

A Natural Gas Update: Let Them Eat Cake

Presented to:
Hart Energy's
America's Natural Gas Conference
Houston, Texas

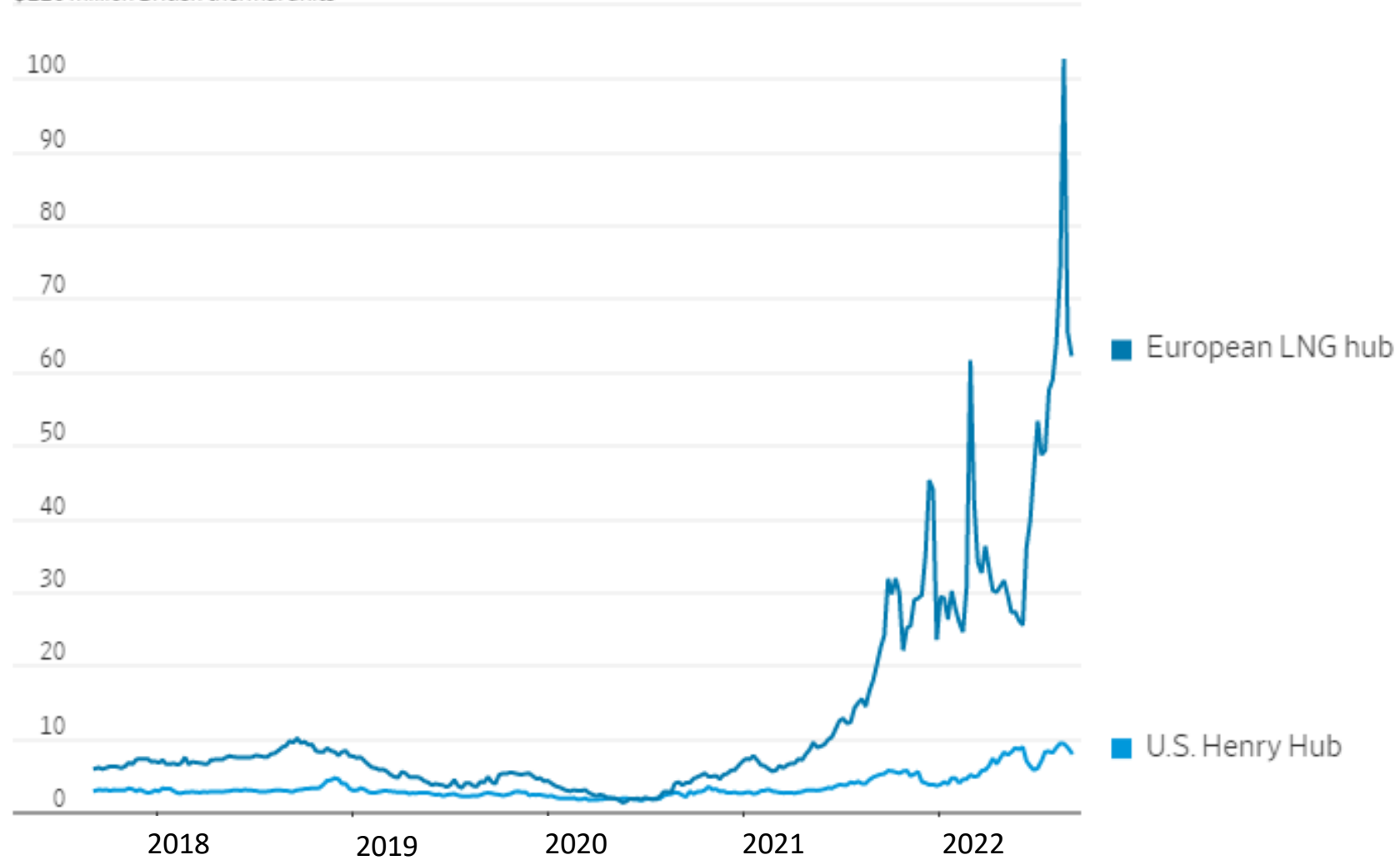
September 27, 2022



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Natural gas price

\$110 million British thermal units



Source: FactSet

One-Year Forward Strip

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

Comparative Forward Strips as of September 22, 2022

One-Year Forward Strip

NYMEX Henry Hub	\$ 6.063
LNG Delivered Price to Asia	\$45.198
LNG Delivered Price to Europe	\$55.920

Three-Year Forward Strip

NYMEX Henry Hub	\$ 5.205
LNG Delivered Price to Asia	\$33.305
LNG Delivered Price to Europe	\$40.635

* Settled price as of September 22, 2022

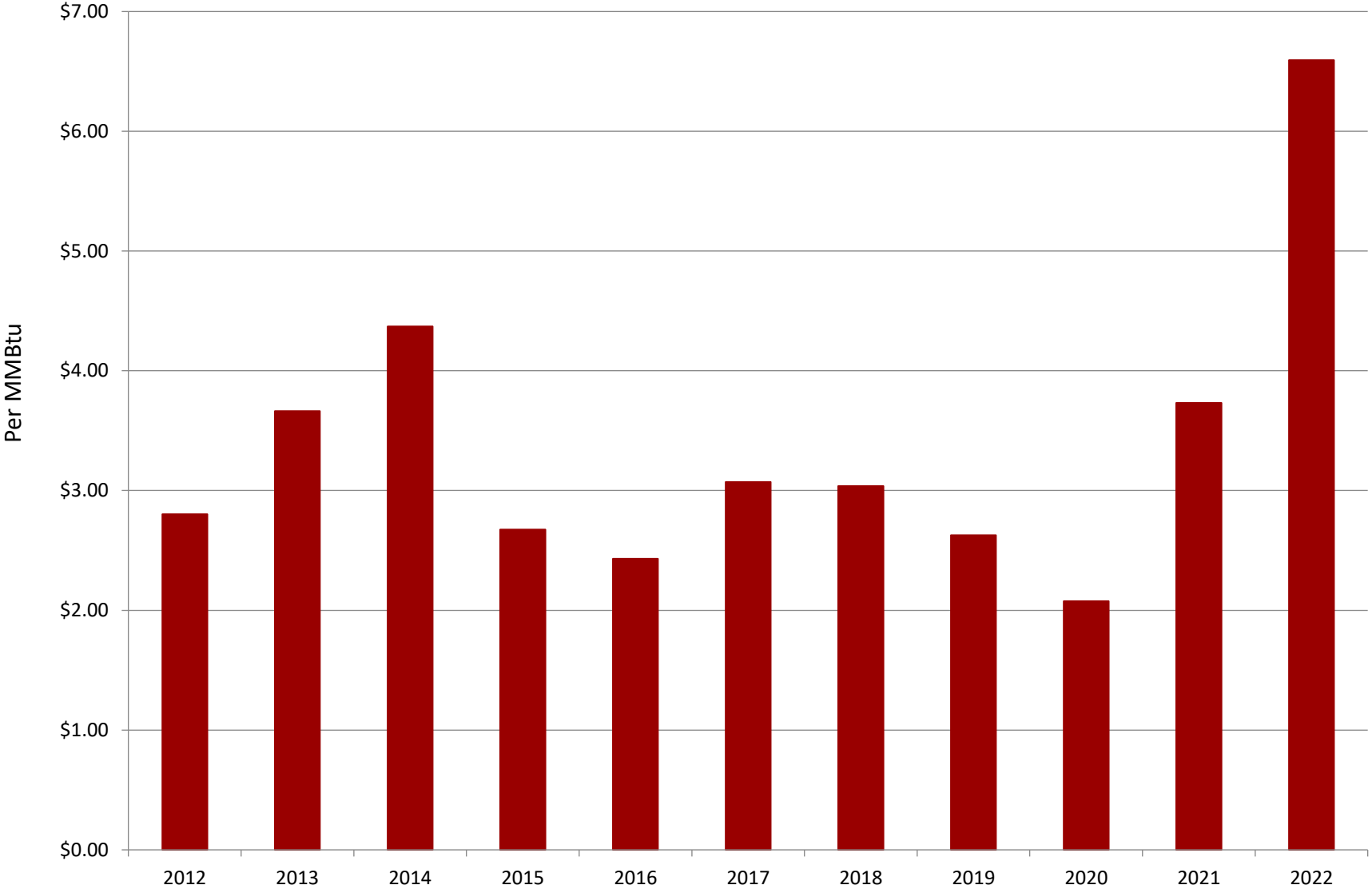
How did we get here?

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

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



Historical NYMEX Henry Hub Index Prices (2012-September 2022)



Source: NYMEX – Average last 3 days of close as reported in Platts Gas Daily Report, An S&P Global Platts publication

- Putin's trap, enabled by the radical green agenda
- Germany and EU take the bait
- U.S. LNG to the rescue
- The 3-year impact on world LNG markets

Closing Bell

LNG Diplomacy: Keystone XL Pipeline, Part 2?

October 2012

Closing Bell

The Glacial Pace Of LNG Exports

By John Harpole

September 2014

Closing Bell

The Putin Vortex

April 2014

Closing Bell

Time To 'Out' Russia?

By John Harpole

January 2015

Merkel's Major Mistake – Trusting Putin



Angela Merkel, Chancellor of Germany from 2005 to 2021



Francois Fillon, Angela Merkel, Mark Rutte, Dmitry Medvedev, Gunther Oettinger, Erwin Sellering

The Former Chancellor Who Became Putin's Man in Germany



Gerhard Schröder, Chancellor of Germany from 1998 to 2005

Title	Term	Income
Chancellor of Germany	1998 – 2005	? currently receives \$9,000/month stipend
Nord Stream I Chairman/Shareholder	2005 – 2022	\$270,000/year
Nord Stream II Board Member	2011 - ?	?
Rosneft Board President	2017 – present	\$600,000/year
Gazprom Board Member	2022 - ?	?

“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.”



