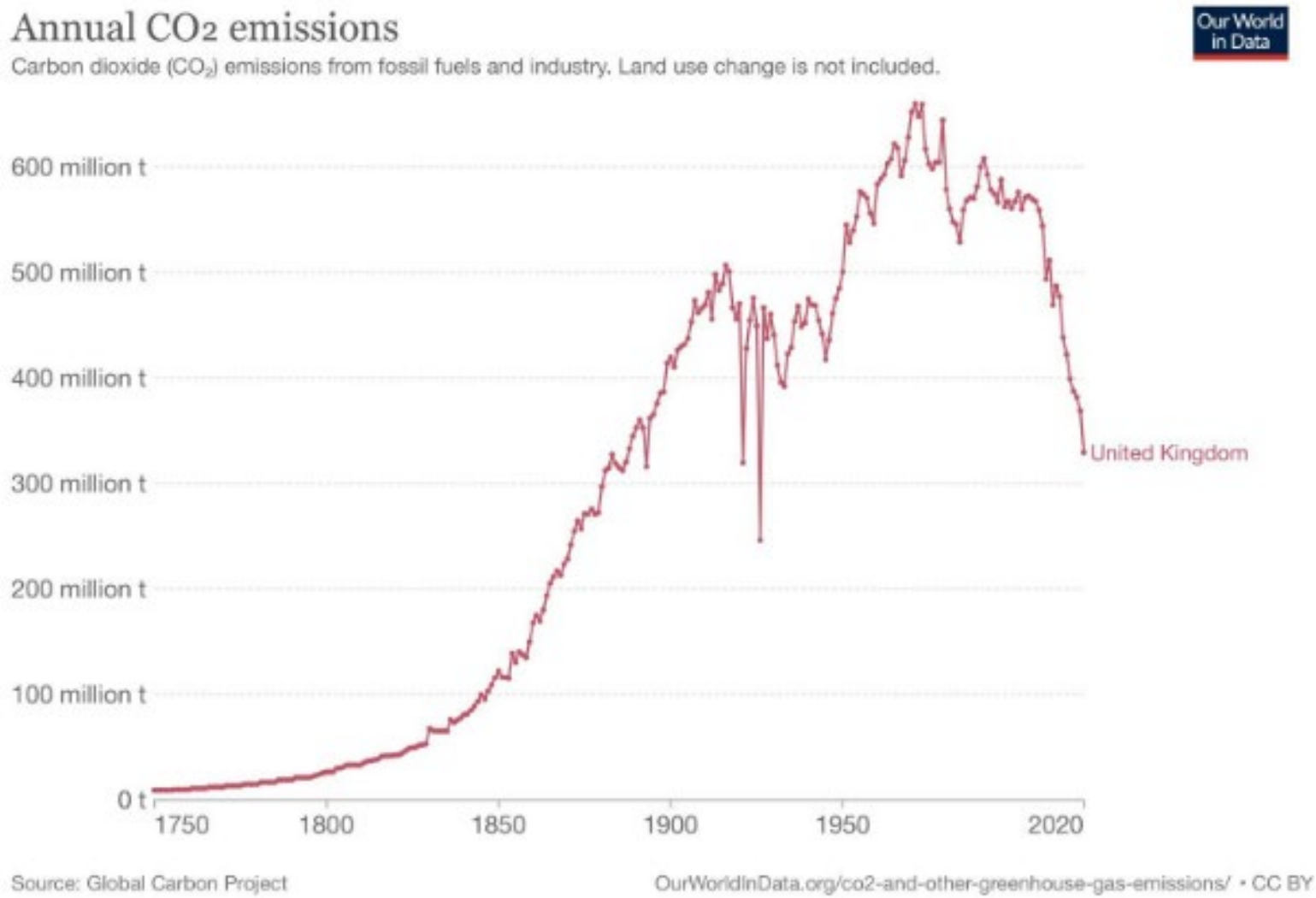
United Kingdom



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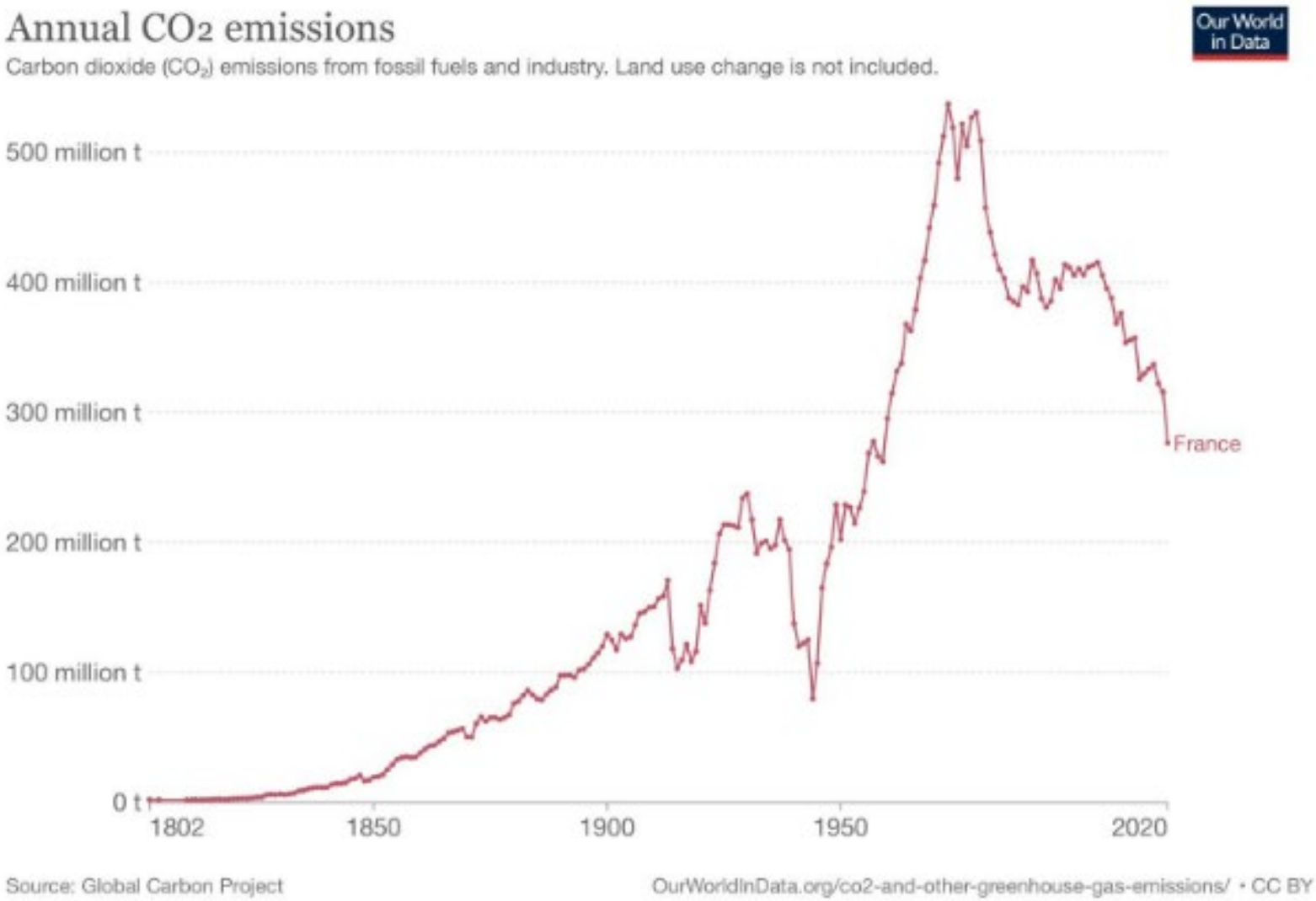
France



Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Despite the Rhetoric, Global Coal Demand Grows

Source: “Why Everything They Said About The Environment Was Wrong,” Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

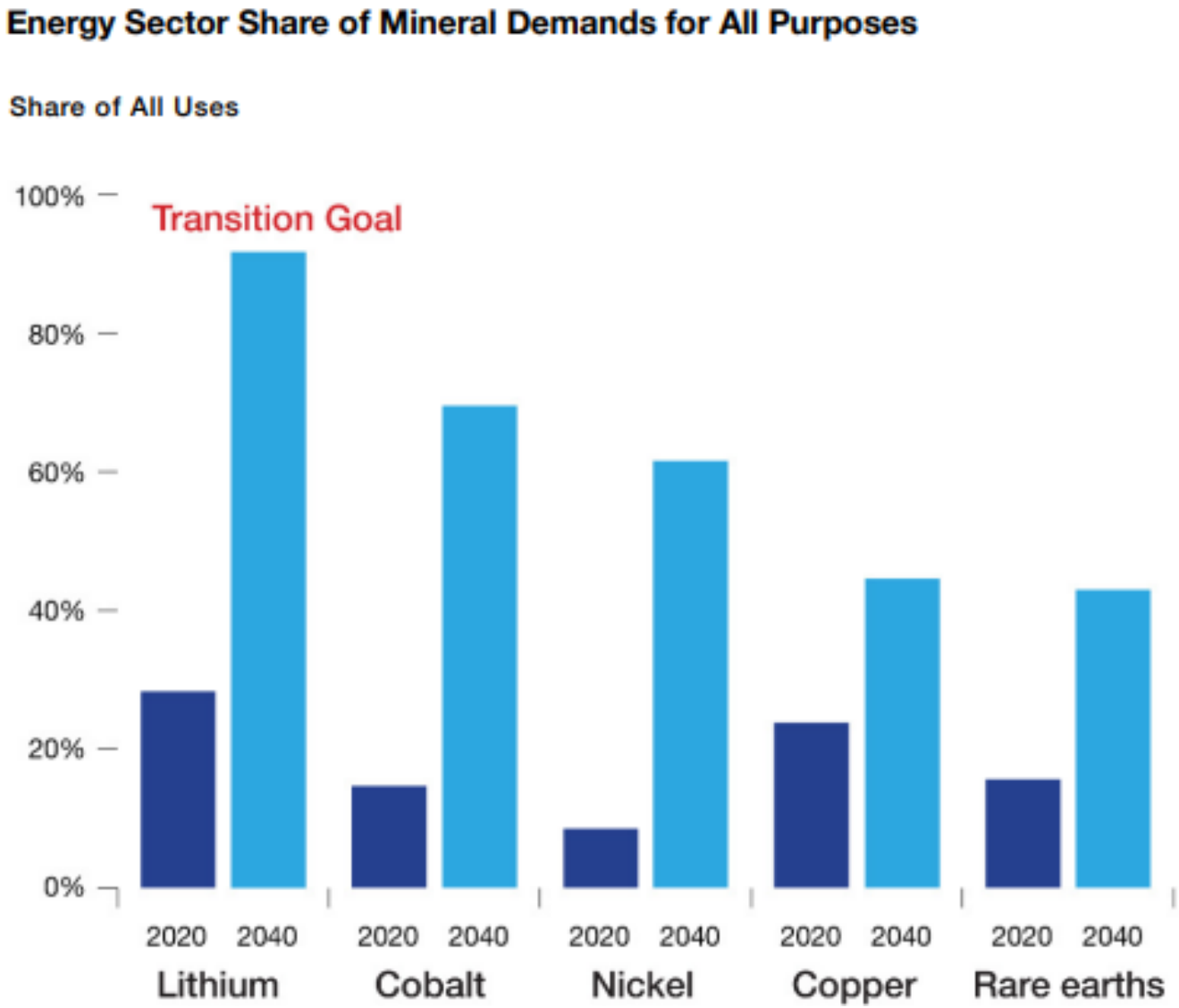
It's All About Scale

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

It's All About Scale

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Energy Transition Policies are Inflationary



Source: IEA, " The Role of Critical Minerals in Clean Energy Transitions," 2021
The "Energy Transition" Delusion: A Reality Reset, Mark P. Mills, The Manhattan Institute, August 2022

China is the OPEC of Green Energy Minerals

Sources of Key Energy Transition Minerals

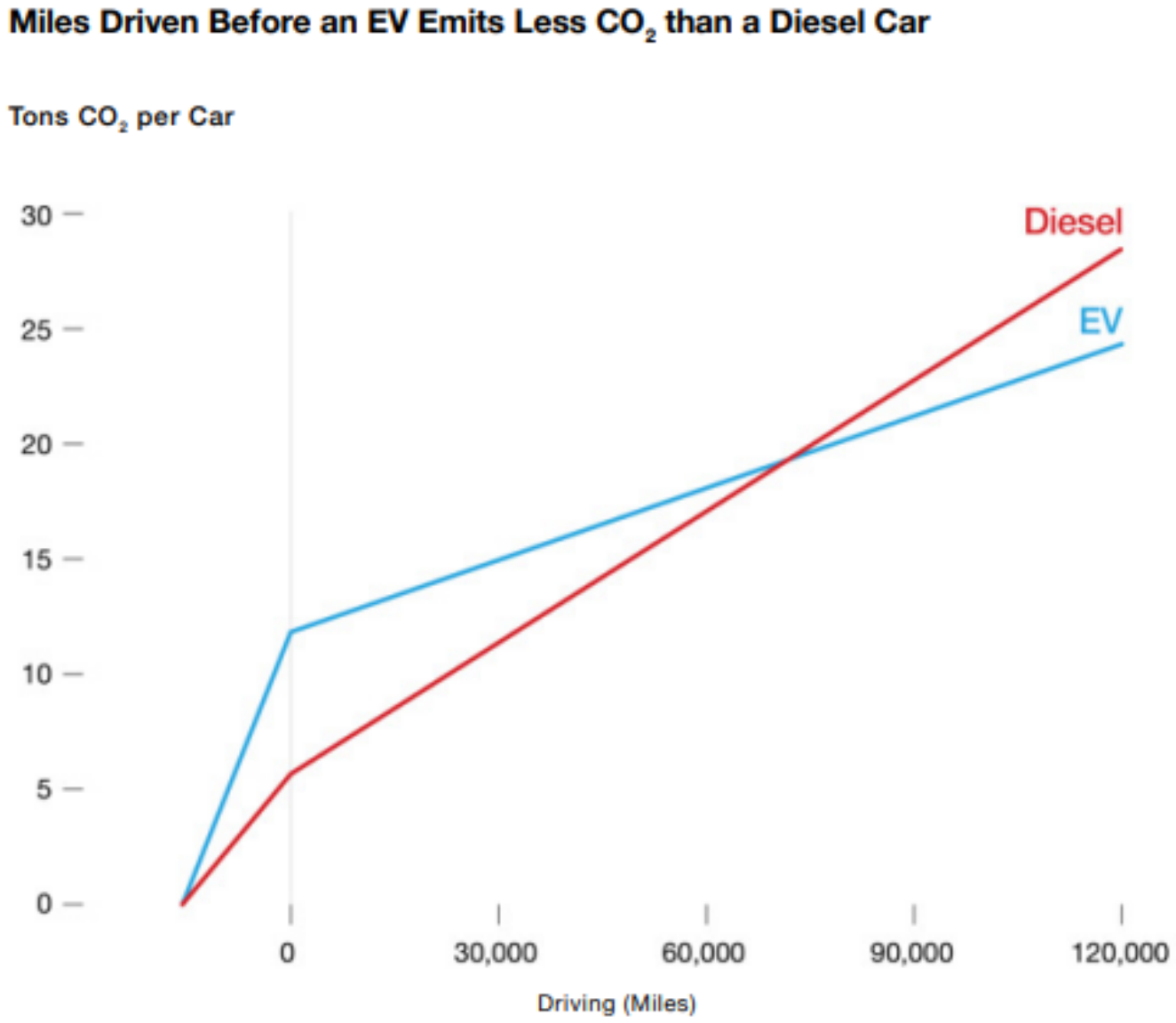
Source: IEA, " The Role of Critical Minerals in Clean Energy Transitions," 2021
The "Energy Transition" Delusion: A Reality Reset, Mark P. Mills, The Manhattan Institute, August 2022

Not Enough Minerals in the Pipeline

"There are simply not enough minerals in the pipeline to meet this kind of demand. One example of this is shown by research done by EV Expert Steve LeVine. Using major metals production forecasts, LeVine found that by 2030, there will only be enough metals for 15.6 million EVs, while automakers claim they want to produce over 40 million."

Source: "The Challenges and Costs of Net-Zero and the Future of Energy," IER, August 2023

Green Energy Isn't Carbon-Free



Source: Volkswagen, "From the Well to the Wheel," April 2019
The "Energy Transition" Delusion: A Reality Reset, Mark P. Mills, The Manhattan Institute, August 2022

China is the OPEC of Green Energy Minerals

"The International Energy Agency's (IEA) 'sustainable development scenario' results in a

- 42-fold increase in lithium demand,
- 25-fold increase in graphite demand,
- 21-fold increase in cobalt demand,
- 19-fold increase in nickel demand,
- 7-fold increase in rare earth demand by 2040"





Source: "The Challenges and Costs of Net-Zero and the Future of Energy," IER, August 2023

Needs 379 times more land for solar than nuclear

Source: Comparison between Diablo Canyon Nuclear Plant and Topaz. In 2018, Diablo Canyon produced 18.29 TWh of electricity on an approximate land area of .742 square kilometers. In 2018, Topaz produced 1.3 TWh of electricity on an approximate land area of 20 square kilometers. Generation data from Energy Information Agency.