Russia's Energy Muscle

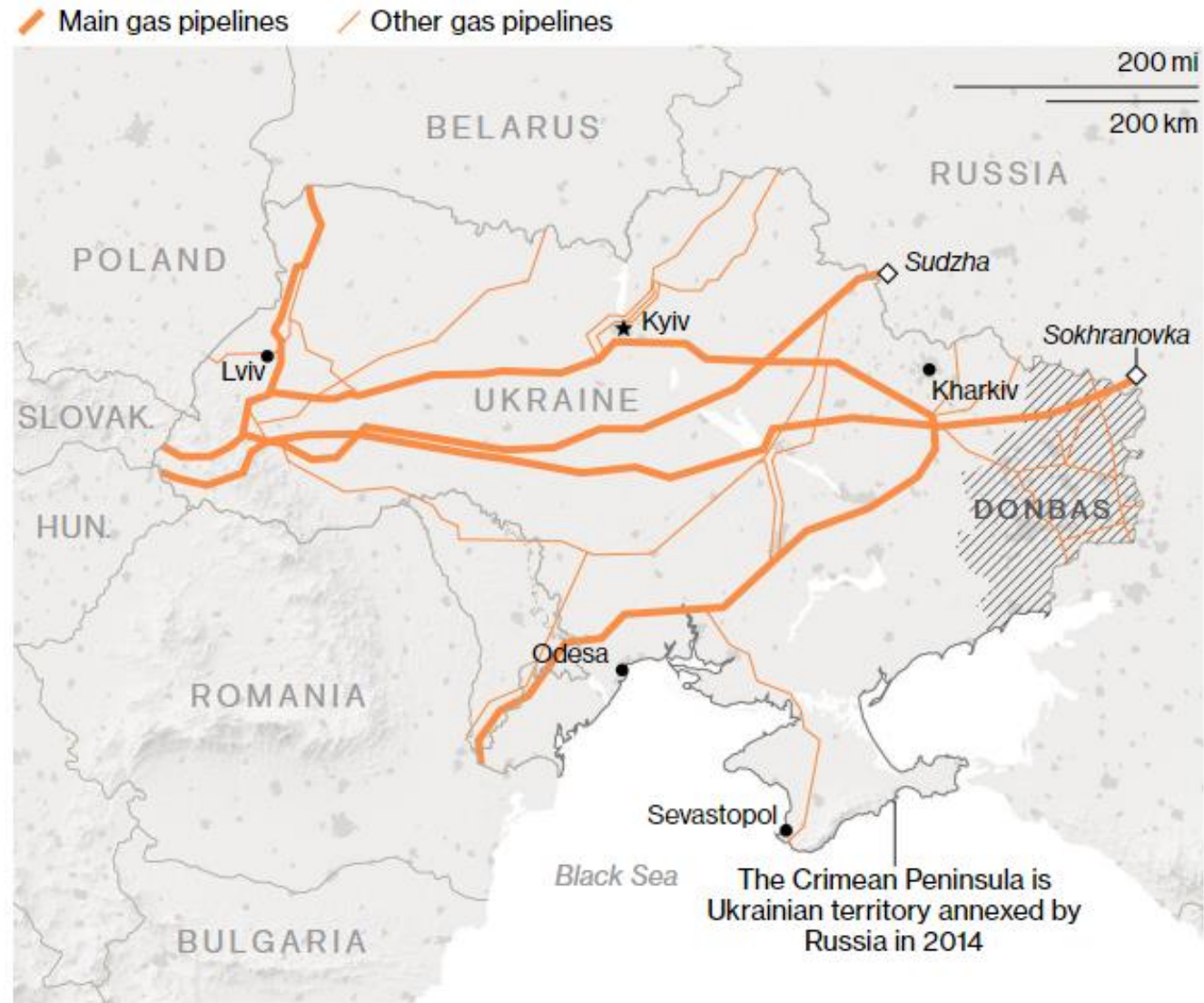
- Energy Used Over 55 times Against Former Soviet Nations Since 1990



Source: *Europe Doubles Down on Russian Gas to Feed its Energy Appetite*, by Andrew Haney, Ricardo Bracho, Nick Wolfe and Max Faith

“He took advantage of the reputation and influence of the chancellor’s office and offered himself up as an agent for Russian interests to get rich,” said Norbert Röttgen, a conservative lawmaker, former minister and longtime Russia hawk.

Natural Gas Runs Through Ukraine



Source: The Oxford Institute for Energy Studies

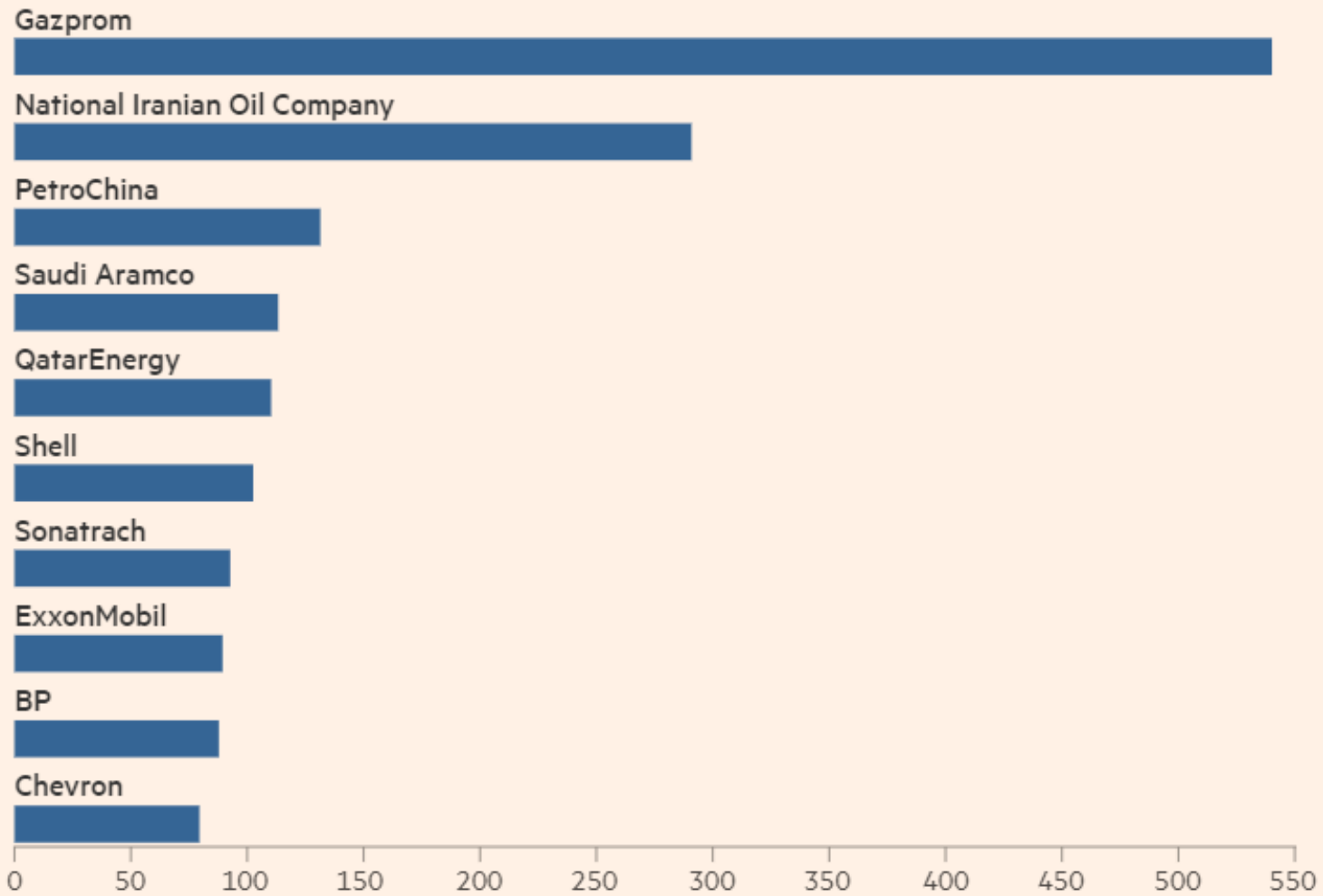
Note: Only the portion of pipelines that run through Ukraine are displayed on the map

Linking the Super Powers



The 10 largest gas companies

Total gas production (bn cubic metres, 2021)



FINANCIAL TIMES

Source: Wood Mackenzie

Rosneft and Gazprom represent
25%-40% of Russia's budget





Former NATO Secretary General Anders Fogh Rasmussen backs up the Romanian claim. He said in London recently,

“Russia, as part of their sophisticated information and disinformation operations, engaged actively with so-called nongovernmental organizations – environmental organizations working against shale gas – to maintain [Europe’s] dependence on imported Russian gas.”

- Former NATO Secretary General Anders Fogh Rasmussen

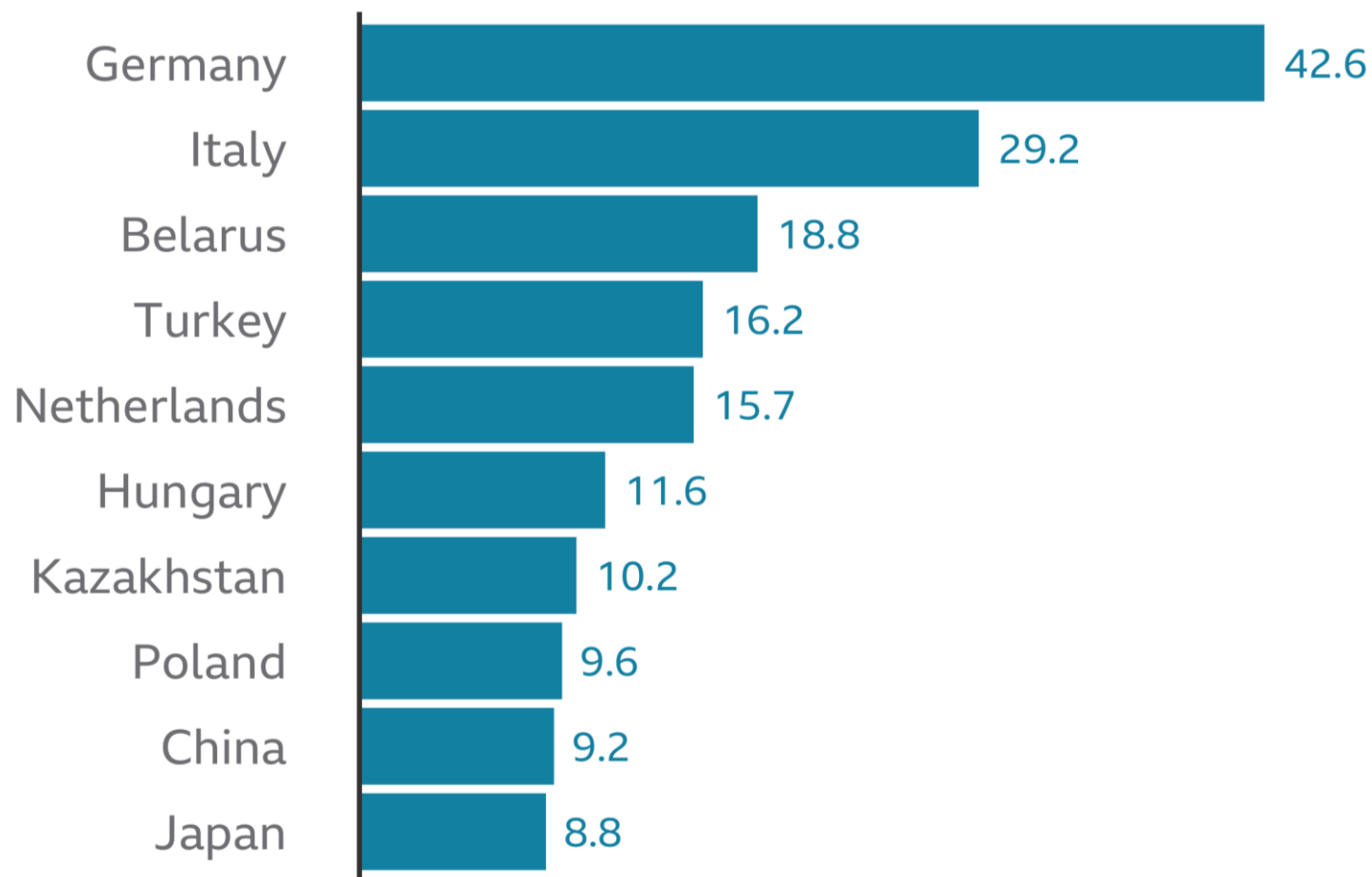
- 
- A map of Europe is shown in the background, with a list of seven countries overlaid in the center. The countries listed are France, Bulgaria, Netherlands, Germany, Ireland, United Kingdom, and Spain. The map is in a light beige and blue color scheme.
1. France
 2. Bulgaria
 3. Netherlands
 4. Germany
 5. Ireland
 6. United Kingdom
 7. Spain

The total population of these countries exceeds 350 million

Energy Security?

- By the year 2020, Gazprom will supply nearly 70% of the European Union's natural gas.
- Would you pursue a conflict with a country that you depend on for the majority of your energy needs?

Countries by billion of cubic metres imported from Russia



Source: IEA, Data for 2020



- When the Sakhalin II project is fully on stream, it will supply around 5% of the world's LNG and make a significant contribution to strengthening global energy security.” (February 18, 2009)
- Sakhalin, formerly owned by Shell Exploration, was “nationalized” by Gazprom. Gazprom currently owns 51% of the project.

April 4, 2009

- Reserves amount to 2 trillion cubic meters of natural gas (70 TCF)
- More than 600 million barrels of gas condensate
- 3-4 BCF gas/day

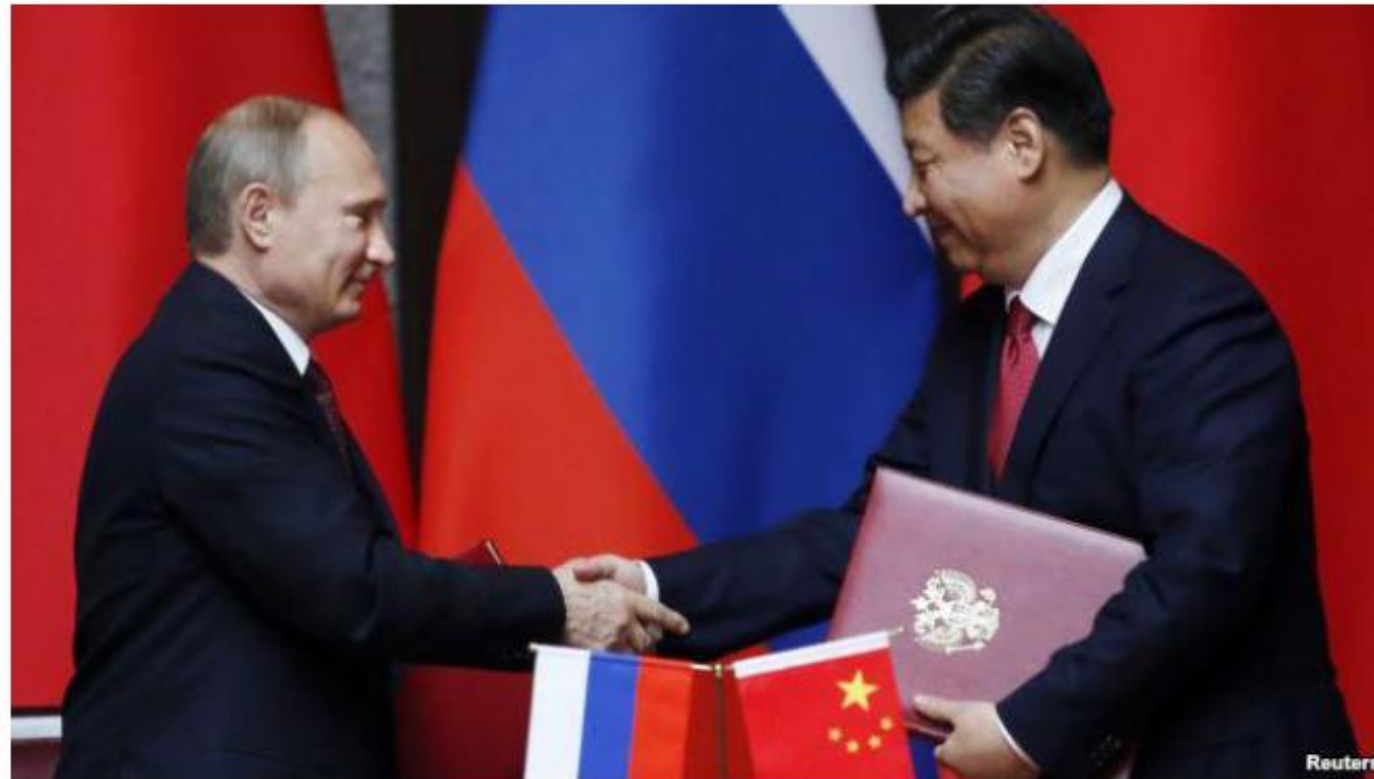


- **1987** – Kovykta discovered
- License to develop held by Russia Petroleum (Majority of RP owned by TNK-BP)
- **June 2006** – Top TNK-BP Engineer Enver Ziganshin murdered
- **June 2007** – TNK-BP offered to sell stake for \$700-\$900 million to Gazprom, but deal never materialized
- **June 2010** – Russia Petroleum filed for bankruptcy
- TNK-BP attempted to sell field to state owned Rosneft but failed
- **March 2011** – Gazprom bought Russia Petroleum's assets, including Kovykta, for \$711 million