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Needs 421 times more land for wind than nuclear

Source: Comparison between Diablo Canyon Nuclear Plant and Alta Wind Energy Center. In 2018, Diablo Canyon produced 18.29 TWh of electricity on an approximate land area of .742 square kilometers. In 2018, Alta produced 3.52 TWh of electricity on an approximate land area of 60.1 square kilometers. Generation data from Energy Information Agency.

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

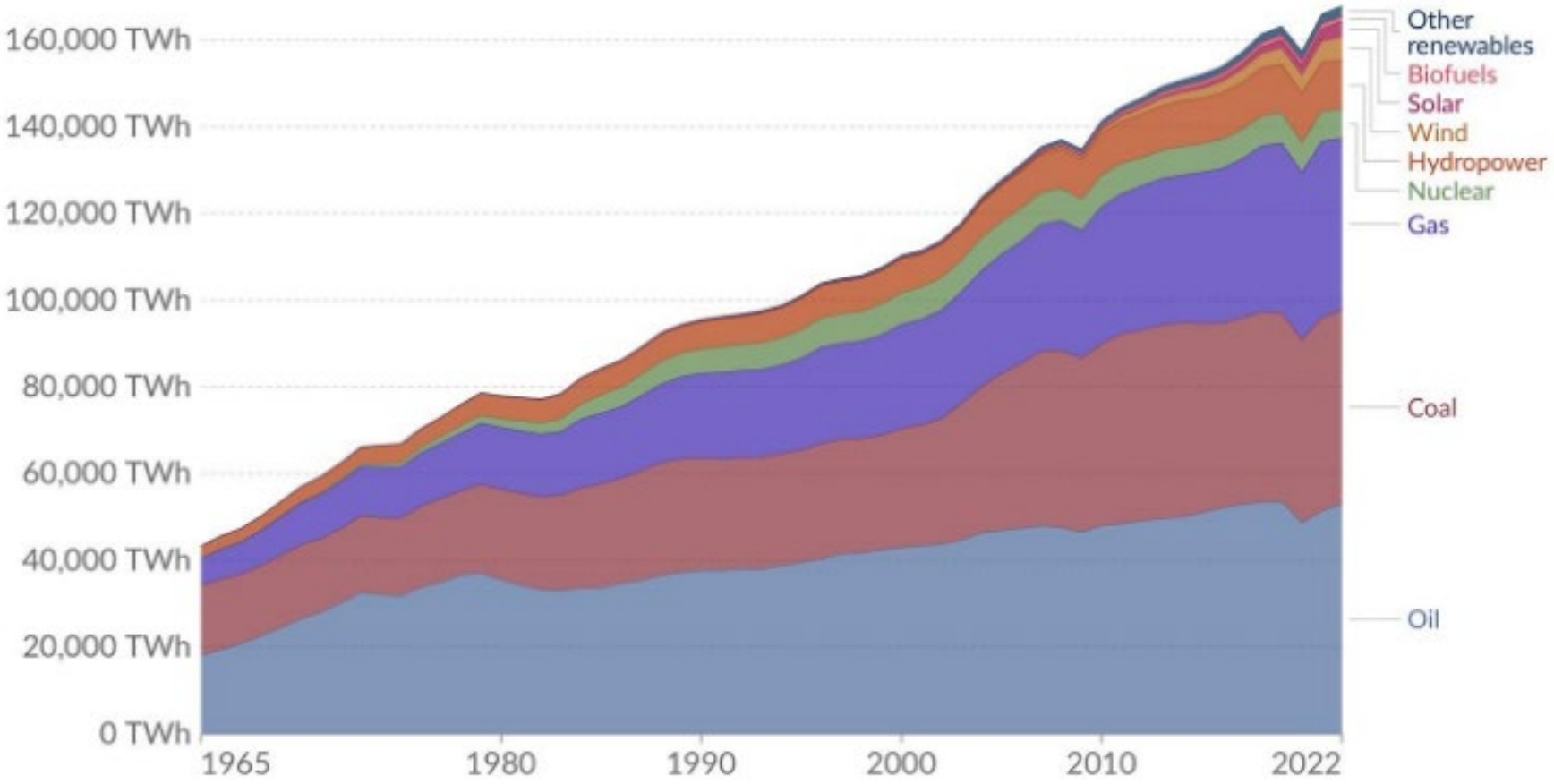
More Proof Electrify Everything Push Is A Regressive Tax:

EIA "Winter Fuels Outlook," October 11, 2023

Source: Robert Bryce, Substack

Energy consumption by source, World

Primary energy consumption is measured in terawatt-hours (TWh). Here an inefficiency factor (the 'substitution' method) has been applied for fossil fuels, meaning the shares by each energy source give a better approximation of final energy consumption.

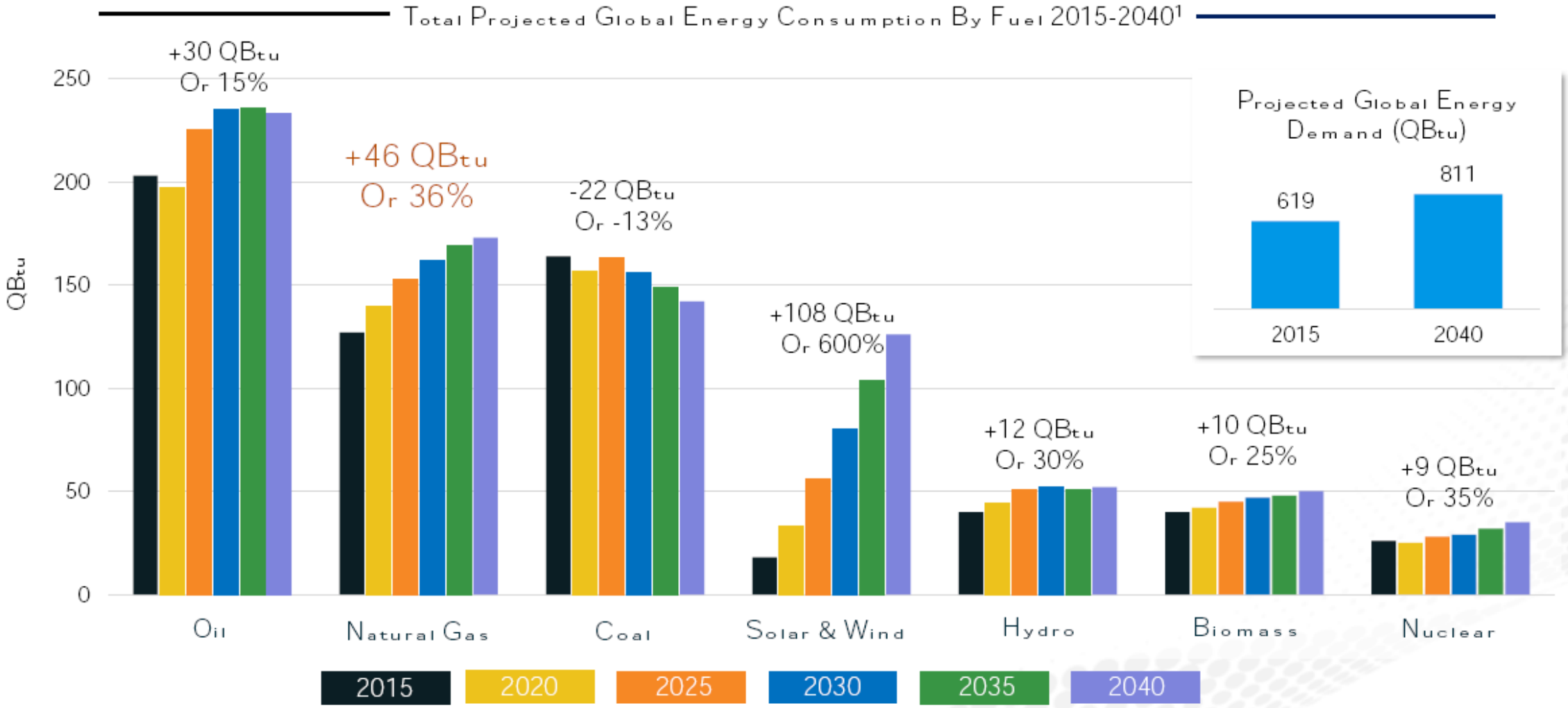


Data source: Energy Institute Statistical Review of World Energy (2023)
Note: 'Other renewables' includes geothermal, biomass and waste energy.

OurWorldInData.org/energy | CC BY

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

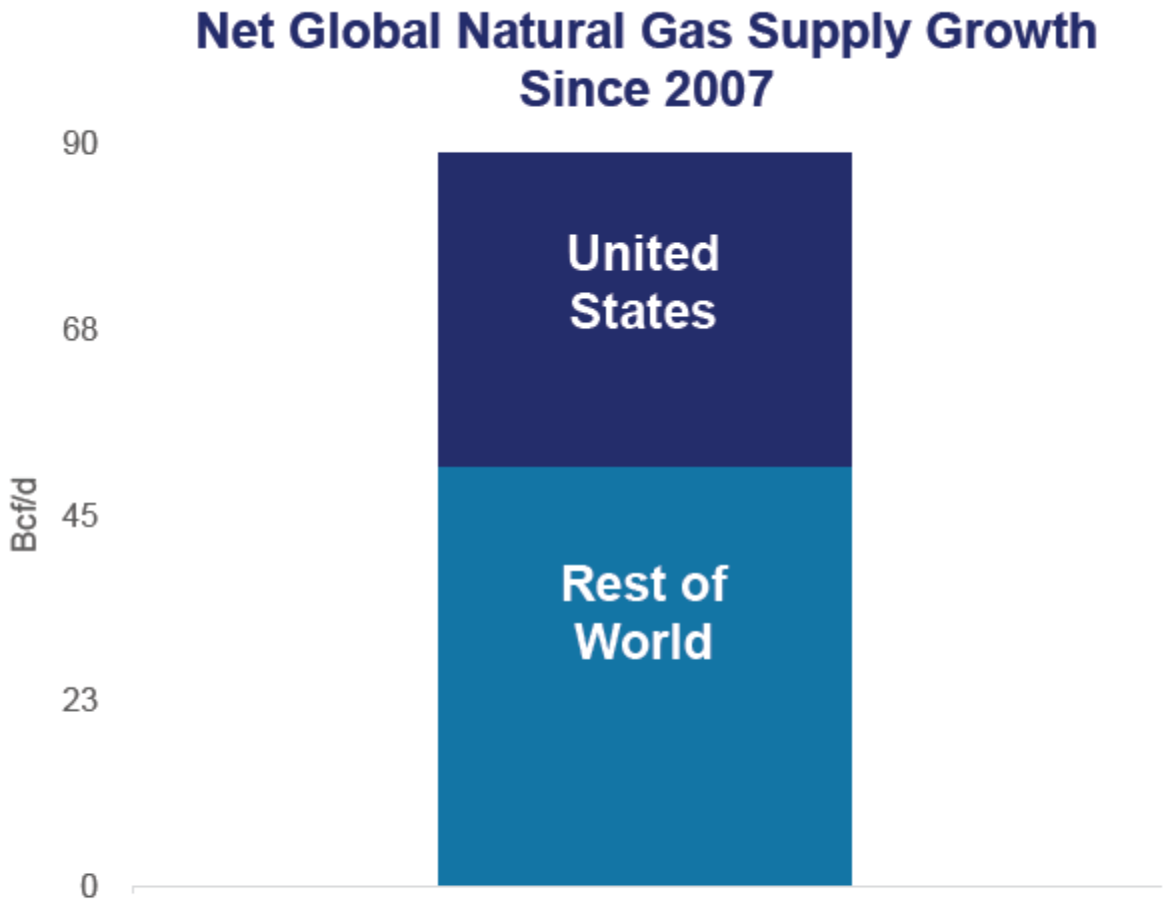
Nearly one-quarter of global energy demand growth through 2040 projected to be filled by natural gas



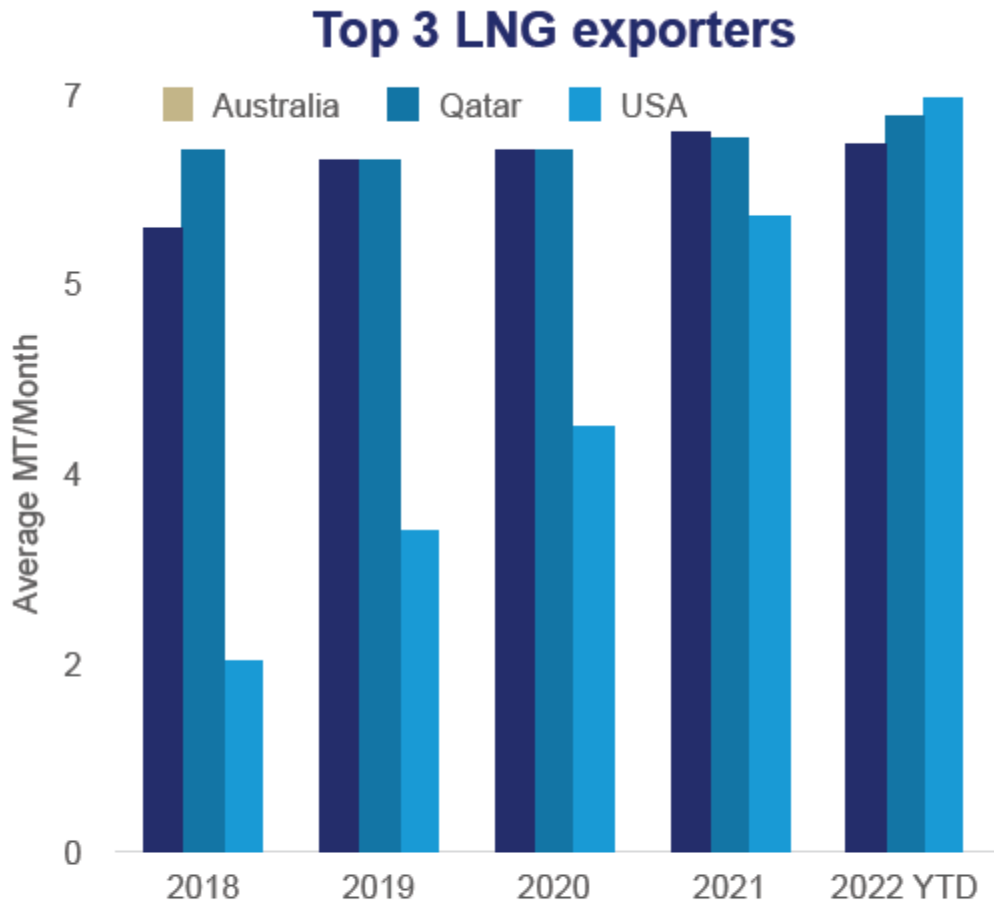
[1]Source: S&P Global Commodity Insights ©2023 May 2023 Reference Case

Source: Williams presentation to J.P. Morgan Energy, Power & Renewables Conference, Alan Armstrong, June 21, 2023

The United States has been the key driver of global natural supply growth



- Since 2007, 42% of global natural gas supply growth has come from the United States

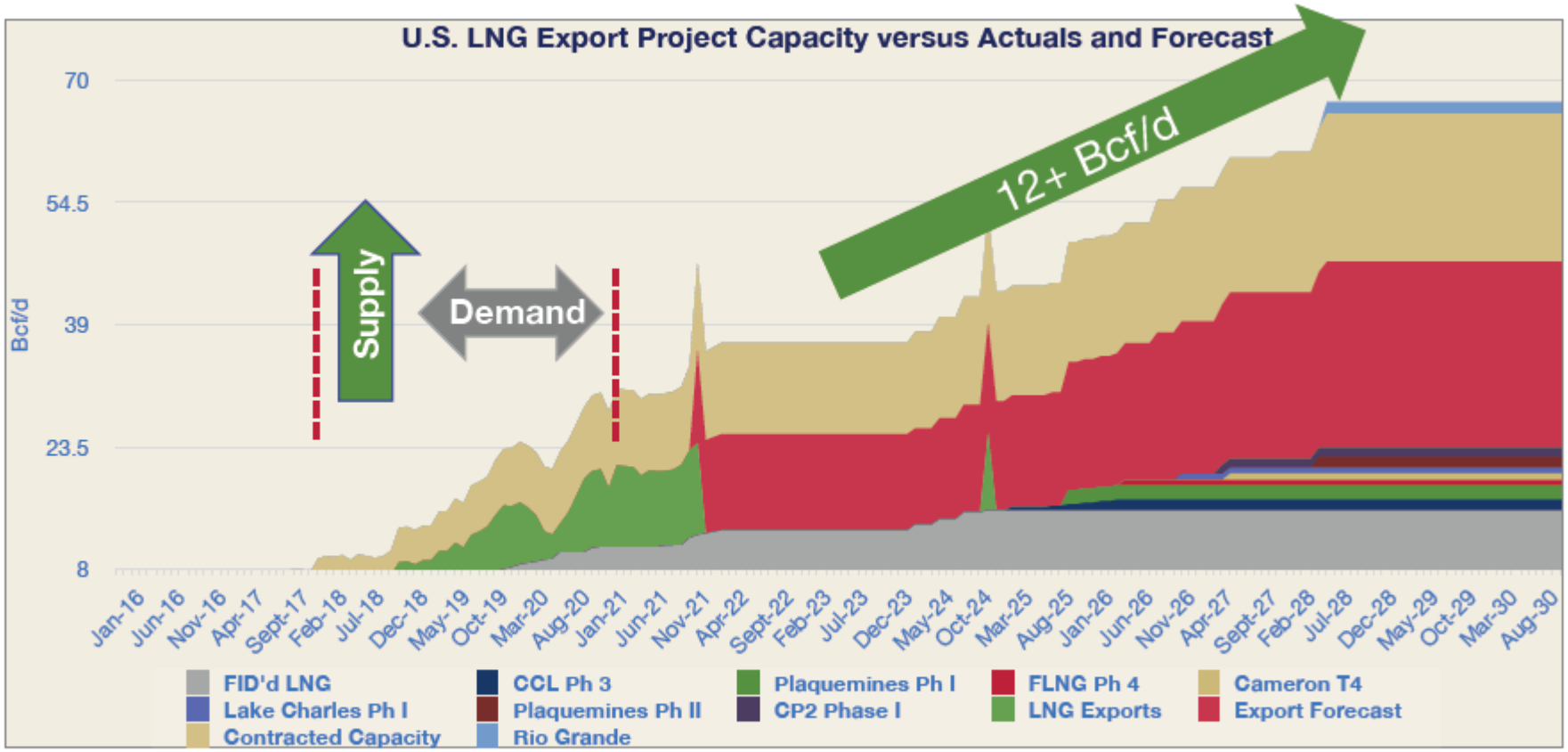


- US natural gas supply growth has supported LNG exports, with the US overtaking Qatar this year