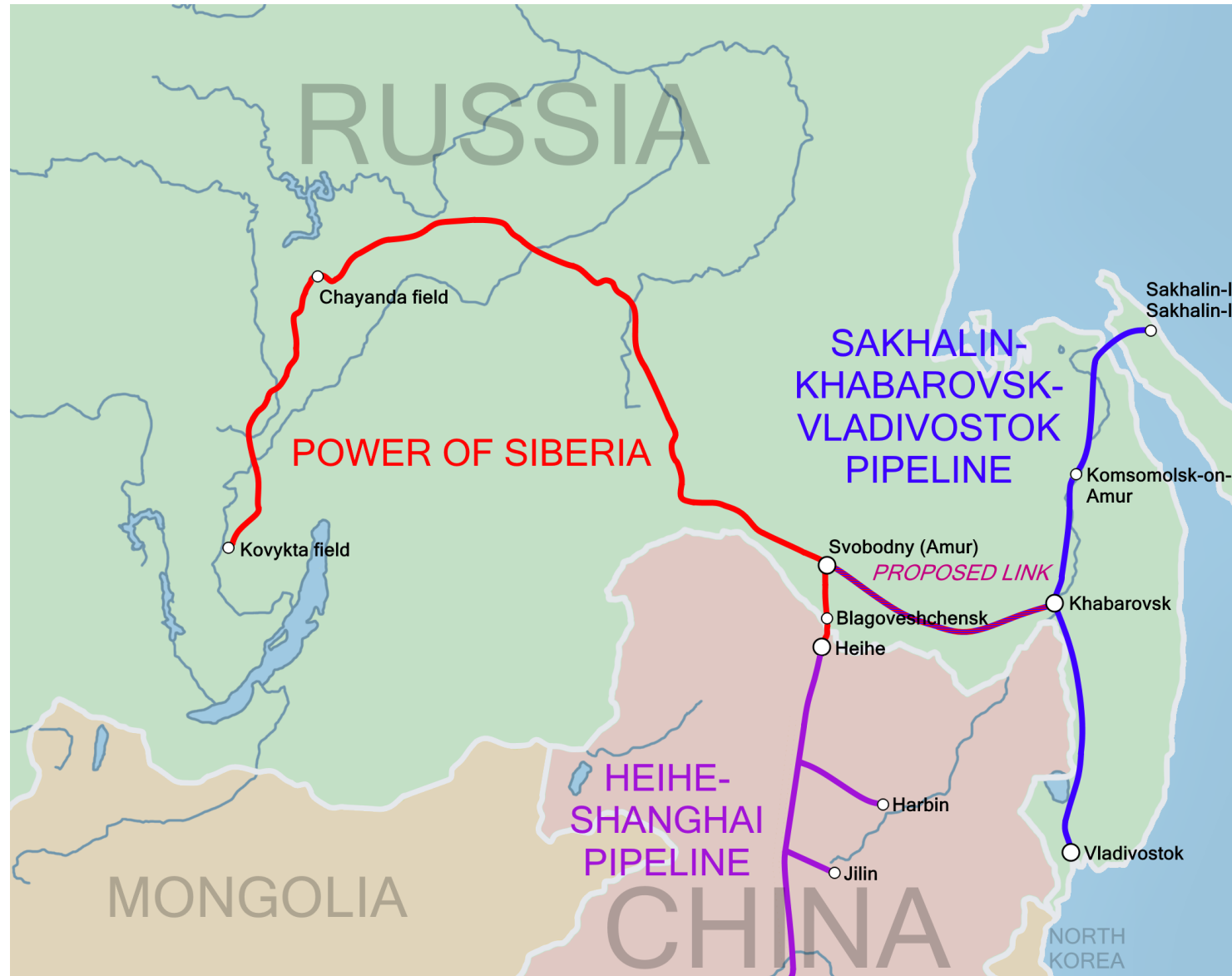
May
2014 -

The Washington Post

China, Russia sign \$400 billion gas deal



Power of Siberia Gas Pipeline Map



European LNG infrastructure



Source: European Commission 2022, Clean Energy Wire



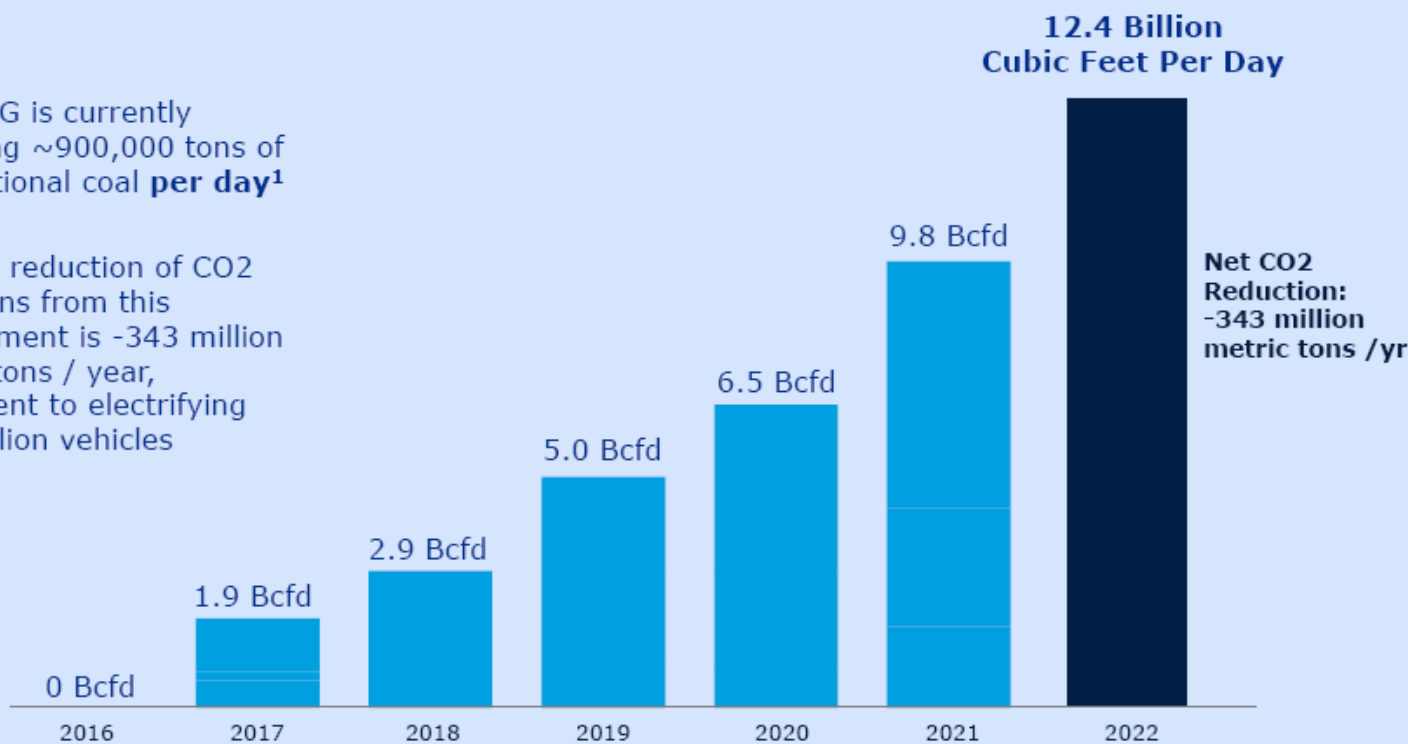
U.S. LNG Export Capacity

LNG export facilities are currently located predominantly on the Gulf Coast



U.S. LNG is currently replacing ~900,000 tons of international coal **per day**¹

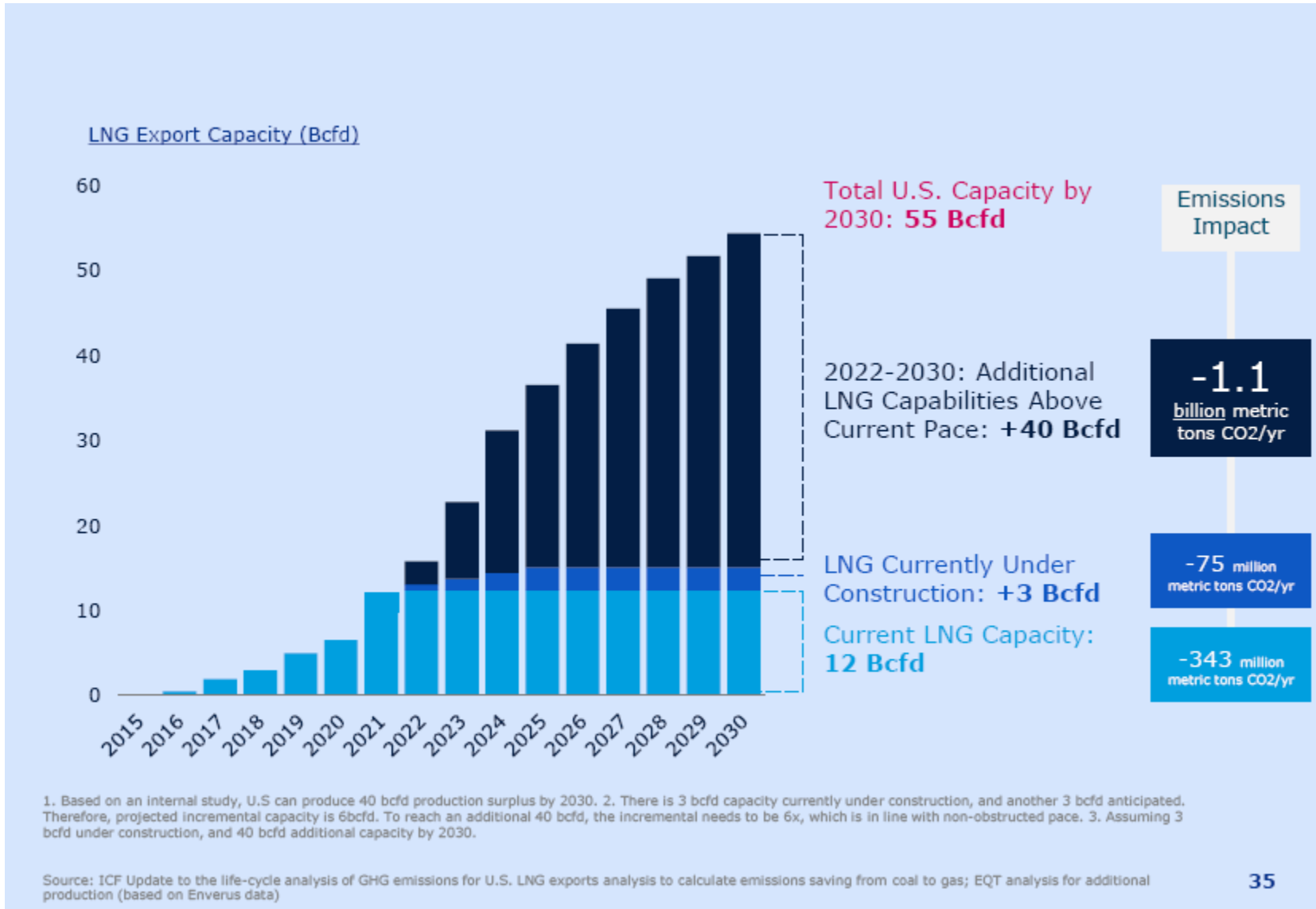
The net reduction of CO2 emissions from this replacement is -343 million metric tons / year, equivalent to electrifying 125 million vehicles



1. International coal displaced is calculated by total thermal unit generated by gas divided by average heating content of coal (~19.8 mmbtu/short ton) // Net GHG reduction is calculated based on the emission differential between coal and natural gas (~560 CO2e kg/MWh) based on a study from ICF.

Source: EIA U.S. Natural Gas Exports and Re-Exports by Point of Exit, Reuters, EIA CO2 emission coefficient.

Projected LNG Export Capacity Through 2030¹



Ukraine Invasion – Putin Miscalculated

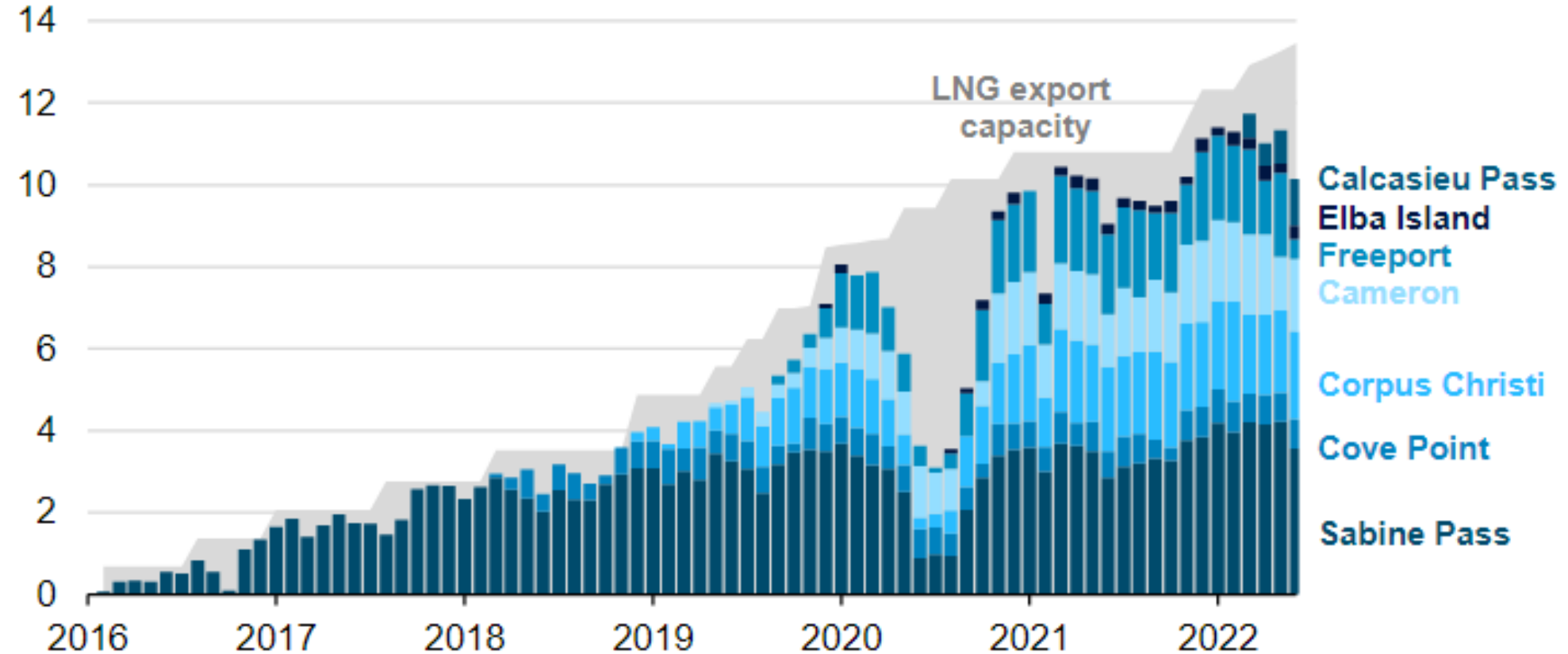




The United States became the world's largest LNG exporter in the first half of 2022

Monthly U.S. liquefied natural gas (LNG) exports (Jan 2016–Jun 2022)

billion cubic feet per day

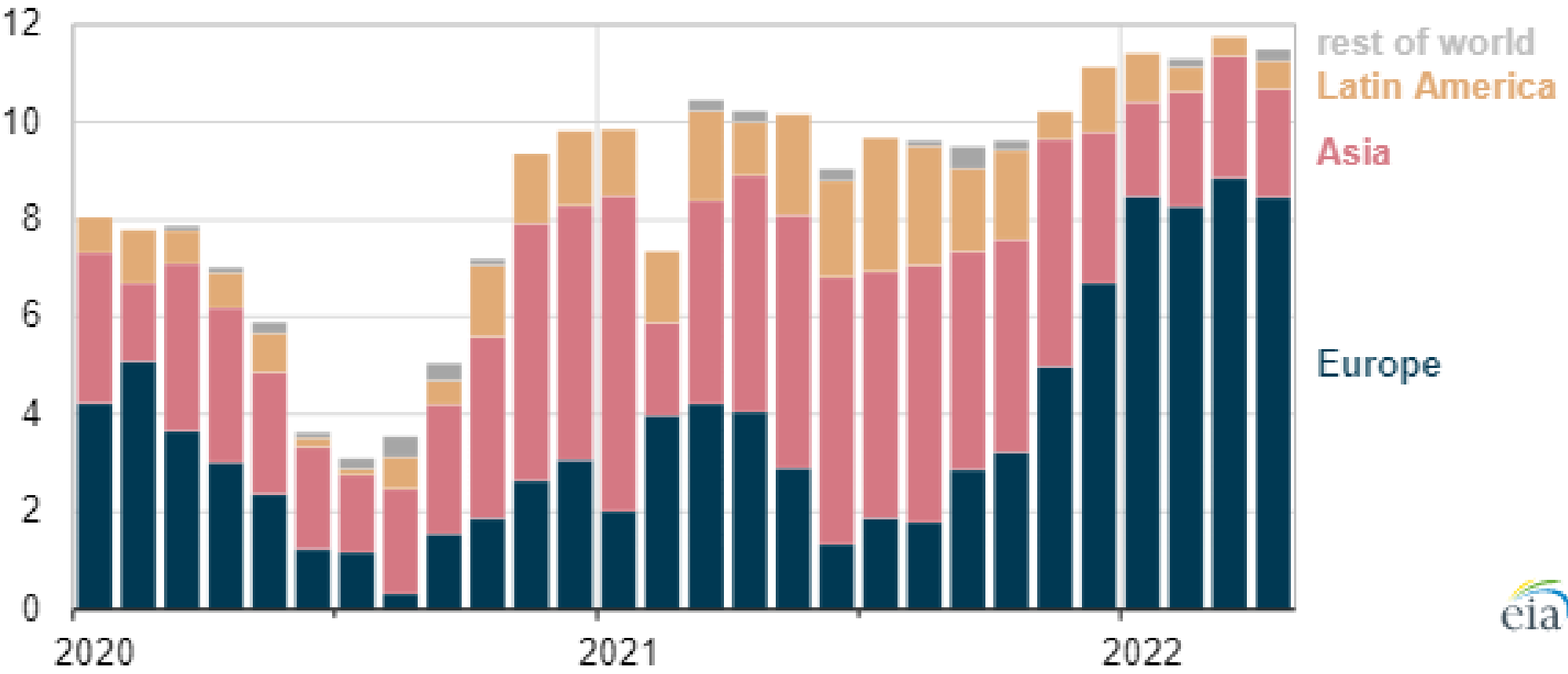


Data source: U.S. Energy Information Administration, [Liquefaction Capacity Table](#), and U.S. Department of Energy [LNG reports](#)

Note: June 2022 LNG exports are EIA estimates based on tanker shipping data. LNG export capacity is an estimated peak LNG production capacity of all operational U.S. LNG export facilities.

U.S. liquefied natural gas exports to Europe increased during the first 4 months of 2022

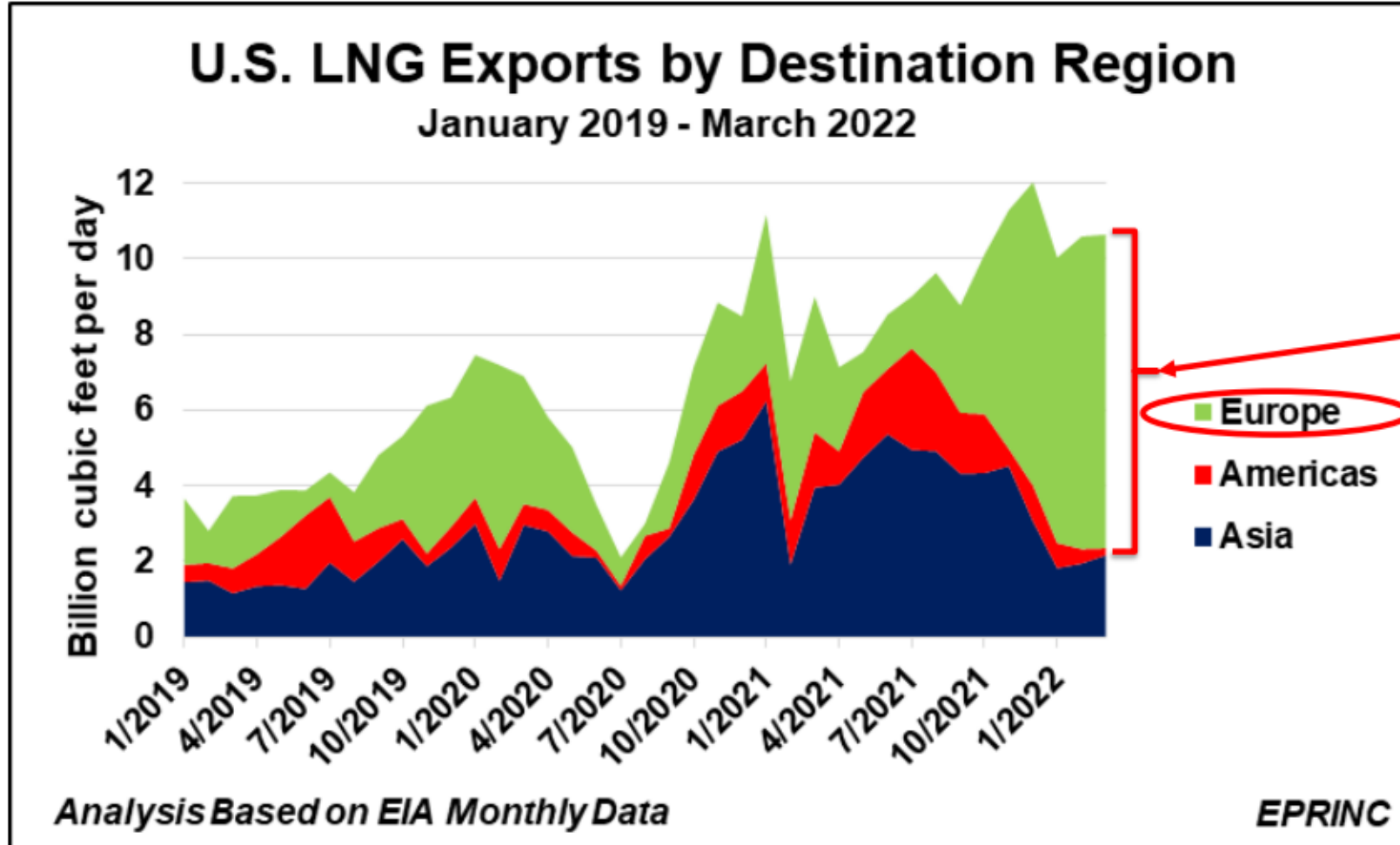
Monthly U.S. liquefied natural gas exports by destination region (Jan 2020–Apr 2022)
billion cubic feet per day



Note: Europe includes Turkey



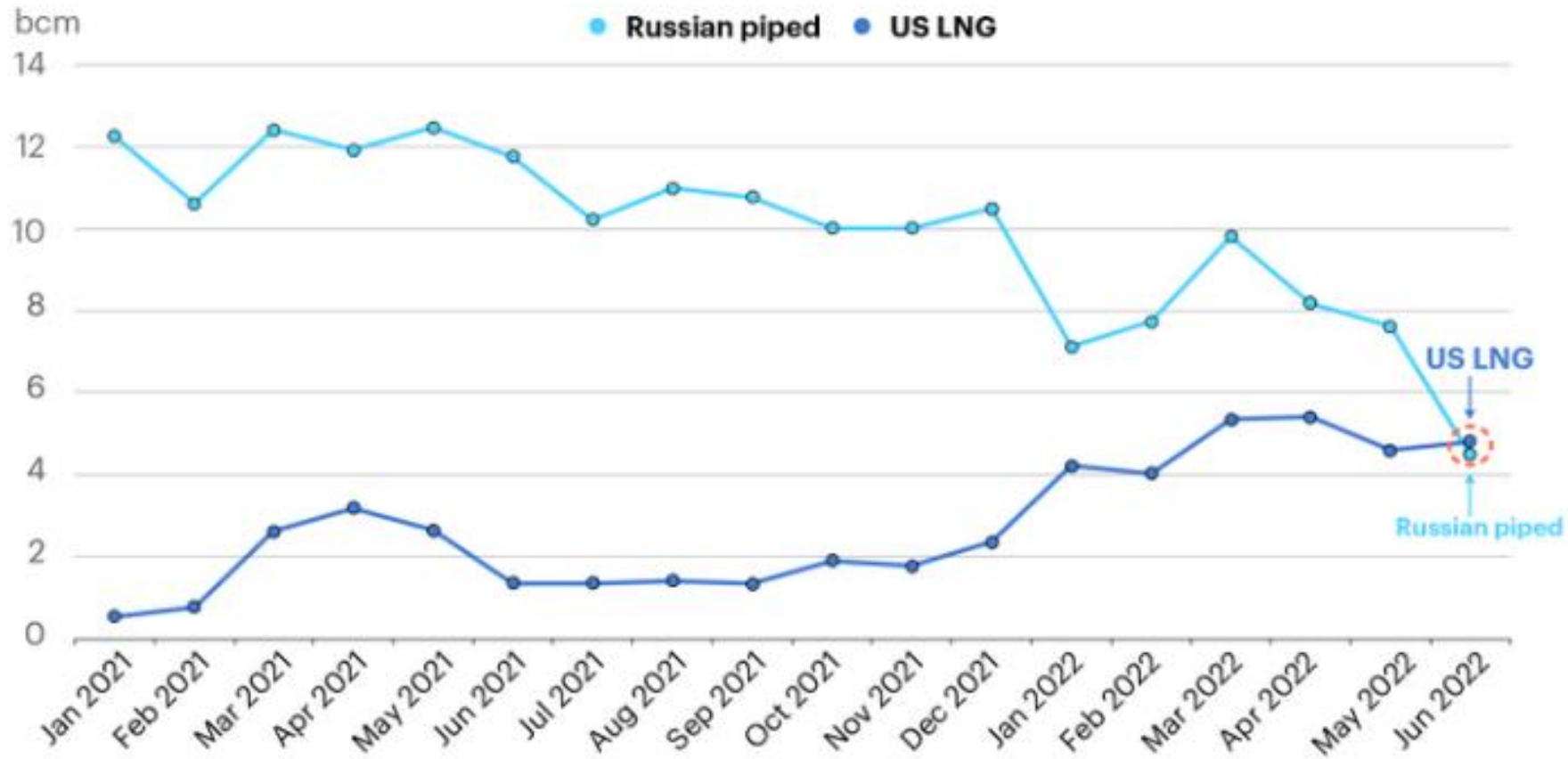
U.S. LNG Exports by Destination Region



With the winter 2021-2022 shortfall in natural gas supplies from Russia, Europe accelerated purchases of U.S. LNG at the rate of 8 BCF/d in the first three months of 2022.

US liquefied natural gas (LNG) overtakes Russian piped gas in EU gas imports in June 2022

IEA analysis



International Energy Agency

Germany's pursuit of peace in trade with Russia failed

“Roughly half of Germany’s homes rely on natural gas for their heating, and 55 percent of the country’s gas comes from Russia.”