Source: Wood Mackenzie, IHS Markit
Note: 2022 YTD = January 1 to June 15, 2022

Source: *Sempra Infrastructure, "Evolving energy for an evolving world," September 27, 2022*

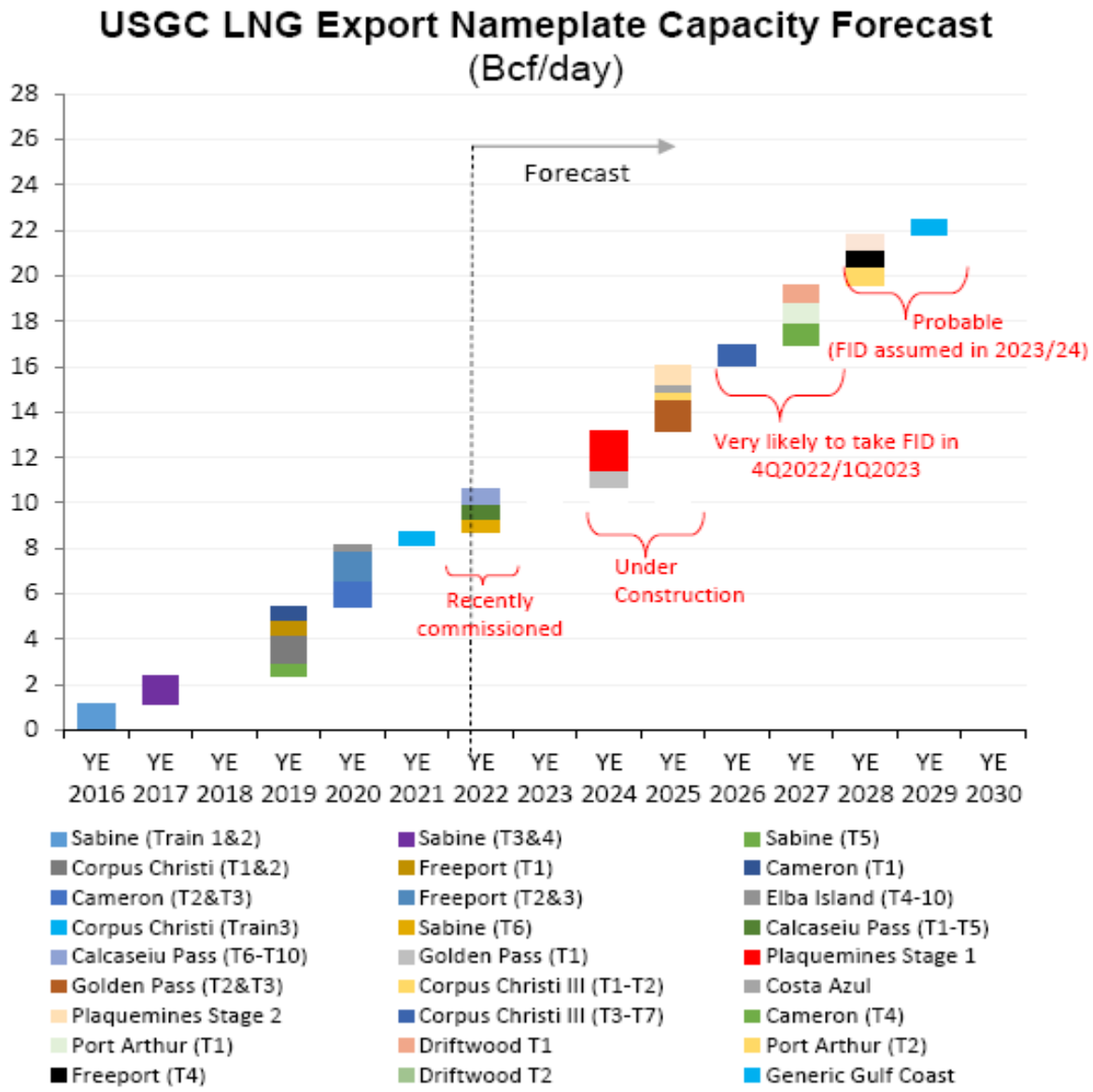
2024 to 2030

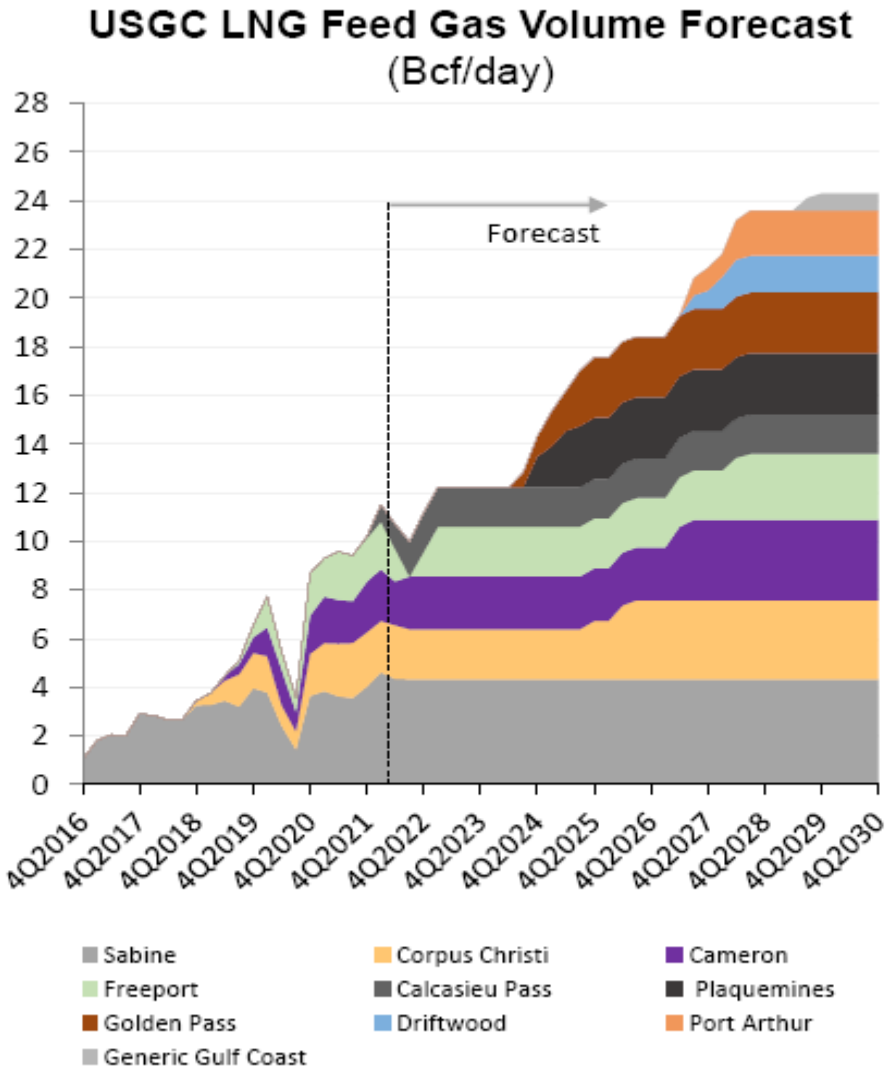


Where will all the gas come from to meet this massive increase in Demand?

Source: *East Daley Analytics, "Natural Gas Supply & Demand Outlook," Zack Van Everen, September 27, 2022, East Daley SPA Tracker, East Daley Supply & Demand Forecast*

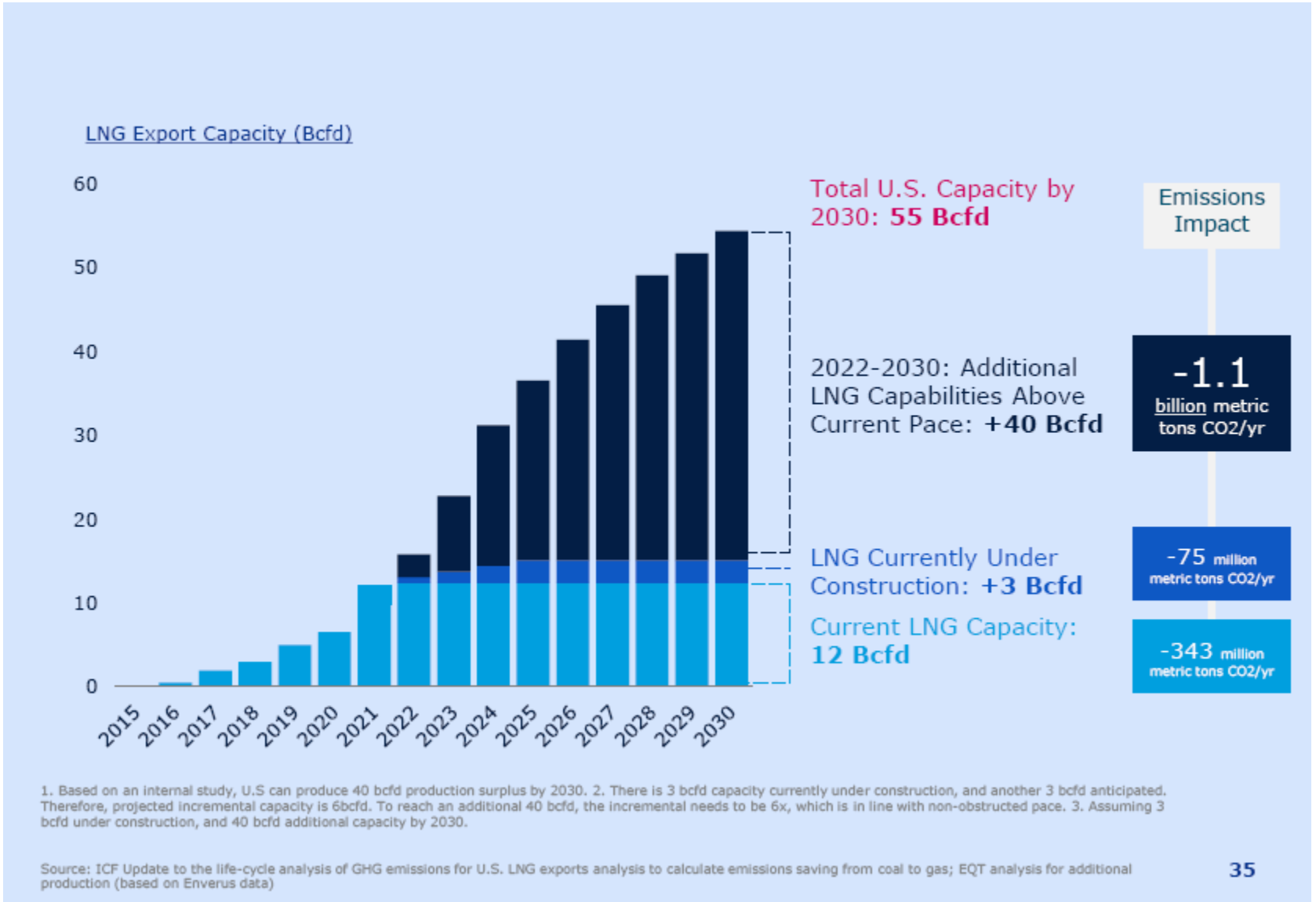
USGC LNG feed gas is expected to reach ~24 Bcf/d by 2030, adding ~14 Bcf/d to regional demand (from 2021 average of ~10 Bcf/d)





Source: Enkon Energy Advisors, "*Are Stars Aligning for U.S. Natural Gas Storage Assets?" September 27, 2022, Enkon Research and Analysis, Investor presentations, FERC, EIA, Informational Postings*

Projected LNG Export Capacity Through 2030[1]



Source: *EQT presentation CERA Week LNG, Unleashing U.S. LNG: The Largest Green Initiative on the Planet*

Is the natural gas industry a sunset business?

A leading indicator of a sunset business is the inability to attract capital investments into expensive, long-term projects. This is not happening in natural gas.

- Over the past year and a half, nearly 50binding contracts have been signed for LNG offtake from facilities on the U.S. Gulf Coast
- Of these contracts, about 75% contemplate a start date in 2026 or 2027
- Of these contracts, over 70% run for 20 years and about 25% run for 15 years
- Conclusion: **Sophisticated investors are betting material capital that this will remain a good business through at lest 2045**

Source: *TG Natural Resources LLC, Craig Jarchow, September 27, 2022*

Final Thoughts - Pinch Points

- Markets broken by Federal Tax Incentives
- Regulations
- Duck Curves
- Canals
- Terrorism/Potential for Critical Energy Infrastructure Sabotage

Texas Energy Fund Should Help the Market

By about a two-thirds margin, voters in the Lone Star State on November 7, 2023 approved a constitutional amendment authorizing a new $10 billion Texas Energy Fund to provide low-interest loans to build gas-fired power plants, develop microgrids and modernize portions of the state's electric grid.

Source: 4 questions answered about Texas' grid crisis, www.eenews.net, Jason Plautz, 11/03/23

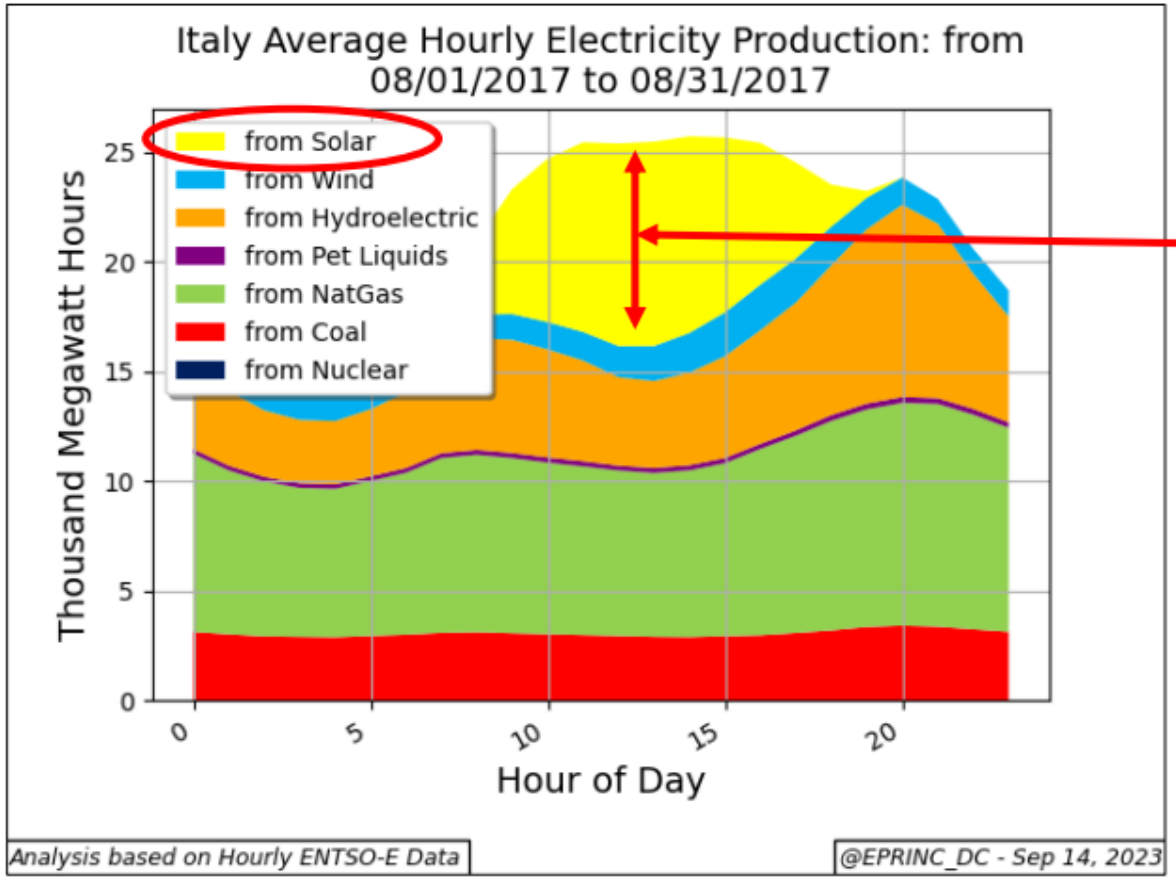
Pinch Points - Regulations? A New Target?