A near-term cut-off of Russian gas supplies to Germany could cost their economy \$120 billion. Germany would be rationing natural gas.

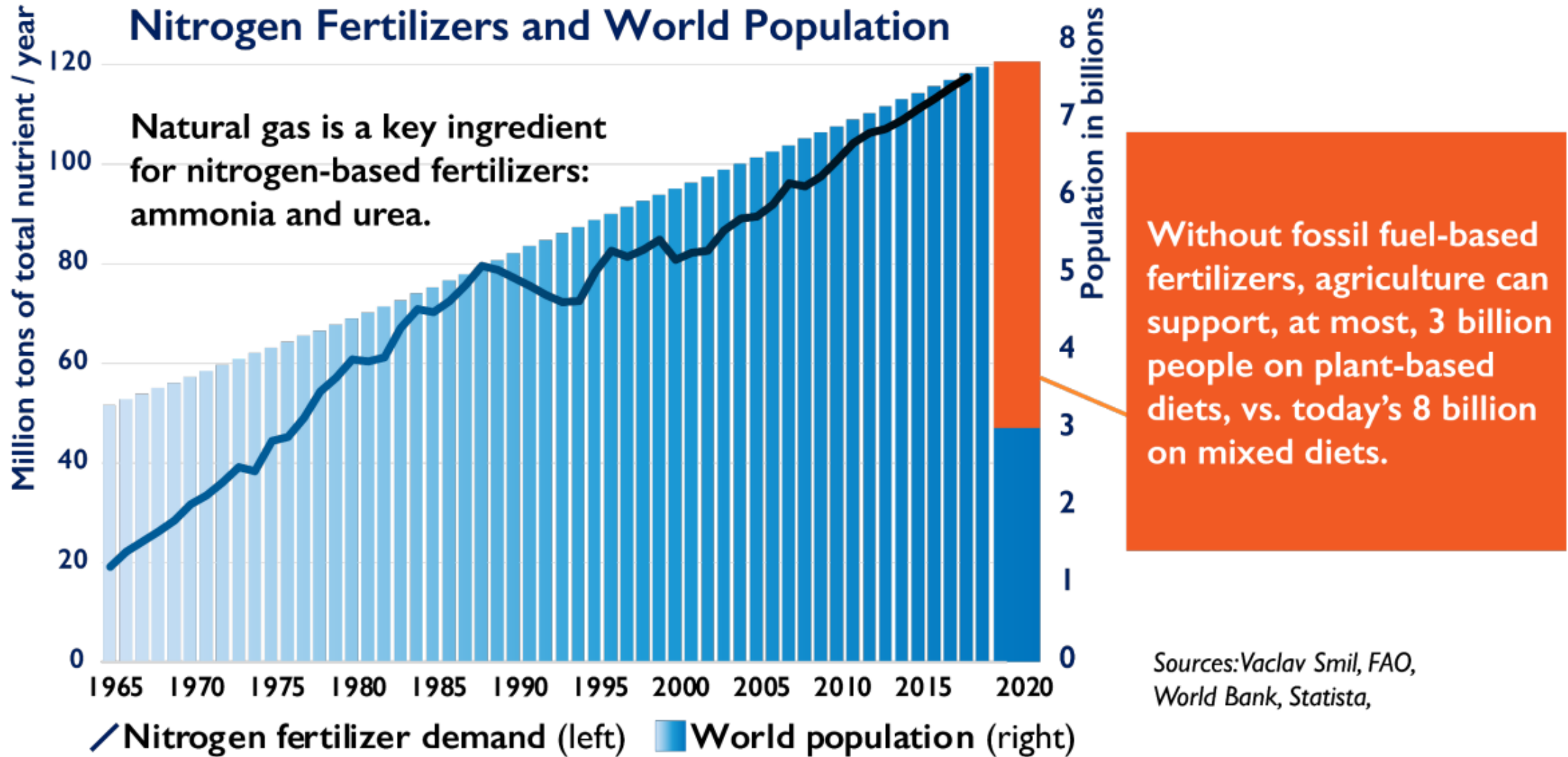
“We must change course to overcome our dependence on imports from individual energy suppliers,”

- Chancellor Olaf Scholz



This will include building two liquefied natural gas (LNG) terminals, one in Brunsbuettel and one in Wilhelmshaven, and raising its natural gas reserves.

Natural Gas is Critical for Global Food Production



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

- Wheat
- Rice
- Corn
- Soybeans



All require intense use of nitrogen fertilizers

Natural Gas is Critical for Global Food Production



- Natural gas is the main feedstock for nitrogen-based fertilizers: ammonia and urea, the primary fertilizers used in agriculture.
- Without fossil fuel-based fertilizers, agriculture can support, at most, 3 billion people on plant-based diets vs. today's 8 billion on mixed diets.
- Mass urbanization and diet change began in the mid-nineteenth century. But it was only in the mid-twentieth century, preceded by a series of haphazard but serendipitous technological breakthroughs that, through the use of natural gas, nitrogen fertilizers were able to be produced at large scale.
- Current production of fertilizers is approximately 117 million metric tons per year. Each ton requires about 33.5 thousand cubic feet of natural gas for a total of 4 trillion cubic feet per year, or 11 billion cubic feet per day.
- This slide deck is available at [EPRINC's Chart of The Week Archive](#).
- For more information on these charts, please contact Batt Ogderel (batto@eprinc.org) or Lucian Pugliaresi (loup@eprinc.org).

- The goal of fertilizing grains is to increase the yield



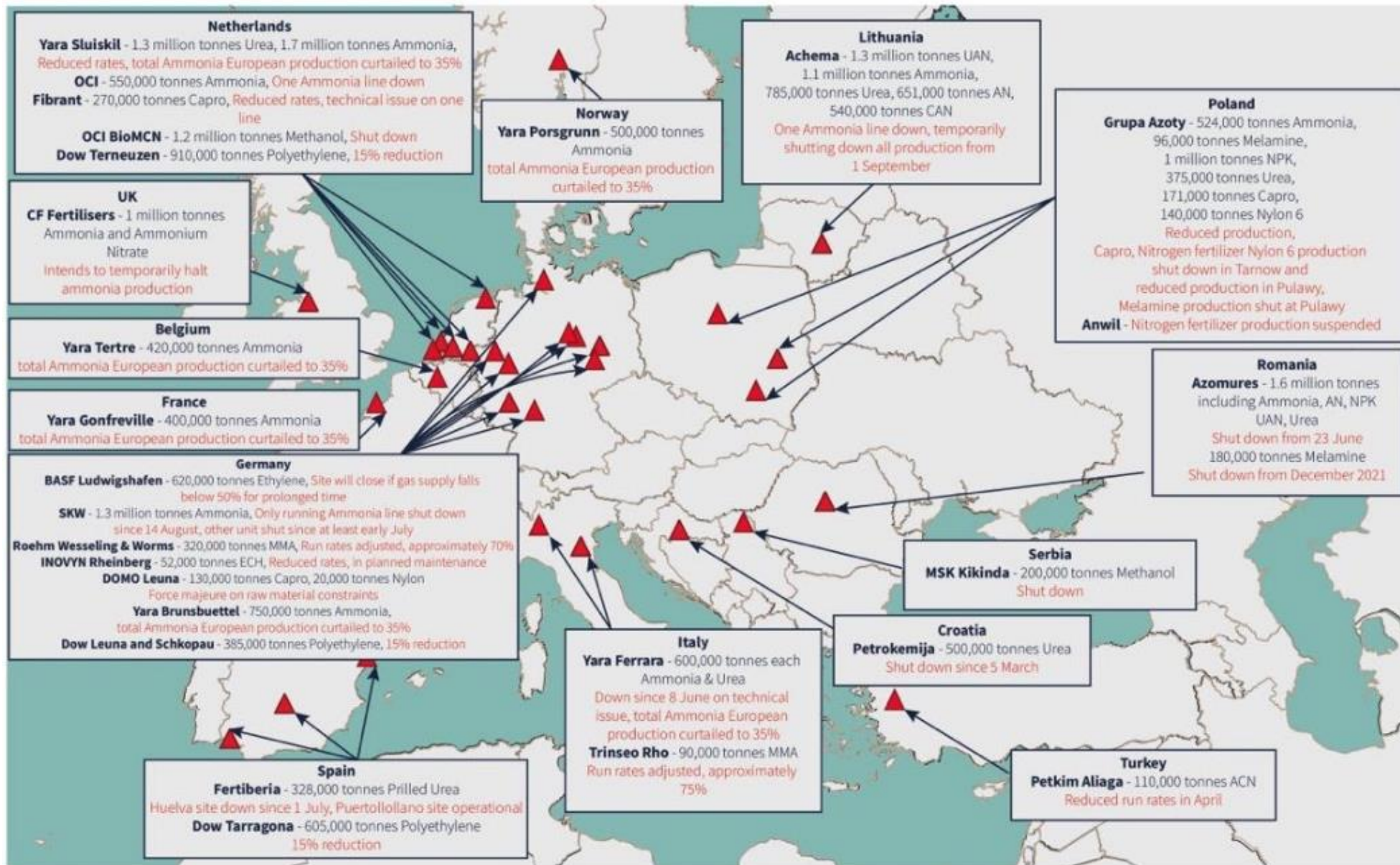
Benchmark Tampa ammonia spot price is rising again



Source: Green Markets, a Bloomberg company

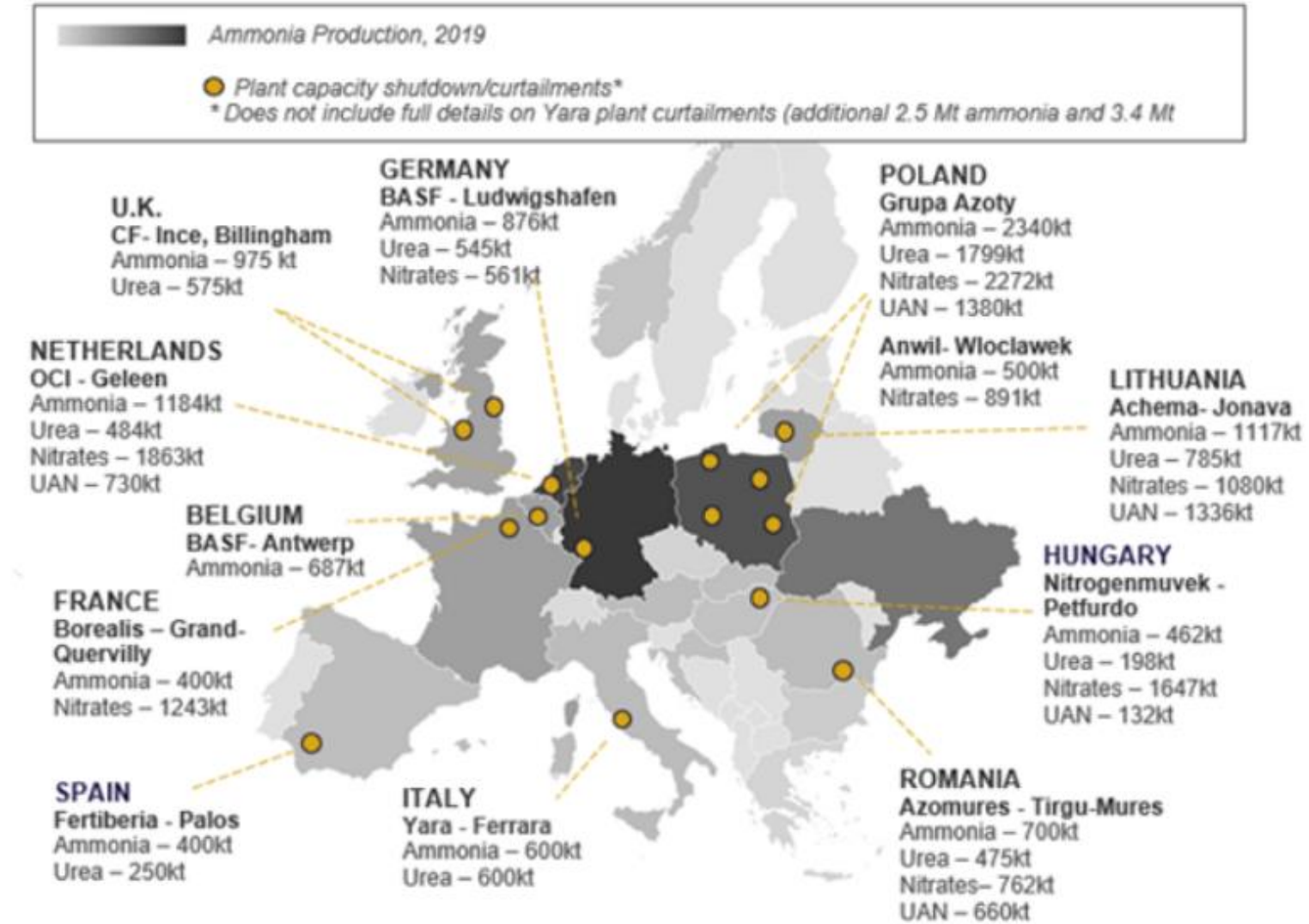
Bloomberg 

Soaring gas prices hit Europe fertilizers, chemicals



70% of Europe's nitrogen fertilizer plants have closed

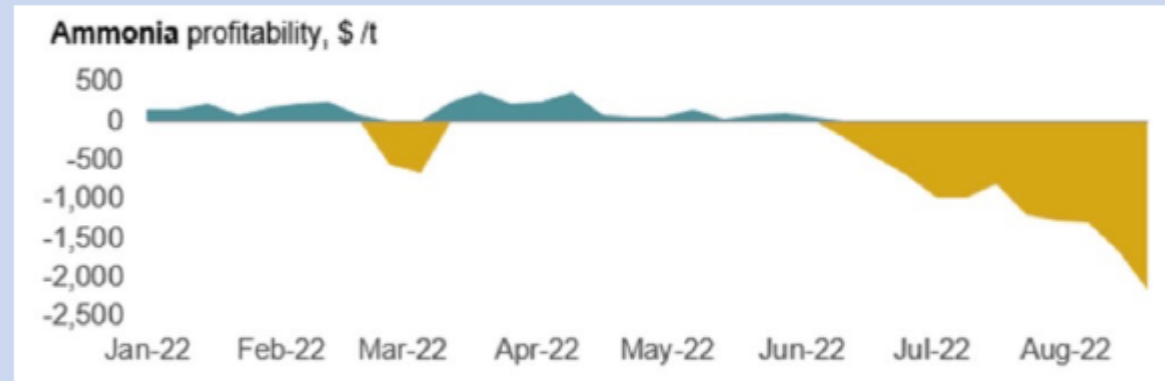
Figure 1: European nitrogen production shutdowns and curtailments



DATA: CRU, IFA

Today's EU Fertilizer Shutdowns Are Tomorrow's Food Shortages/Famine

- $\approx 70\%$ of Europe's fertilizer capacity has been shuttered due to high nat gas prices
- Ammonia prices up 5x since 1Q21
- China began restricting fertilizer exports October 2021
- Russia began restricting exports in March 2022
- Harpole: "Fertilizer production in Europe is over"
- Africa facing "shortage of at least 30 million metric tons of food"



Surging Fertilizer Prices Set to Exacerbate African and Mid-East Food Crisis

- Use of nutrients may shrink by a third in sub-Saharan Africa
- Import-dependent region may face increasing food shortages



“That could potentially curb cereals output by 30 million tons, enough to feed 100 million people.”

– Sebastian Nduva, Program Manager at AfricaFertilizer.Org

Goldman Sees \$2 Trillion Surge in European Household Energy Bills by 2023

- September 6, 2022, Bloomberg.com

3,500 energy intensive industries are surveyed, only half have hedges in place for energy requirements

- July 25, 2022, Oilprice.com

Energy Prices Trigger Deindustrialization In Germany

- August 19, 2022, Oilprice.com

Germany Risks a Factory Exodus as Energy Prices Bite Hard

August 18, 2022, Bloomberg.com

Germany's Natural Gas Crunch Could Cause Supply Chains to Collapse

- August 3, 2022, Oilprice.com

Europe's metals industry warns of existential threat to their future

- September 2022, Eurometaux

FERC retreats on gas policies as chair pursues clarity

- March 25, 2022, E&E News

Calif. gives 'new life' to gas plants in emergency overhaul

- July 1, 2022, E&E News

New [Floating LNG] Terminals Arrive to Ease Putin's Grip on Europe

- September 7, 2022, Bloomberg.com

Mexico Plans to Become an [LNG] Export Hub With US-Drilled Natural Gas

- August 12, 2022, Bloomberg.com

Worried about a warming world, thousands of Germans reject using LNG – including Canada's

- August 14, 2022, CBC

Macron Backs EU-Wide Windfall Tax on Energy Company Profits

- September 5, 2022, Bloomberg.com

'Huge amount of money' in climate law could spawn gas bans

- September 7, 2022, E&E News

Texas Consumers On Hook for \$10 Billion In Debt Incurred During Winter Storm Uri

- August 24, 2022, Forbes.com

Railroad Commission adopts state's first weatherization rule for natural gas facilities

- September 8, 2022, The Center Square

EPA denies Cheniere Energy's request for LNG pollution waiver

- September 6, 2022, Associated Press

“... pension funds and endowments that invest in private-equity funds have [asked] their managers to stop backing producers of fossil fuels...”

- September 1, 2022, WSJ.com

Shale Profit Bonanza Frees Up Even More Cash to Reward Investors

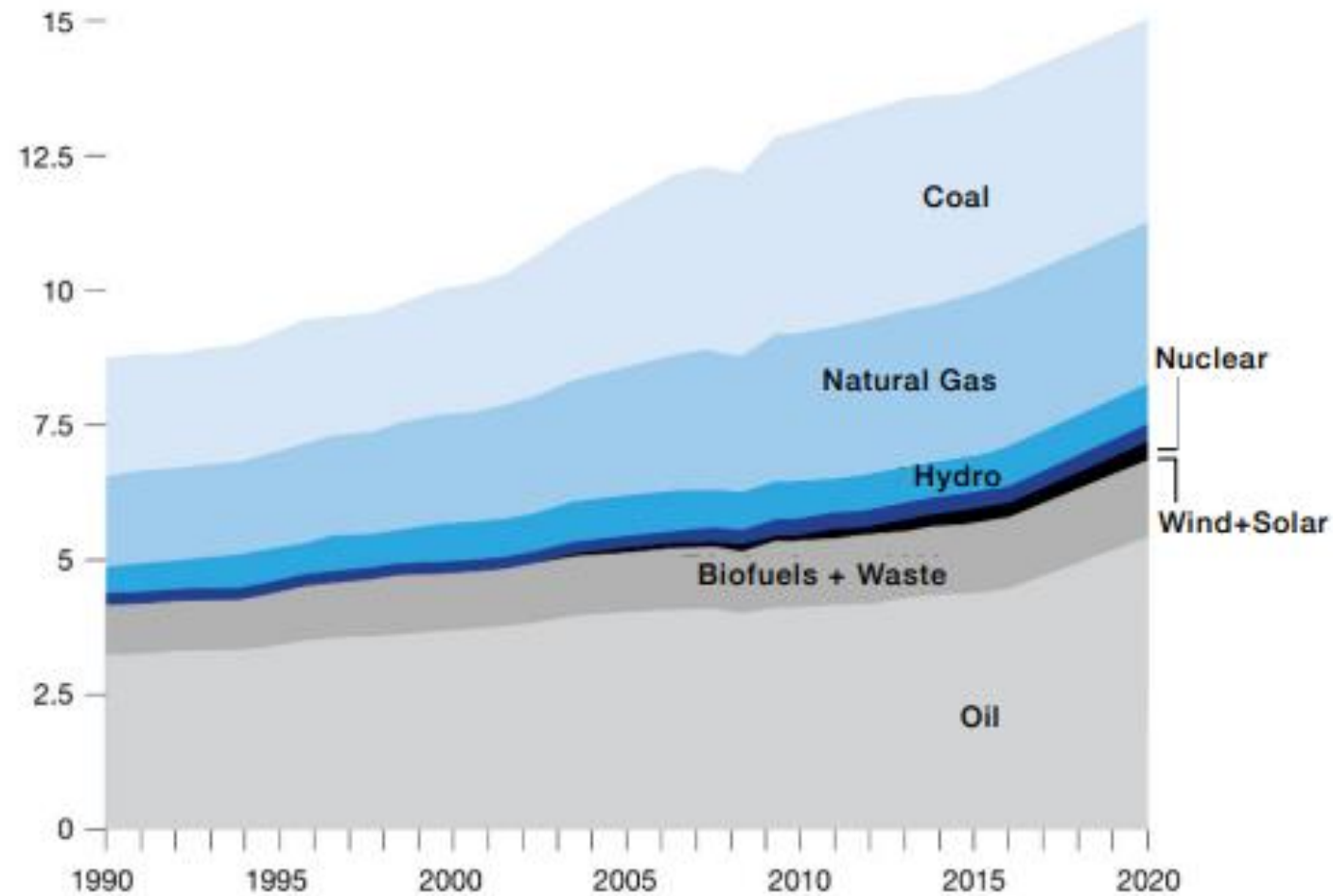
- August 11, 2022, Bloomberg.com

Make it Rain – E&Ps Shower Cash on Shareholders as Cash Flows Rise with Soaring Oil and Gas Prices

- July 12, 2022, RBN Energy

Growth in Global Energy Supplies

(Oil Equivalent Billion Tons/Year)