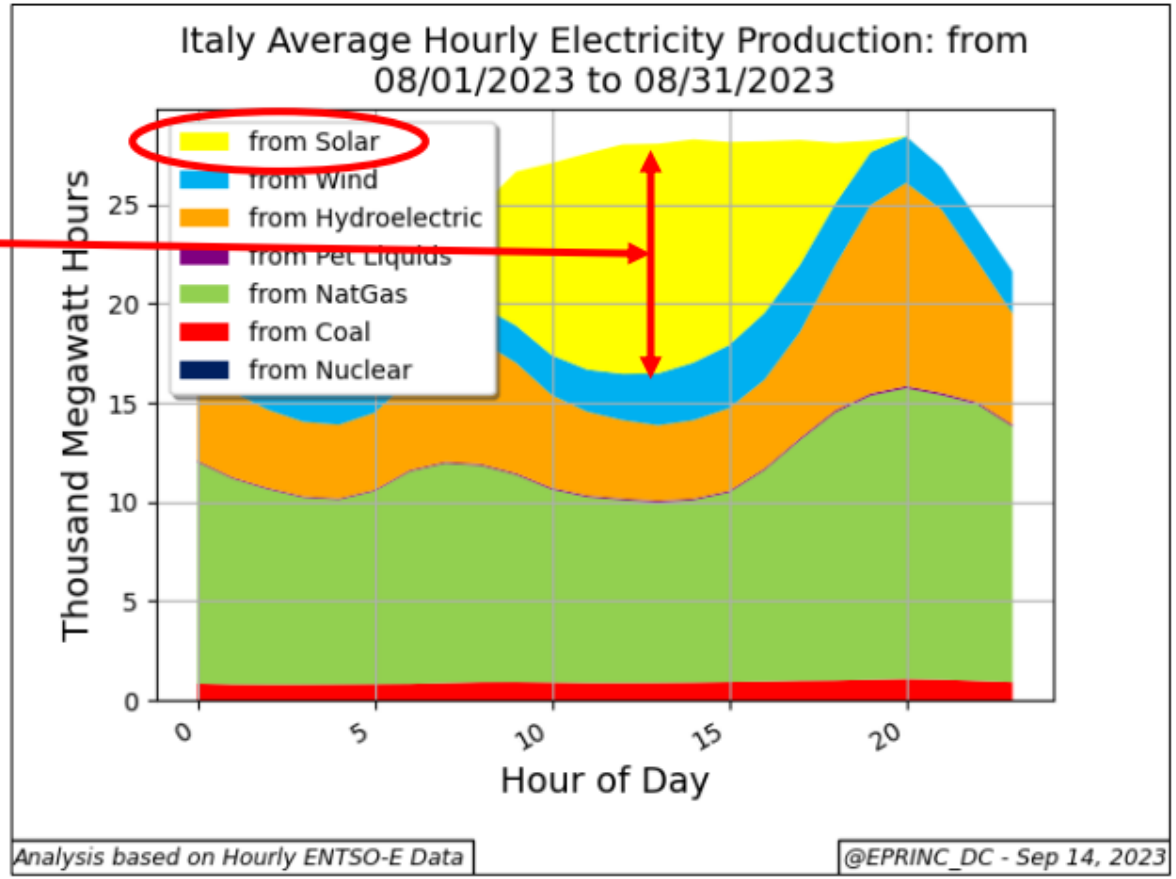
- Environmental left wants to force Biden's hand on U.S. LNG exports
- "The buildout of LNG infrastructure in the U.S. is by far the largest example of fossil-fuel expansion currently proposed anywhere in the world."
- "worse than digging up and burning an equivalent amount of coal"

– Bill McKibben

Source: *A McKibben With Fries*, Doomberg, 11/14/2023

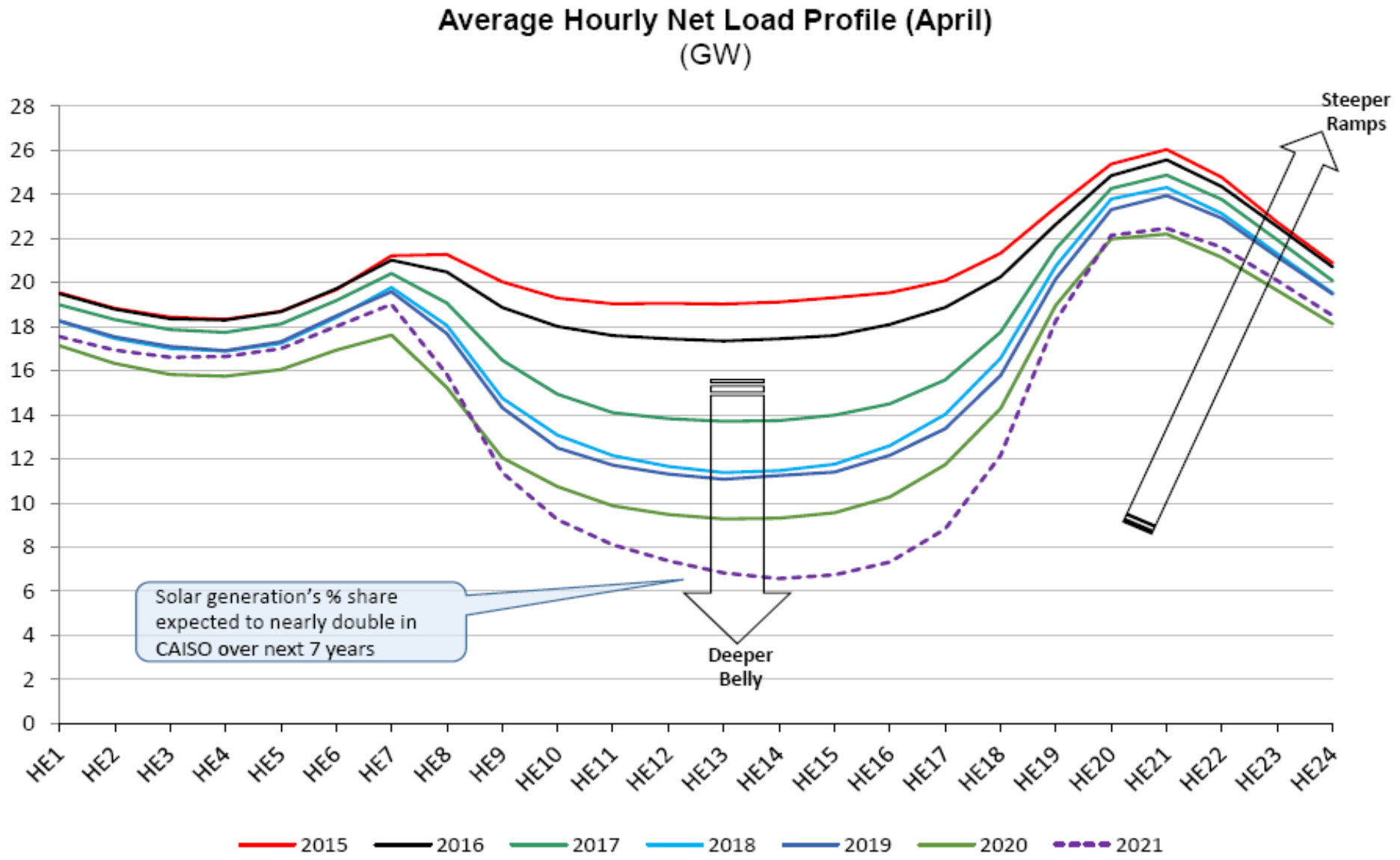
Pinch Point - The Troublesome Duck Curve





Source: The Italian Duck Curve: Evolution of Italy's August Electricity Generation Resource Mix – 2017-2023, Energy Policy Research Foundation, Max Pyziur

Growth in wind/solar resource will amplify hourly swings in net load stressing pipeline systems that rely on ratable 1/24 deliveries



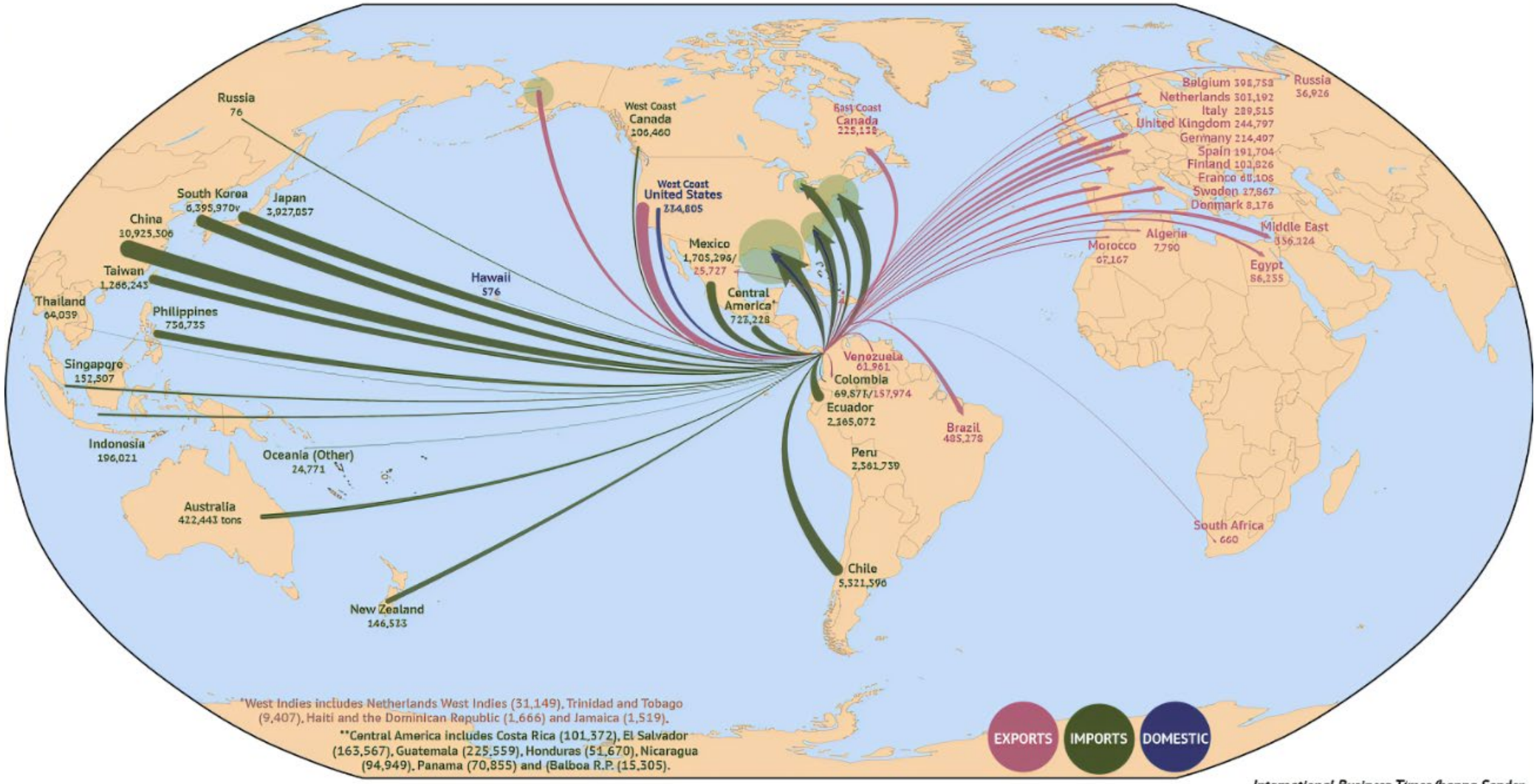
Source: Enkon Energy Advisors, "*Are Stars Aligning for U.S. Natural Gas Storage Assets?" September 27, 2022, Enkon Research and Analysis*

Pinch Point – The Panama Canal

- 40% of all U.S. container traffic travels through the Panama Canal every year
- That is roughly $270 billion in cargo annually
- Due to drought, historical shipping which averaged 40 cargo ships per day, has been cut to less than 20
- A month ago, at auction a record bid was received for a shipping slot (a liquified petroleum gas tanker) later this month at $3.98 million, typically worth $100,000-150,000*

Source: Bloomberg

U.S. TRADE ROUTED THROUGH THE PANAMA CANAL



Source: Panama Canal Recovers market in Routes to Asia, The Panama Perspective, Adrain Prozzo, August 16, 2016

Pinch Point – The Suez Canal – An Artery at the Heart of Global Trade

Mercator Energy

- More than 10% of global trade, 18,000 ships every year, goes through the Suez Canal and China is its biggest user
- On average, 50 ships traverse the canal daily, carrying $3.9 billion worth of cargo
- Over 1 billion tonnes of cargo was shipped through the canal in 2019
- That is 4X the Panama Canal

Source: Bloomberg

China: 124, America: 56

Source: Four Maps Showing China's Rising Dominance in Trade, visualcapitalist.com, Jeff Desjardins, April 27, 2016

Pinch Point - Straits of Hormuz

Approximately 10 BCF/day is exported through the Straits… That is equivalent to 20% of world LNG supply

Finland Joins NATO, April 4, 2023

Source: Map shows how Russia's border with NATE more than doubles with Finland as a member, msn.com, Sinead Baker, Erin Snodgrass,

Pinch Point - Asymmetric Warfare? May 3, 2023 NATO Warning

Mercator Energy

- NATO warns Russia could target undersea pipelines and cables
- Moscow is ‘actively mapping’ gas pipelines and internet cables, top intelligence official says
- “We see a significant risk that critical infrastructure in Europe and potentially North America could be targeted by Russia as part of its war on Ukraine,” (David Cattler, NATO’s assistant secretary general for intelligence and security)

Source: Politico

Pinch Point – "Not Petya" From a New Jersey Appellate Court Opinion

"The exclusion of damages caused by hostile or warlike action by a government or sovereign power in times of war or peace requires the involvement of military action. The exclusion does not state the policy precluded coverage for damages arising out of a government action motivated by ill will, … It was not willing to refine war."

"If the sabotage was linked to a state, does it constitute an act of war?"

Source: *A Pipeline Mystery Has a $53 Million Solution,* Foreignpolicy.com, Elisabeth Braw, November 6, 2023

Within 24-hours of the Hamas Attack on Israel

- A Chinese ship, the NewNew Polar Bear, drags a 6-ton, 12,000 lb. anchor over 100 nautical miles, through the Baltic Sea while shadowed by a Russian nuclear powered cargo ship, taking out 2 critical fiber optic cables and the Balticconnector Pipeline (the only natural gas pipeline serving Finland)
- Is this a case of asymmetric hybrid Russian maritime warfare?
- Doesn’t this constitute an attack on NATO’s critical energy infrastructure?

Questions to Ponder

- Should we anticipate more “grey zone” asymmetric warfare on our energy infrastructure?
- Should we anticipate continued regulatory upheaval with respect to fossil fuels?
- How do you measure the impact of geopolitical risk, ie – potential attacks on critical energy infrastructure, on the insurance industry?

Closing

Mercator Energy

Progressives don’t understand scale.

Daniel Yergin: “… this is a $90 trillion world economy that gets 80% of its energy from hydrocarbons. It’s not going to change overnight.”

Source: *Energy conference leader pans Kerry’s 2050 climate goals: ‘Going to still be an energy mix,’ Tyler Olson, Fox Business, March 15, 2022*

Threats to Shipping Vessels – A Disturbing Global Trend

“Comment: Shipping splutters as key choke points feel the pressure”

“Taiwan Strait could be the next shipping passageway to be impacted by disturbing global trends”

Source: Tradewinds, Adam Corbett, December 5, 2023

“Satellite Imagery Shows Ship Hijacked by Houthis Near Yemen Port”

“A frame from the video released by the Houthi militia shows a helicopter carrying armed men preparing to land on the Galaxy Leader”

Source: New York Times, Christiaan Triebert and David Botti, November 21, 2023

Yemen: Ship & Hostages Seized

- November 15: USS Thomas Hudner, another destroyer, was sailing toward the Bab-el-Mandeb strait when the crew saw a drone, reported to have originated in Yemen. The ship shot down the drone.
- Nov. 20: **Yemen's Houthi rebels hijack an Israeli-linked ship in the Red Sea and take 25 crew members hostage**, saying they hijacked the ship because of it's Israeli connection. The Houthis descended onto the ship by rappelling from a helicopter.
- Nov. 23: **USS Thomas Hudner, shoots down more attack drones en route to Israel from the Houthis in Iran.**
- Nov 25: Israeli air force intercept armed drone heading towards Israel in the Red Sea

Screen shots from Houthi propaganda video of their hijacking the Galaxy Leader cargo ship in the Red Sea

Source: Israel-Hamas War, 55 Day Update, Council for a Secure America

“Panama Canal transits plunge 20% as Clarksons predicts deepening disruption”

Mercator Energy

“UK shipbroker said drought impact will intensify before it eases”

Source: Tradewinds, Gary Dixon, December 1, 2023

Selected Reading and Podcasts

RobertBryce.substack.com

Unreportedstorysociety.com

AlexEpstein.substack.com

@Shellenberger

Committeetounleashprosperity.com

Doomberg.substack.com

RogerPielkejr.substack.com

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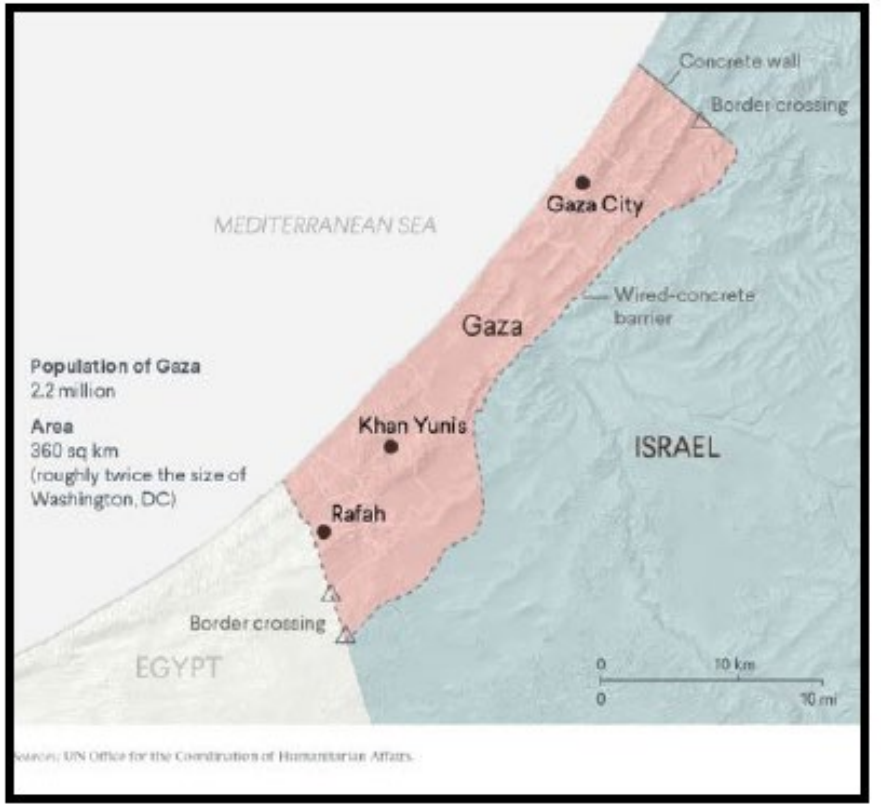
Gaza, population 2.2M, is 25 miles long and 6 miles wide

Gaza's borders:

West borders **Mediterranean Sea**

East, North borders **Israel**

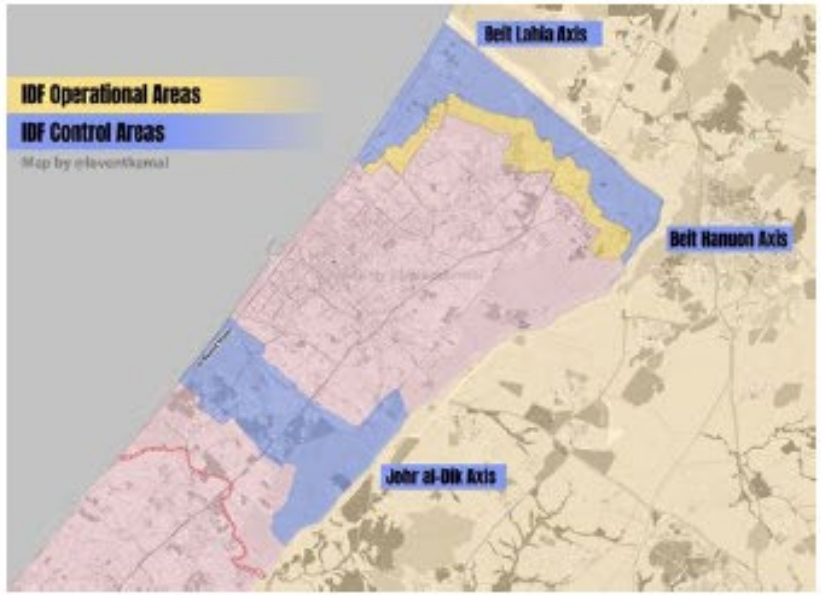
South borders **Egypt**



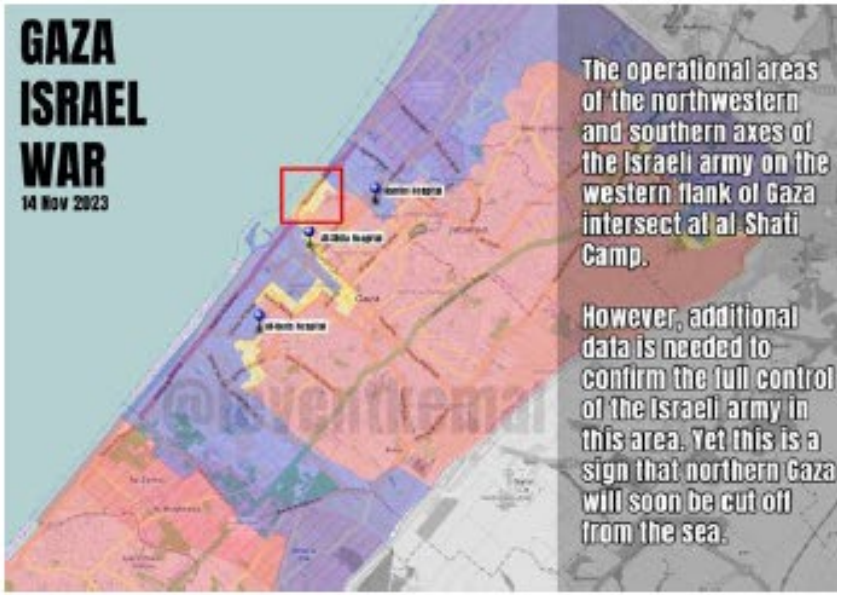
Source: Israel-Hamas War, 55 Day Update, Council for a Secure America

IDF Forces Progress Through Northern Gaza

October 31



November 2



November 14

Source: Israel-Hamas War, 55 Day Update, Council for a Secure America; Images sourced from @LeventKemai

IDF Begins Ground Operations in Northern Gaza

- **Cut off Northern Gaza** from Southern Gaza
- **Cut off Gaza City** from the sea
- **Encircle Gaza City**
- Enter **HAMAS strongholds**
- **Go house-by-house to kill or capture HAMAS** personnel and collect stored weapons (slow operations due to landmines, boobytraps, hidden HAMAS terrorists, tunnel entrances)
- **~40,000 IDF soldiers inside Gaza** from at least 3 Divisions 36th, 162nd, 252nd
- **Continue to tell Gazan civilians to move South** to safer areas

Source: Israel-Hamas War, 55 Day Update, Council for a Secure America

PHASE 4

American Forces Come Under Attack in the Middle East From Iran-Backed Militias in Iraq and Syria

Nov. 30: Secretary Blinken visits region

Source: Israel-Hamas War, 55 Day Update, Council for a Secure America

Scale

100 BCF	Average U.S. Daily Production and Demand
70 BCF	Russian Daily Production
50 BCF	European Union average daily usage
18 BCF	Russian export volume to Europe (2021)
12 BCF	U.S average daily LNG Export volume (2022)
12 BCF	Expected growth in U.S. LNG export capacity next 4 years
11 BCF	Worldwide daily volume of natural gas that is converted to fertilizer
11 BCF	Anticipated 24-hour swing in natural gas demand in California by 2035

Scale

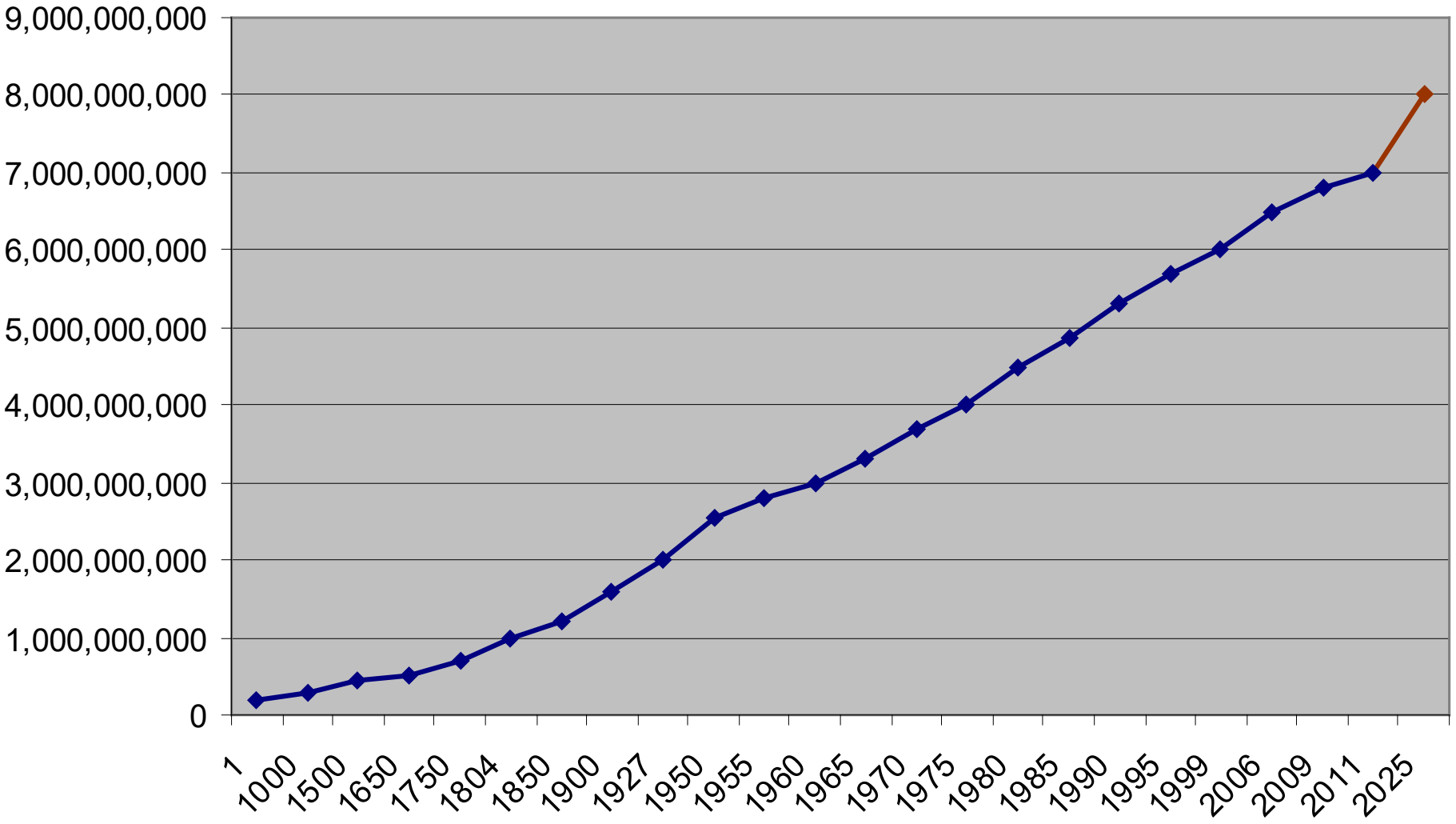
7-8 BCF	California peak day natural gas usage (2022)
4 BCF	Colorado peak day natural gas usage
3 BCF	Volume contained in the average LNG tanker
2.5 BCF	Daily volume of natural gas managed by Mercator Energy
2 BCF	Xcel Energy peak day natural gas usage (CO)
84 Dth	Typical annual average use per U.S household

1 Dekatherm (Dth) = 1 MMBtu = 1 MCF (approx.)

10 Therms = 1 Dekatherm

4/10 of 1%: Percentage of total U.S. gas stove usage vs. total U.S. gas usage

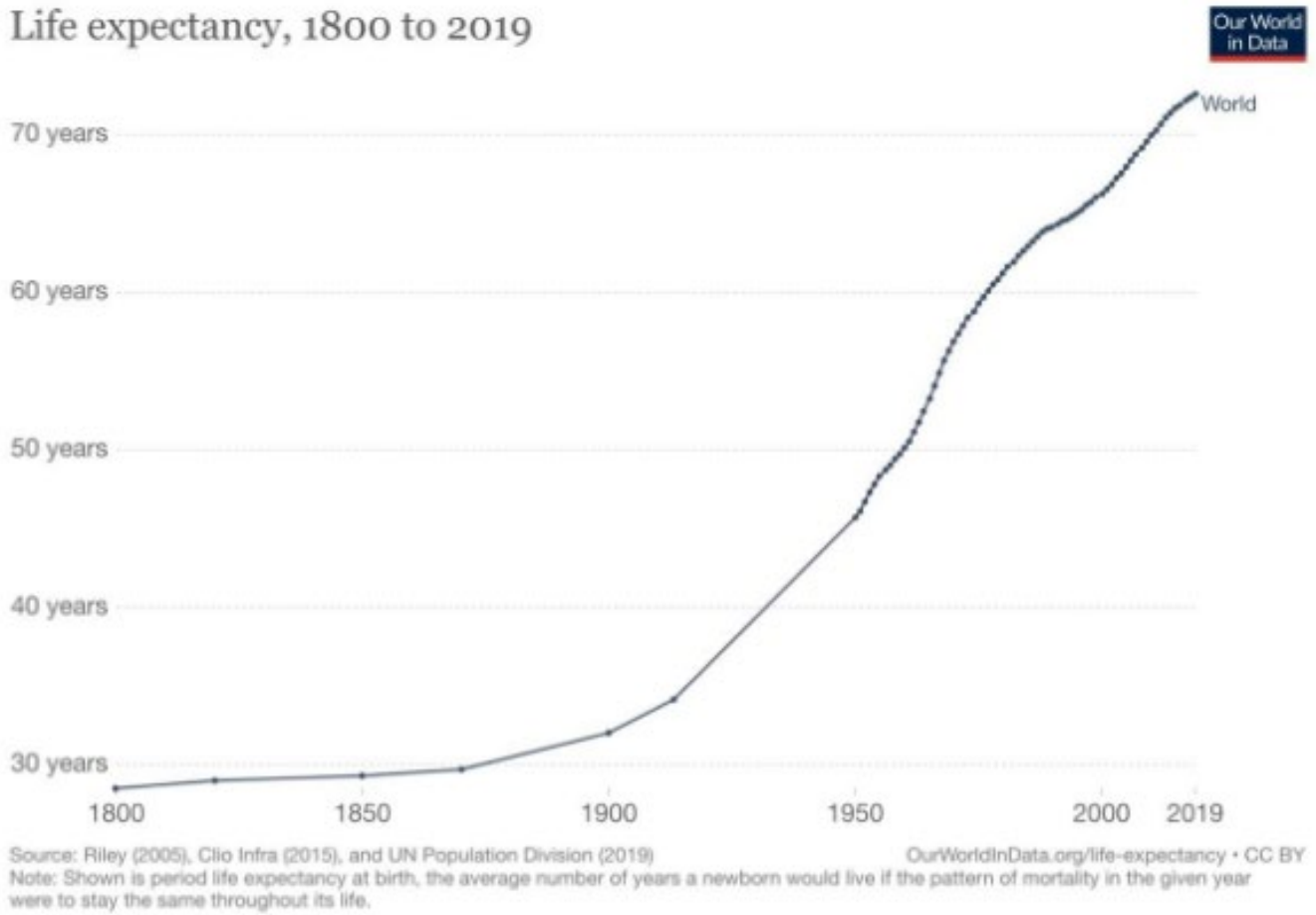
World Population Growth



Source: About.com; http://geography.about.com/od/obtainpopulationdata/a/worldpopulation.htm

Life Expectancy Since the Year 1800

Urbanization, industrialization, and energy consumption have contributed to an extension of life expectancy of **over 40 years...**



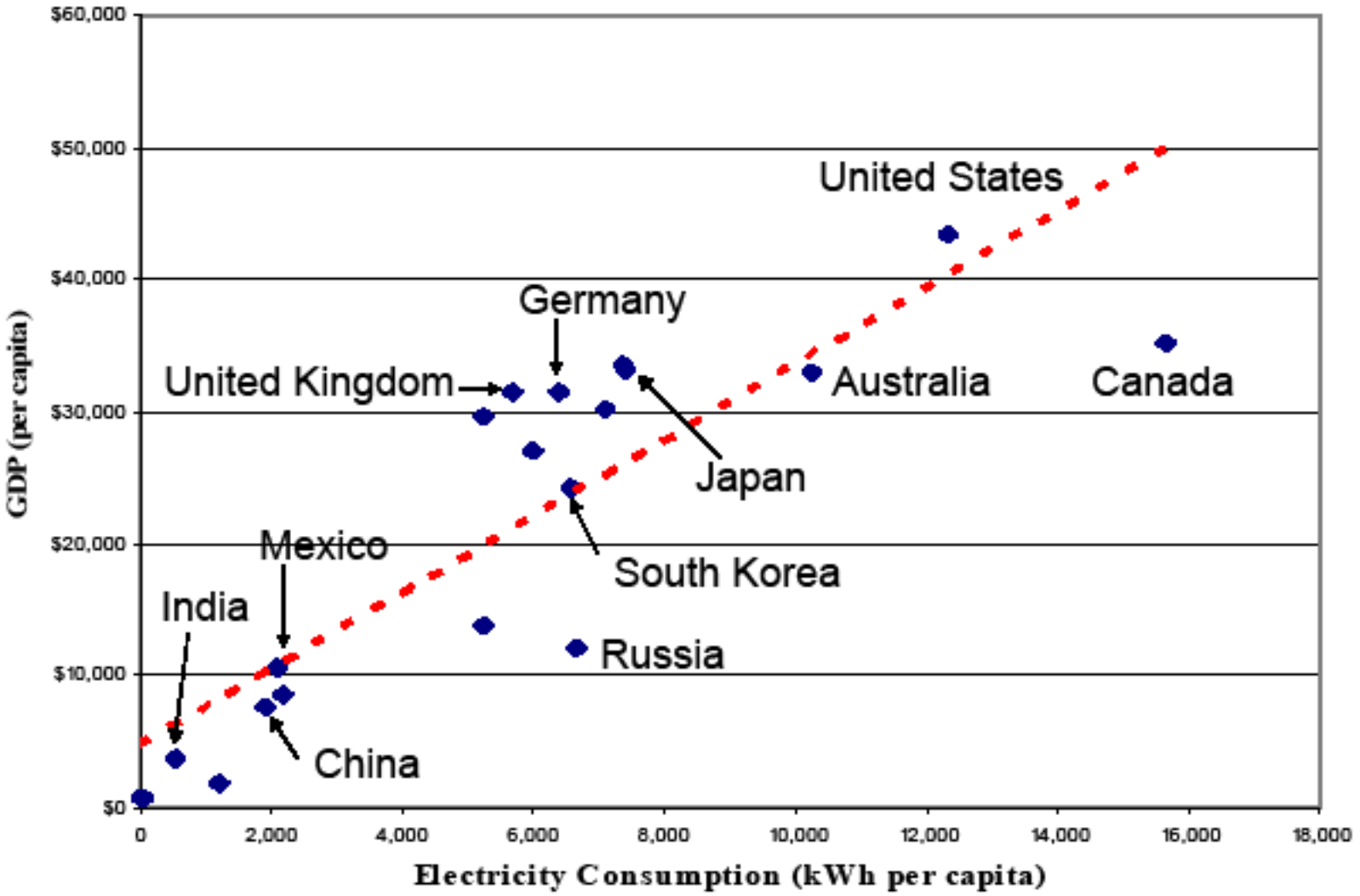
ENVIRONMENTAL PROGRESS

Source: Nikos Alexandratos and Jelle Bruinsma, "World Agriculture Towards 2030/2050: The 2012 Revision," ESA Working Paper no. 12-03, Agricultural Develop- ment Economics Division, Food and Agriculture Organization of the United Nations, June 2012, http://www.fao.org/3/a-ap106e.pdf.

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Quality of Life is Strongly Correlated with Electricity Consumption

Mercator Energy



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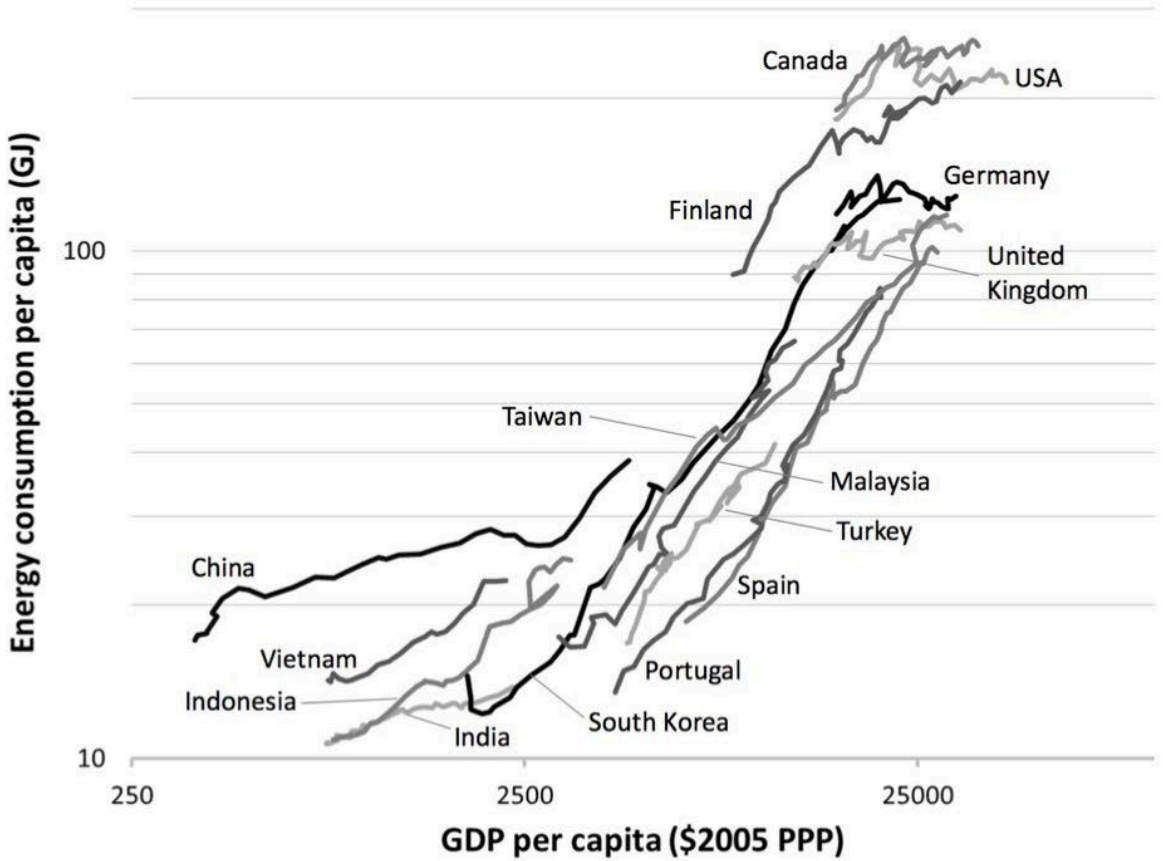
Source: CIA World Factbook, 2007

Energy consumption tightly tied to GDP

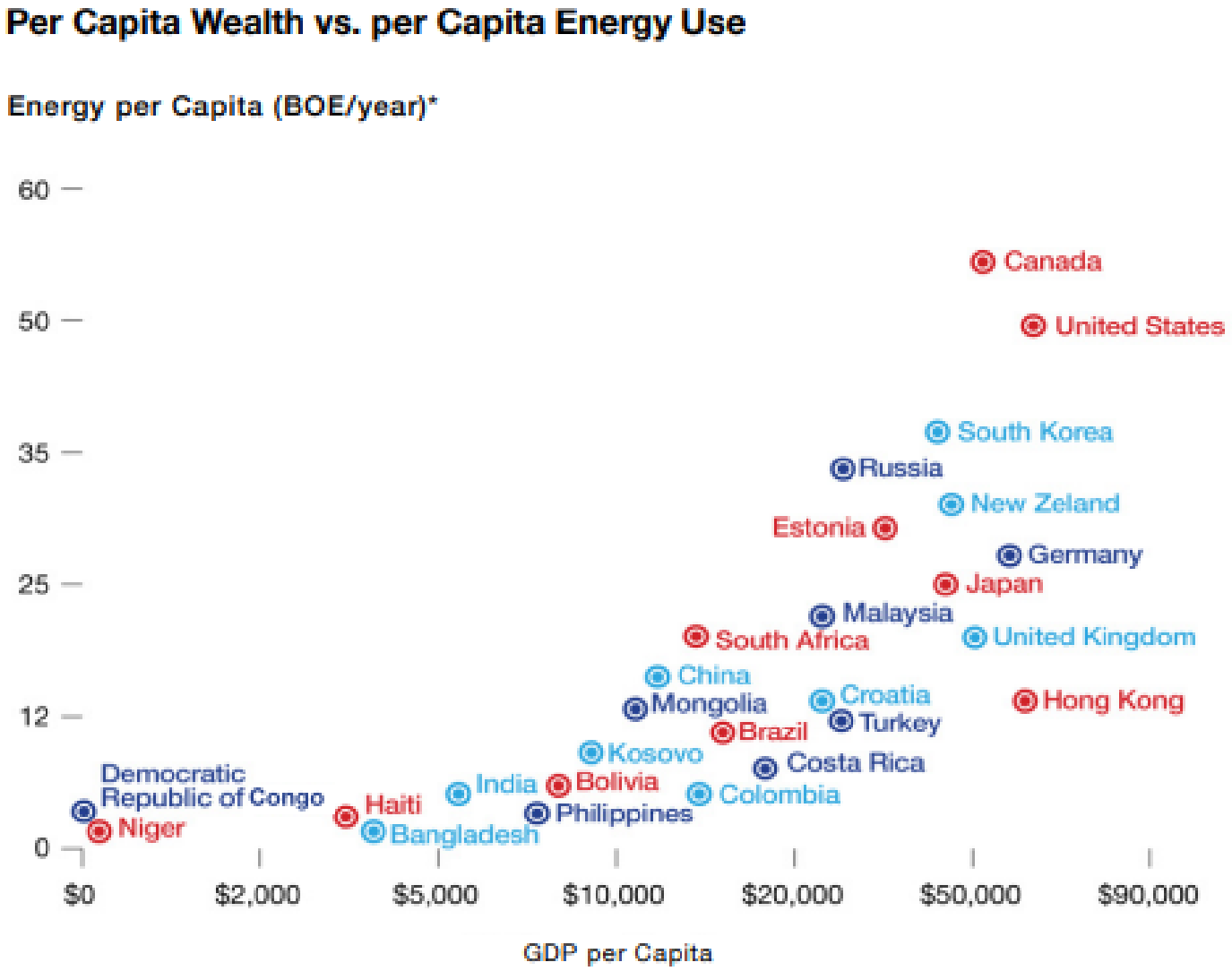
Figure 1: The *Energy Ladder*: Per Capita Final Energy Consumption and GDP at PPP, 1960 – 2006



Notes: Both axes have a logarithmic scale. Energy consumption data are obtained from the International Energy Agency's Extended Energy Balances, GDP per capita from the World Bank's World Development Indicators.

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Economic Growth Creates Demand for More Energy



Note: Total energy measured as barrels-of-oil-equivalent (BOE). Thus, the average person in Japan, where GDP/capita is about $50,000 uses about 25 BOE per year vs. about 5 BOE in India, where GDP per capita is around $5,000

Source: World Bank; Our World in Data
The "Energy Transition" Delusion: A Reality Reset, Mark P. Mills, The Manhattan Institute, August 2022

Worldwide Electricity Use in Context

3 Billion people in the world currently use less electricity than a typical American refrigerator

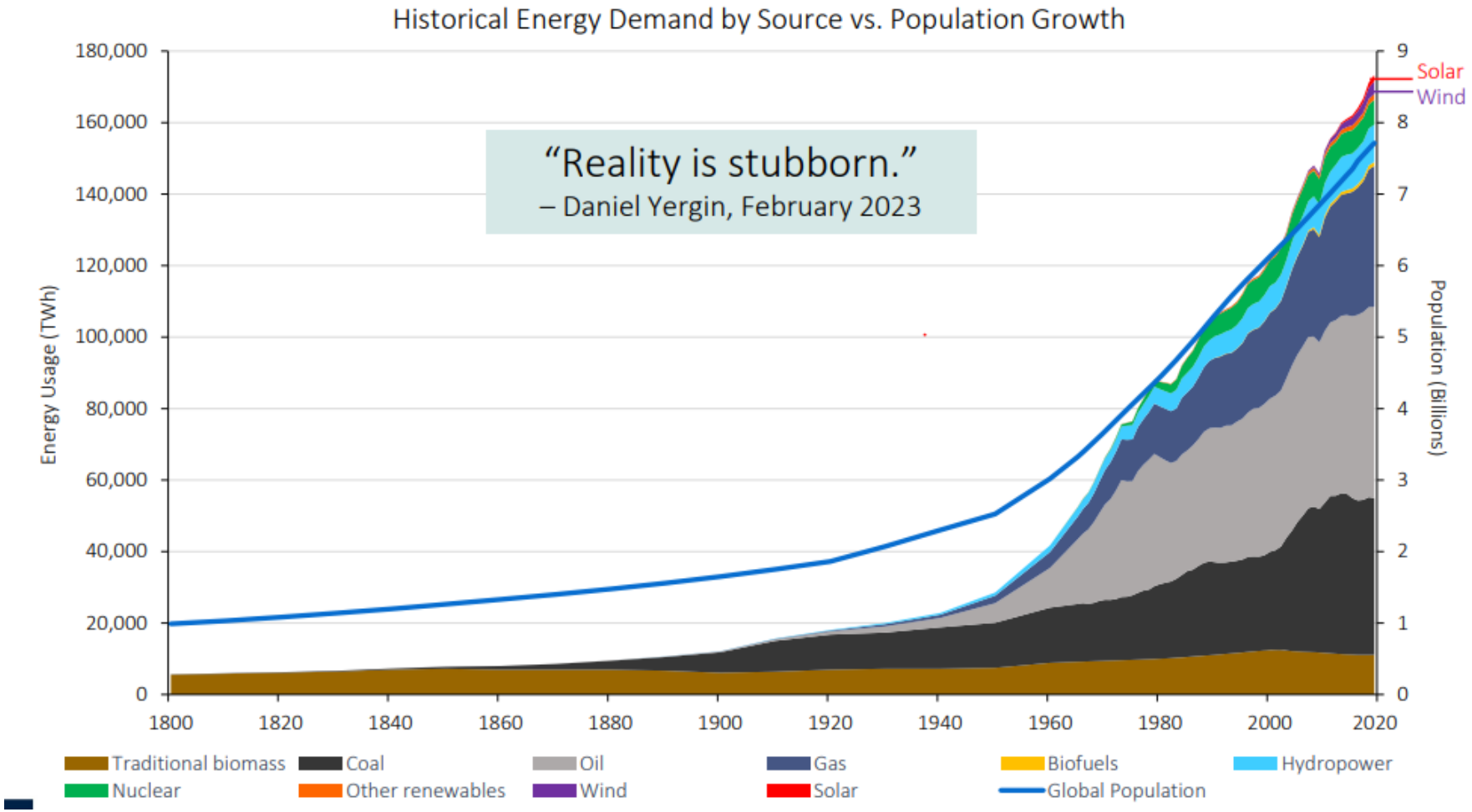
The essentiality of electricity to modernity

Over 1.2 billion people – 20% of the world's population – are still without access to electricity worldwide, almost all of whom live in developing countries. This includes about 550 million in Africa, and over 400 million in India.

Source: The World Bank, *Energy – The Facts*

Global Population Growth Drives Energy "Addition"

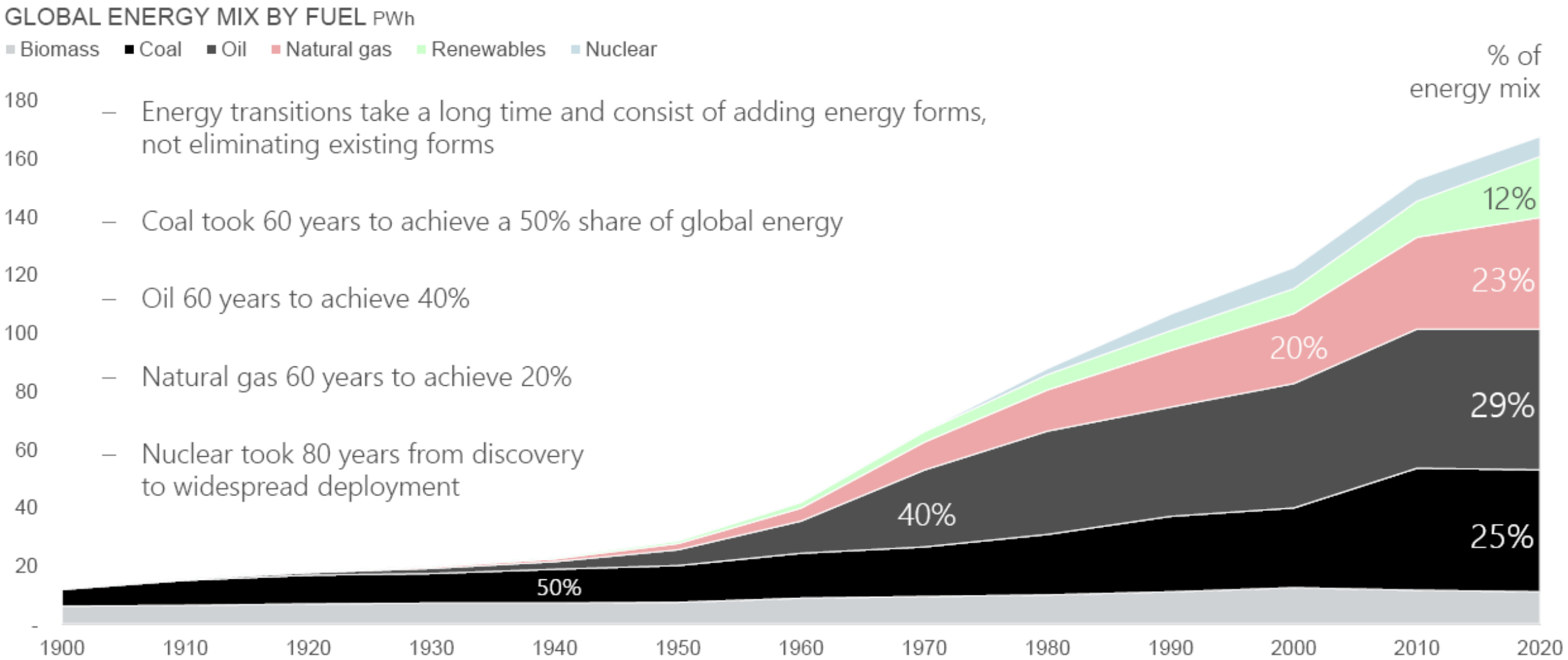
Over the past century, global energy usage increased rapidly in connection with industrialization and rising global population. Further, from 1965 to 2021, per capita energy consumption grew 61%.



Energy Transitions Take Time

KINDER MORGAN

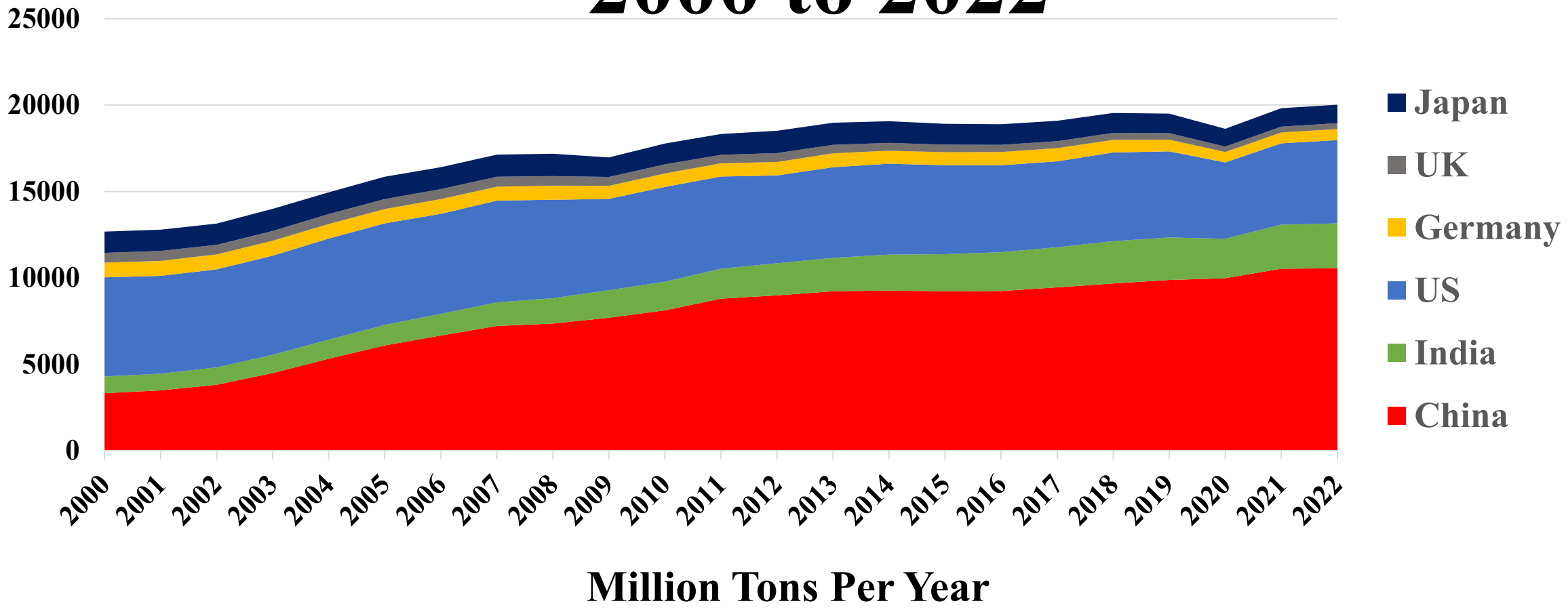
Our assets and services will be needed for a very long time



Source: Pre-1965 from *Energy Transitions: Global and National Perspectives*; 1965 and beyond from BP's Statistical Review of World Energy.

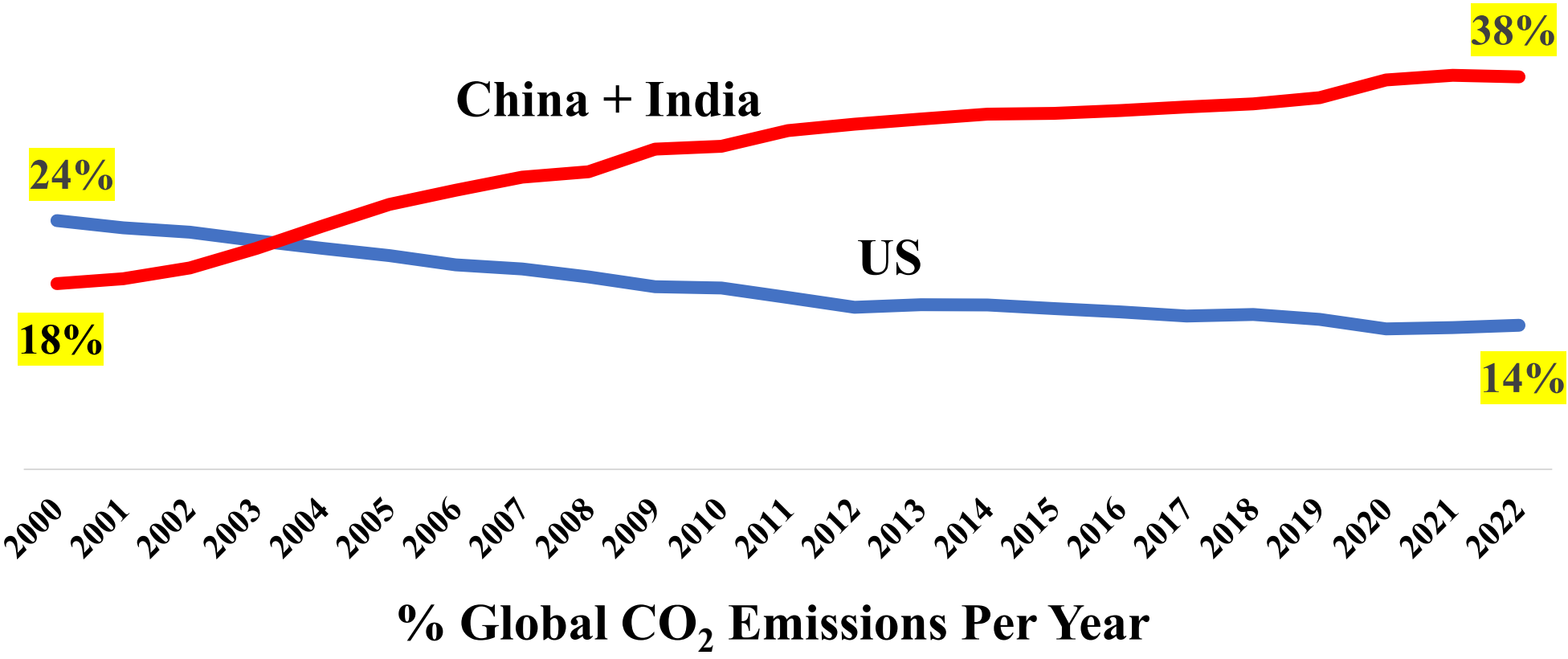
Source: KinderMorgan Investor Presentation 3Q 2023

What Energy Transition?
CO_2 Emissions In Six Largest Economies, 2000 to 2022



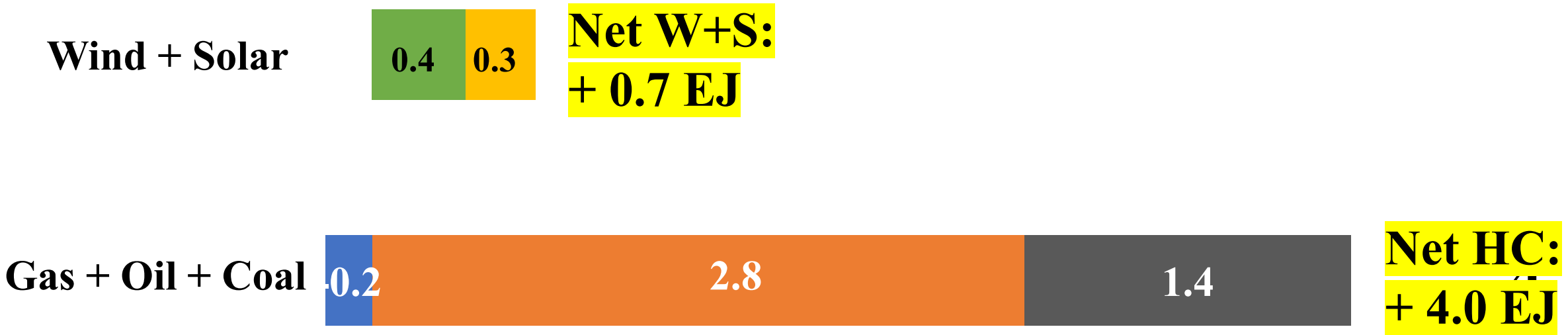
Sources:Statistical Review of World Energy

Share Of Global CO_2 Emissions, US Versus China + India, 2000 to 2022



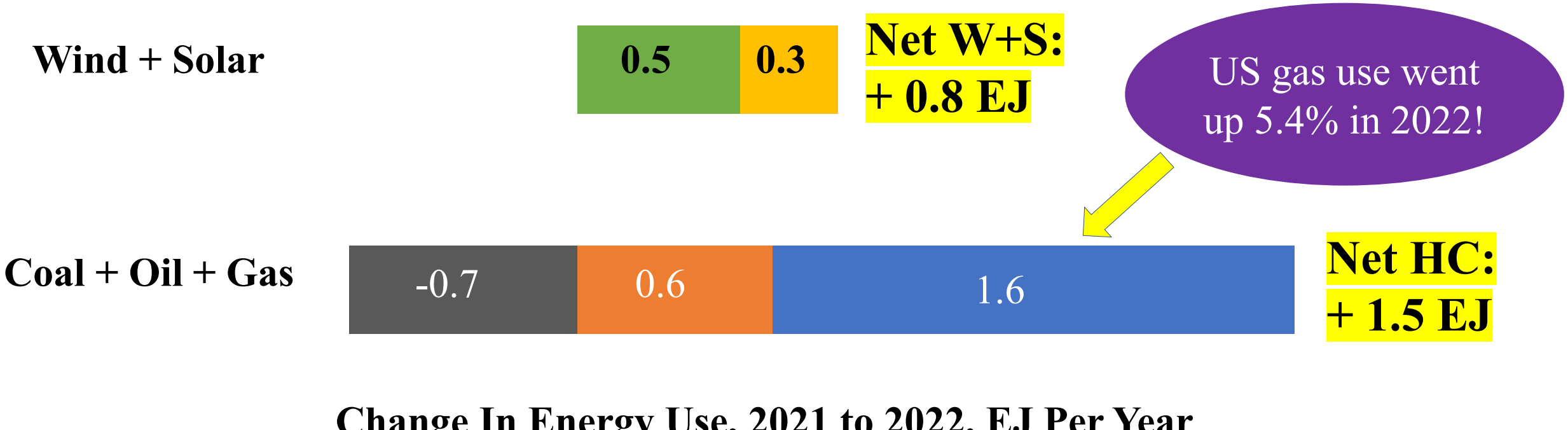
Source:Statistical Review of World Energy, 2023

In 2021, US Hydrocarbon Use Grew *5.7x Faster* Than Wind + Solar Combined



Sources: BP

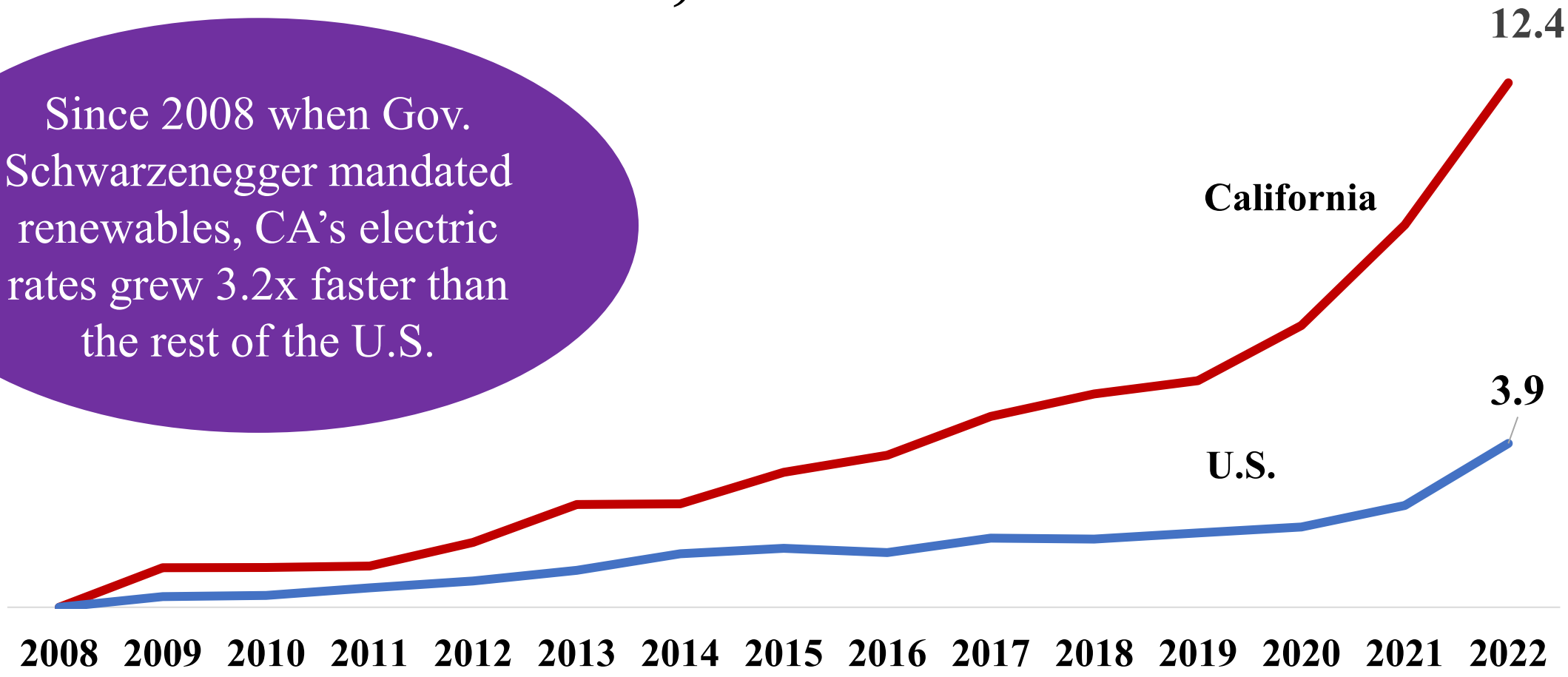
In 2022, US Natural Gas Use Grew ***2x Faster*** Than W + S Combined



Sources:BNEF, Statistical Review of World Energy 2023

Change In California Residential Electricity Prices, 2008 to 2022

Since 2008 when Gov. Schwarzenegger mandated renewables, CA's electric rates grew 3.2x faster than the rest of the U.S.



Sources: EIA,

Again, It's All About Scale

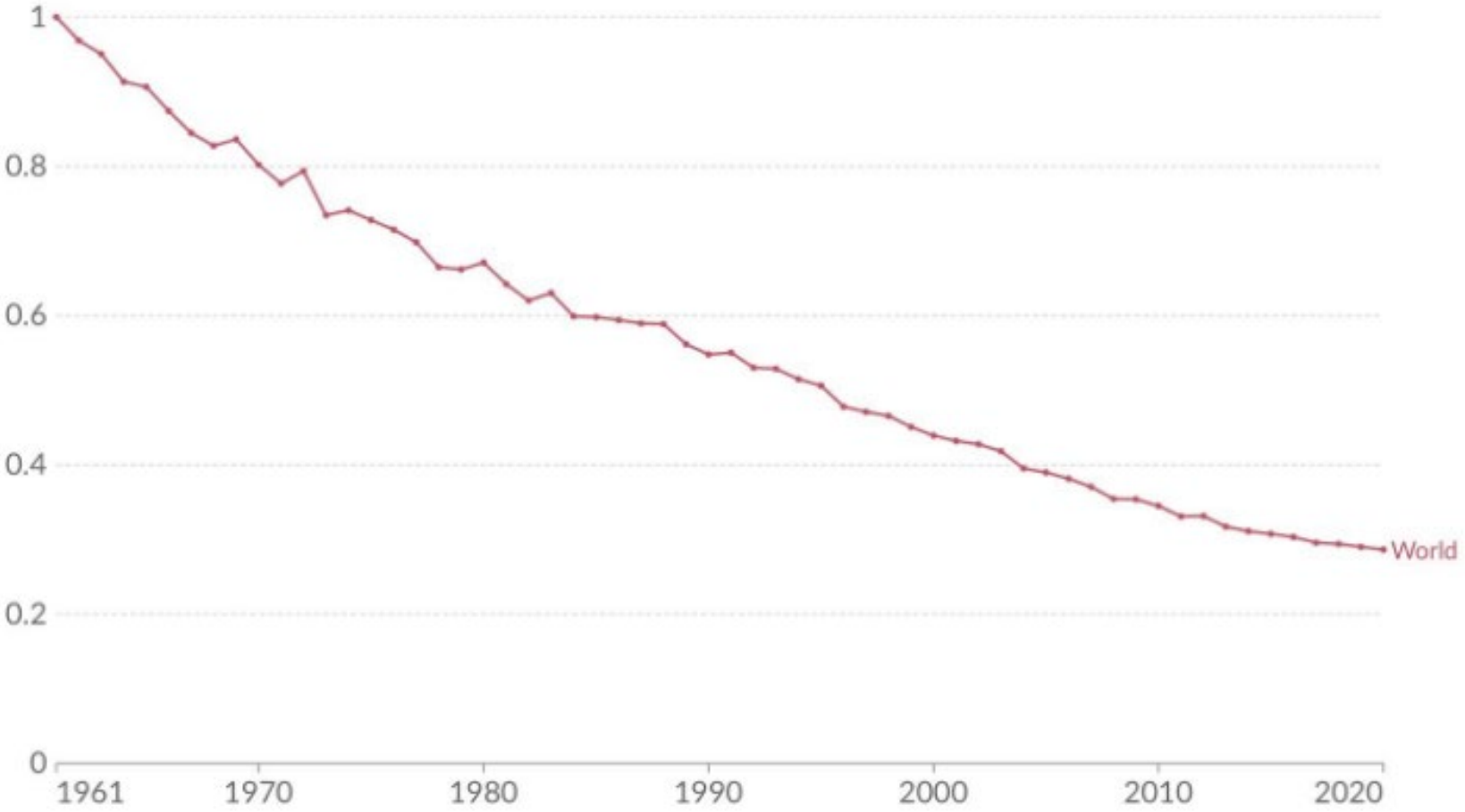
It would require **15,280** storage centers the size of Escondido, the largest in California, to provide just **4 hours** of backup power for the U.S. grid — at an estimated cost of **$764 billion**

Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Arable land needed to produce a fixed quantity of crops, 1961 to 2020

Mercator Energy

Arable land needed to produce a fixed quantity of crops is calculated as arable land divided by the crop production index (PIN). The crop production index (PIN) here is the sum of crop commodities (minus crops used for animal feed), weighted by commodity prices. This is measured as an index relative to 1961 (where 1961 = 1).



Data source: Food and Agriculture Organization of the United Nations

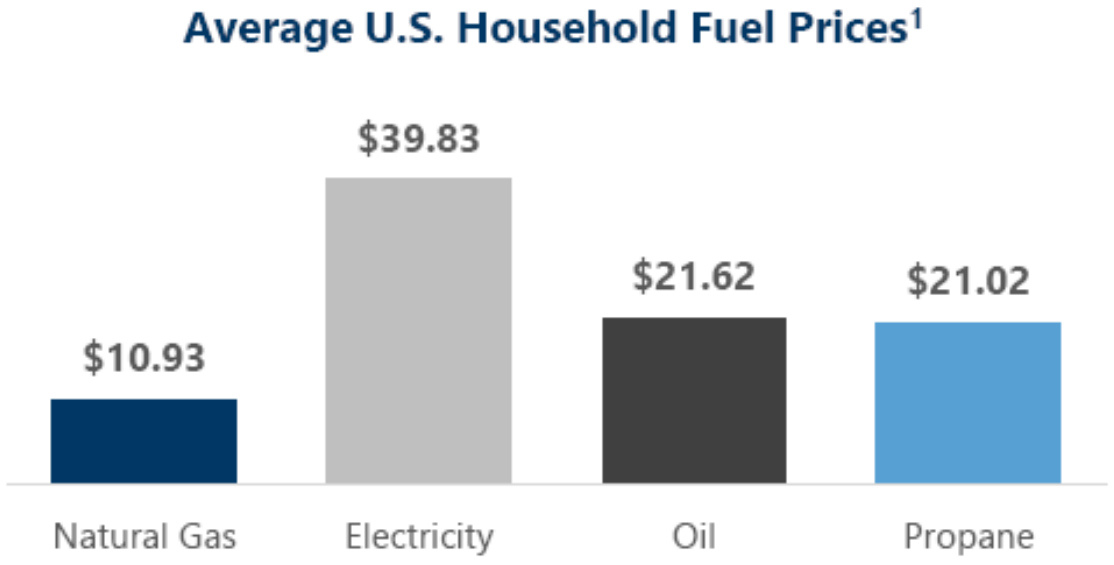
OurWorldInData.org/land-use | CC BY

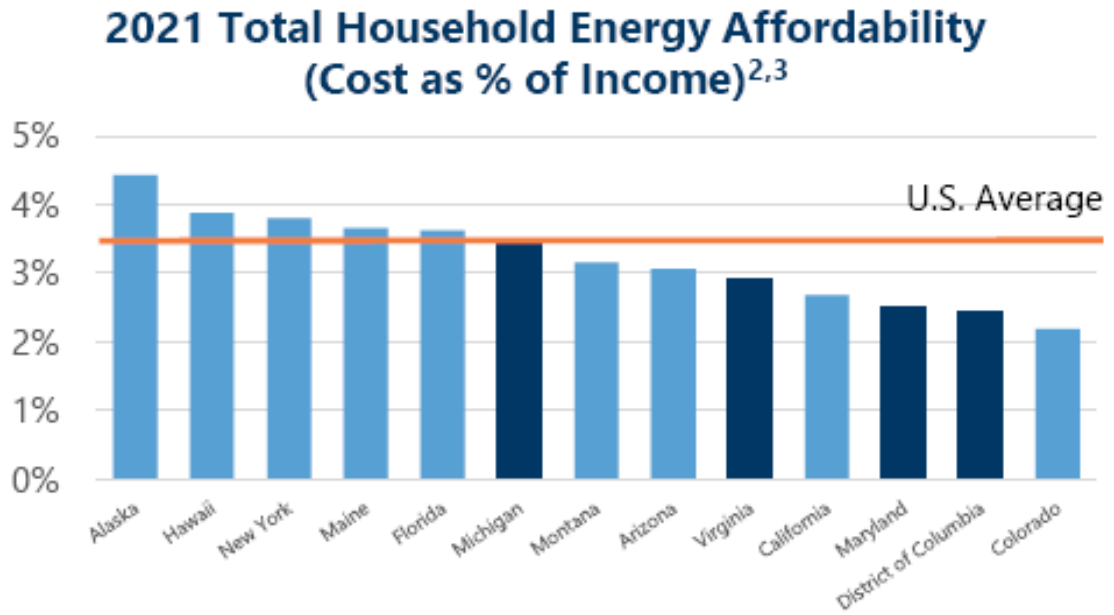
Source: "Why Everything They Said About The Environment Was Wrong," Michael Shellenberger speech to the Alliance for Responsible Citizenship (ARC) in London, October 31, 2023

Affordability is Paramount Through the Energy Evolution

Mercator Energy

Affordability must be prioritized in regions where demand is high and cost is prohibitive



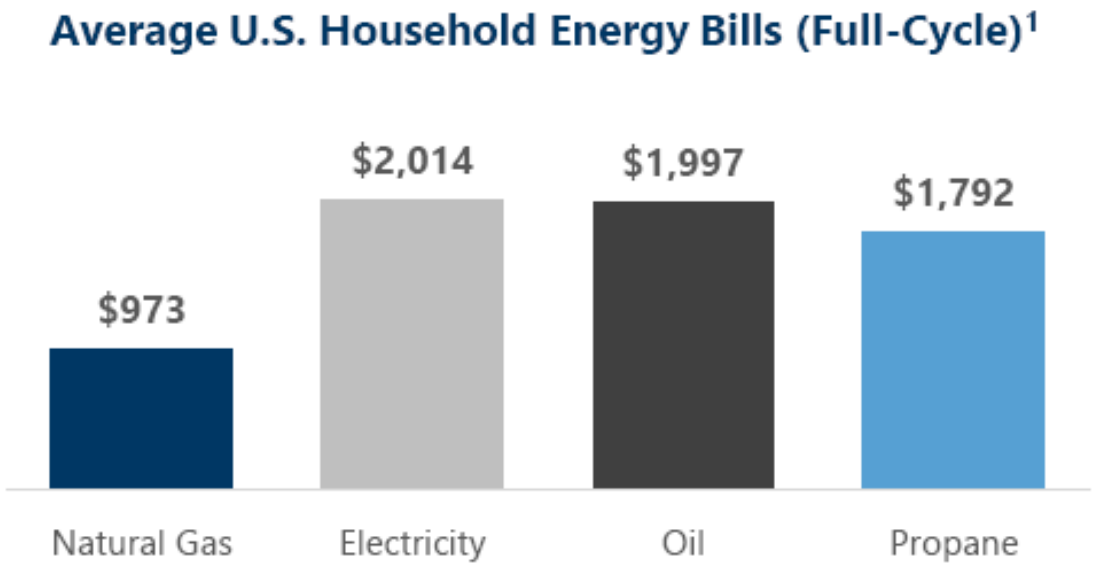


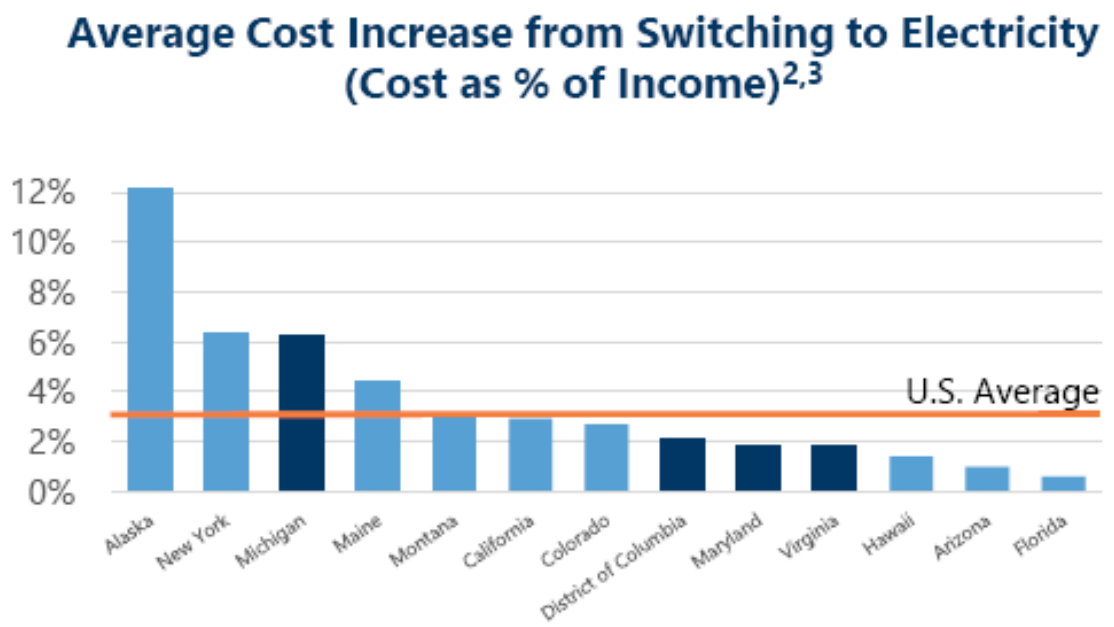
Notes: 1) 2022 AGA Study, based on 2021 data; electricity based on actual generation mix in 2019;"Typical US Home" defined as 2,000 ft^2 home in an average climate, using national energy prices for space heating, water heating, cooking and clothes drying; 2) Income data based on U.S. Bureau of Labor Statistics and U.S. Census Bureau; using 5-year average growth data to extrapolate 2021; and 3) Household energy data based on U.S. Energy Information Administration, based on 2021 data; "Energy" defined as electricity and natural gas consumption

Source: "Fundamentally Focused," Investor Presentation, AltaGas

Affordability is Paramount Through the Energy Evolution

Affordability must be prioritized in regions where demand is high and cost is prohibitive





Notes: 1) 2022 AGA Study, based on 2021 data; electricity based on actual generation mix in 2019;"Typical US Home" defined as 2,000 ft^2 home in an average climate, using national energy prices for space heating, water heating, cooking and clothes drying; 2) Income data based on U.S. Bureau of Labor Statistics and U.S. Census Bureau; using 5-year average growth data to extrapolate 2021; and 3) Household energy data based on U.S. Energy Information Administration, based on 2021 data; "Energy" defined as electricity and natural gas consumption

Source: "Fundamentally Focused," Investor Presentation, AltaGas

Affordability is Paramount Through the Energy Evolution

- The average per unit fuel cost for natural gas was roughly one-third the cost of electricity for the same on-site energy uses.

- Conversely, transitioning to an all-electric home would imply a two-fold increase to energy bills on average, increasing the financial burden on residential consumers as energy costs would amount to roughly 6.5% of the average household income.

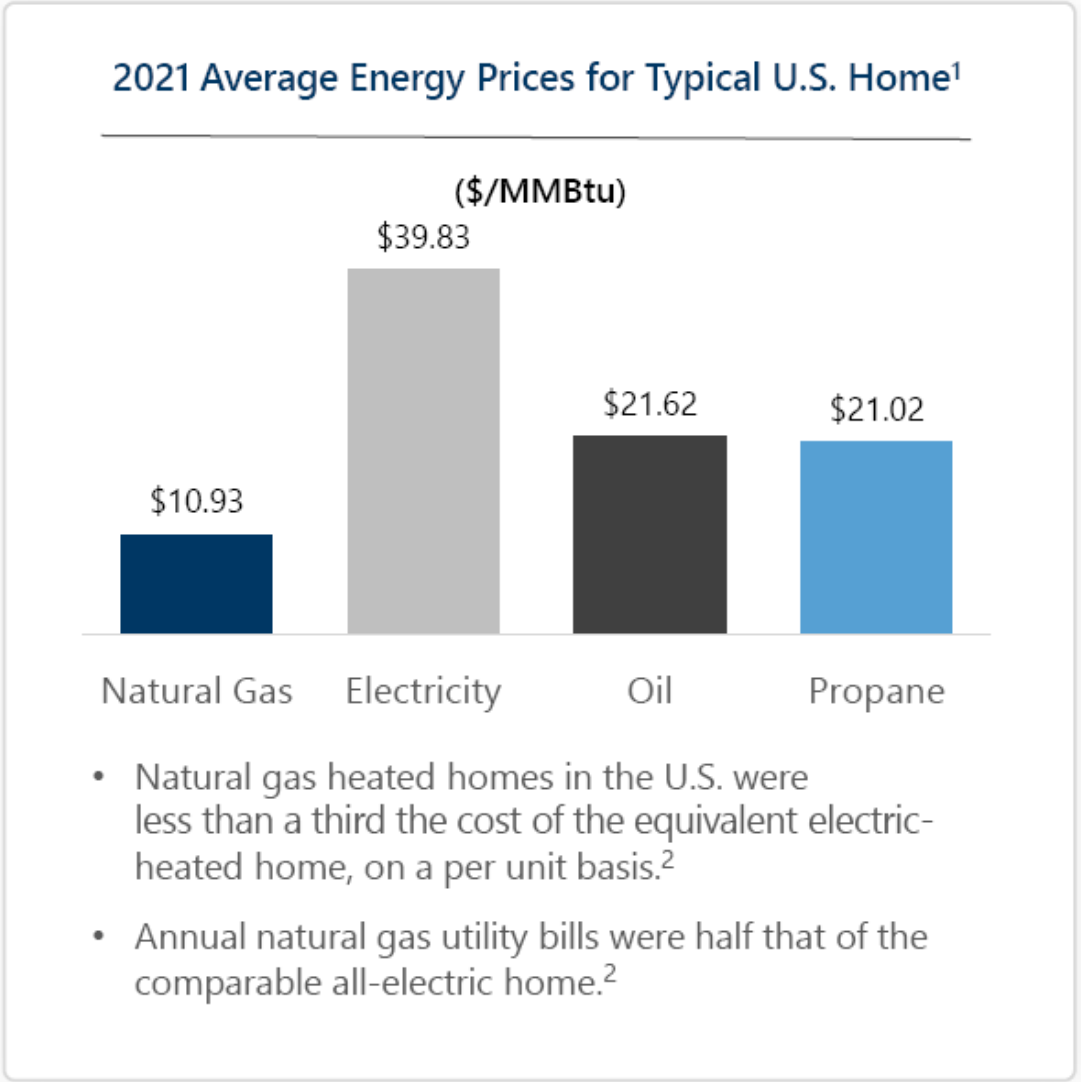
Notes: 1) 2022 AGA Study, based on 2021 data; electricity based on actual generation mix in 2019;"Typical US Home" defined as 2,000 ft^2 home in an average climate, using national energy prices for space heating, water heating, cooking and clothes drying; 2) Income data based on U.S. Bureau of Labor Statistics and U.S. Census Bureau; using 5-year average growth data to extrapolate 2021; and 3) Household energy data based on U.S. Energy Information Administration, based on 2021 data; "Energy" defined as electricity and natural gas consumption

Source: "Fundamentally Focused," Investor Presentation, AltaGas

Natural Gas will Remain a Critical Transition Fuel

Mercator Energy

Economic and Emission Reductions Are Aligned; Affordability will be a key Variable in Energy Evolution



Notes: 1) Energy Analysis, AGA; 2) All-electric homes based on actual generation mix in 2019; "Typical US Home" defined as 2,000 ft^2 home in an average climate, using national energy prices for space heating, water heating, cooking and clothes drying and meets 2013 code standards;
Source: "Fundamentally Focused," Investor Presentation, AltaGas