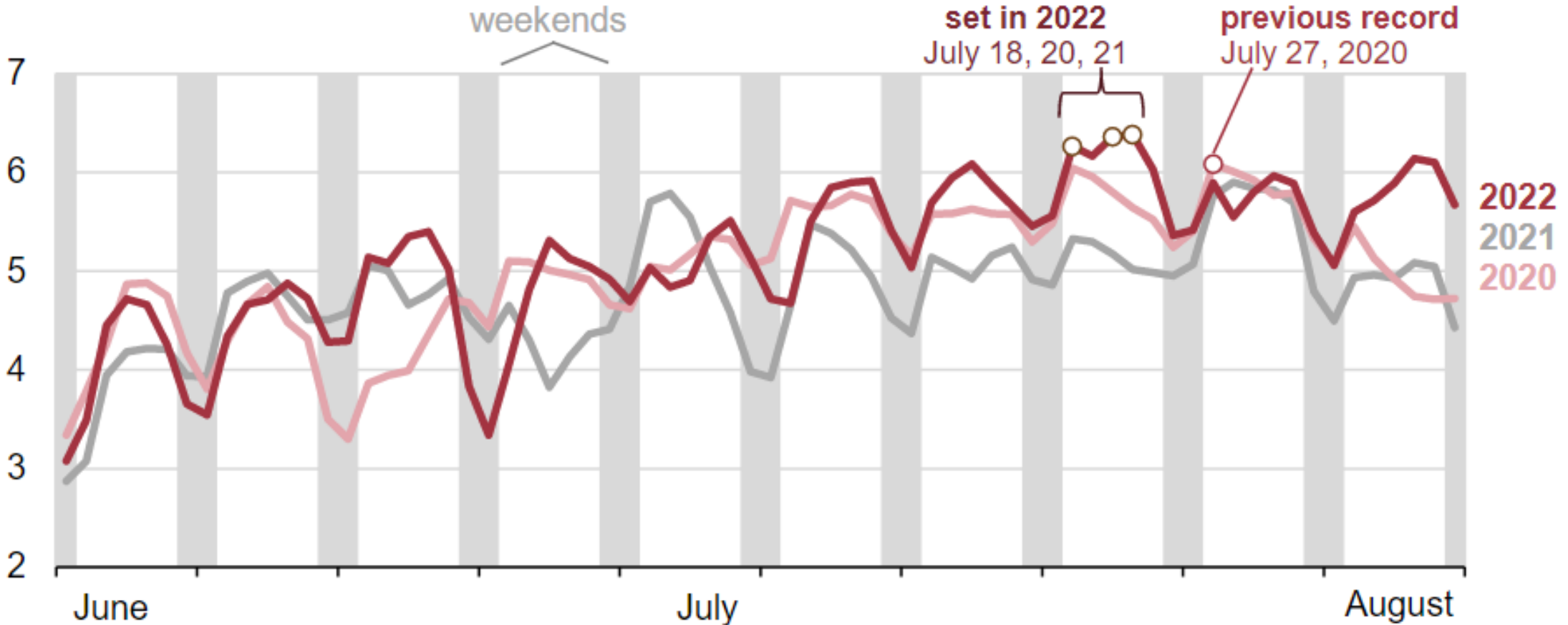
Note: 1 billion tons oil/year = 20 million barrels/day.

Source: BP, Statistical Review of World Energy 2022

Daily U.S. electricity generation from natural gas hits a record in mid-July

Daily U.S. natural gas-fired electricity generation (selected weeks in 2020–2022)

million megawatthours



Data source: U.S. Energy Information Administration, *Hourly Electric Grid Monitor*

Note: We adjusted values for previous years to align weekdays and weekends.

- European natural gas prices will remain 5x-10x the historical norm for the next 3 years
- That will cause the continued deindustrialization of Europe
- Putin's goal of separating the EU may succeed
- Food security and famine will be one of the top concerns of all world leaders
- This is essentially a clash between globalism and nationalism
- This is also the clash between the extreme radical environmental agenda and energy pragmatism

The far green left still doesn'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."

John Harpole

President

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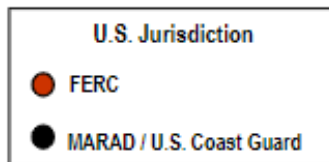
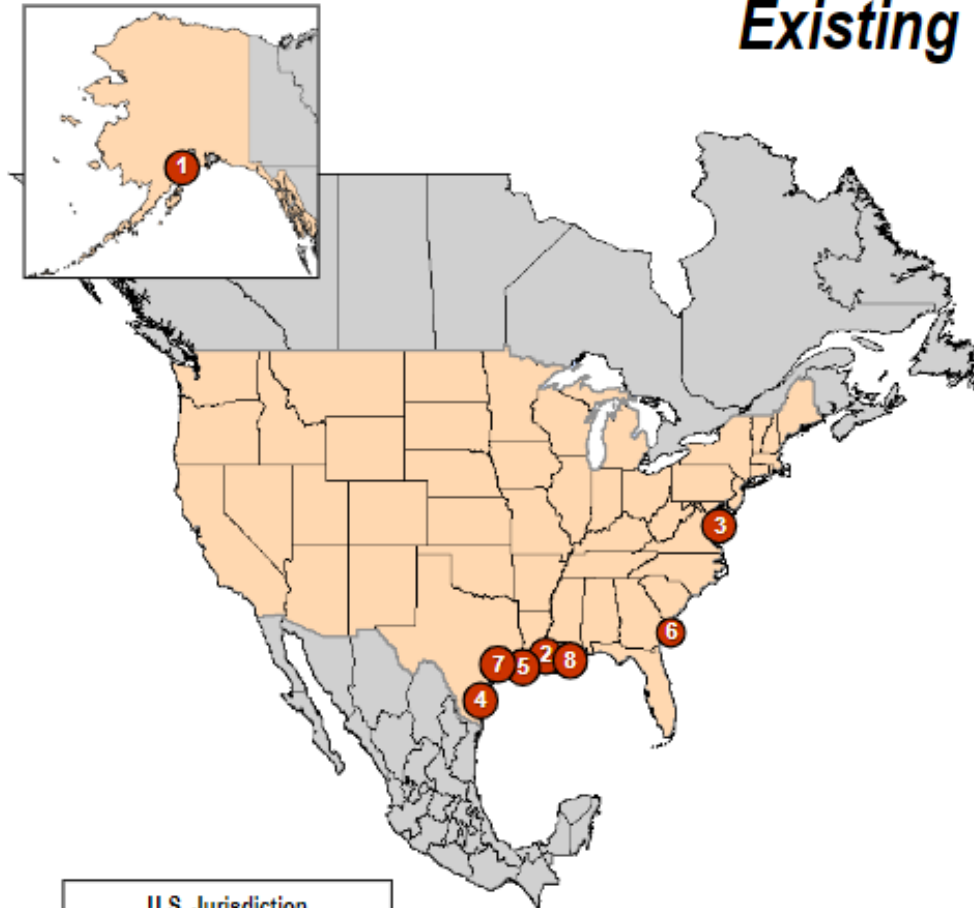
(303) 478-3233 (mobile)





North American LNG Export Terminals

Existing



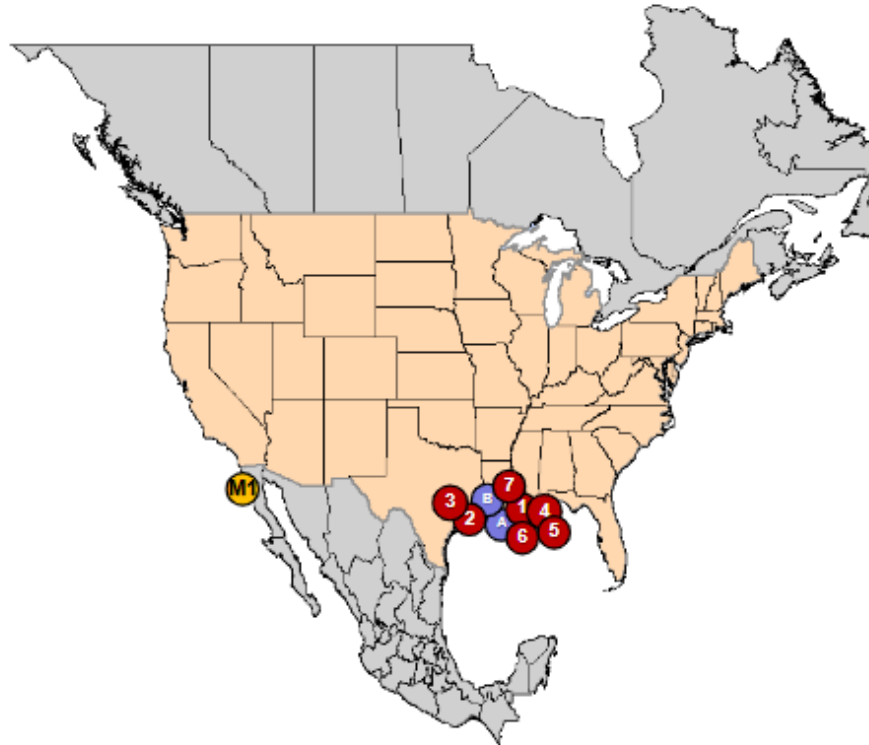
Export Terminals

UNITED STATES

1. Kenai, AK: 0.2 Bcfd (Trans-Foreland)
2. Sabine, LA: 4.55 Bcfd (Cheniere/Sabine Pass LNG – Trains 1-6)
3. Cove Point, MD: 0.82 Bcfd (Dominion–Cove Point LNG)
4. Corpus Christi, TX: 2.40 Bcfd (Cheniere – Corpus Christi LNG Trains 1-3)
5. Hackberry, LA: 2.15 Bcfd (Sempra–Cameron LNG, Trains 1-3)
6. Elba Island, GA: 0.35 Bcd (Southern LNG Company Units 1-10)
7. Freeport, TX: 2.14 Bcfd (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction Trains 1-3)
8. Cameron Parish, LA: 0.74 Bcfd (Venture Global Calcasieu Pass Units 1-4)

As of June 7, 2022
No updates since previous issuance

North American LNG Export Terminals Proposed



UNITED STATES

PROPOSED TO FERC

Pending Applications:

1. Cameron Parish, LA: 1.18 Bcf/d (Commonwealth, LNG) (CP19-502)
2. Port Arthur, TX: 1.86 Bcf/d (Sempra - Port Arthur LNG Trains 3 & 4) (CP20-55)
3. Freeport, TX: 0.24 Bcf/d (Freeport LNG uprate) (CP21-470)
4. Cameron Parish, LA: 1.45 Bcf/d (Venture Global CP2 Blocks 1-9) (CP22-21)
5. Cameron Parish, LA: .057 Bcf/d (Venture Global Calcasieu Pass) (CP22-25)
6. Hackberry, LA: -0.45 Bcf/d (Sempra - Cameron LNG Vacate T5 & modify T4) (CP22-41)
7. Plaquemines Parish, LA: 0.45 Bcf/d (Venture Global Plaquemines) (CP22-92)

Projects in Pre-filing:

- A. LaFourche Parish, LA: 0.65 Bcf/d (Port Fourchon LNG) (PF17-9)
- B. Plaquemines Parish, LA: 2.76 Bcf/d (Delta LNG - Venture Global) (PF19-4)

CANADA

For Canadian LNG Import and Proposed Export Facilities:

<https://www.nrcan.gc.ca/energy/natural-gas/5683>

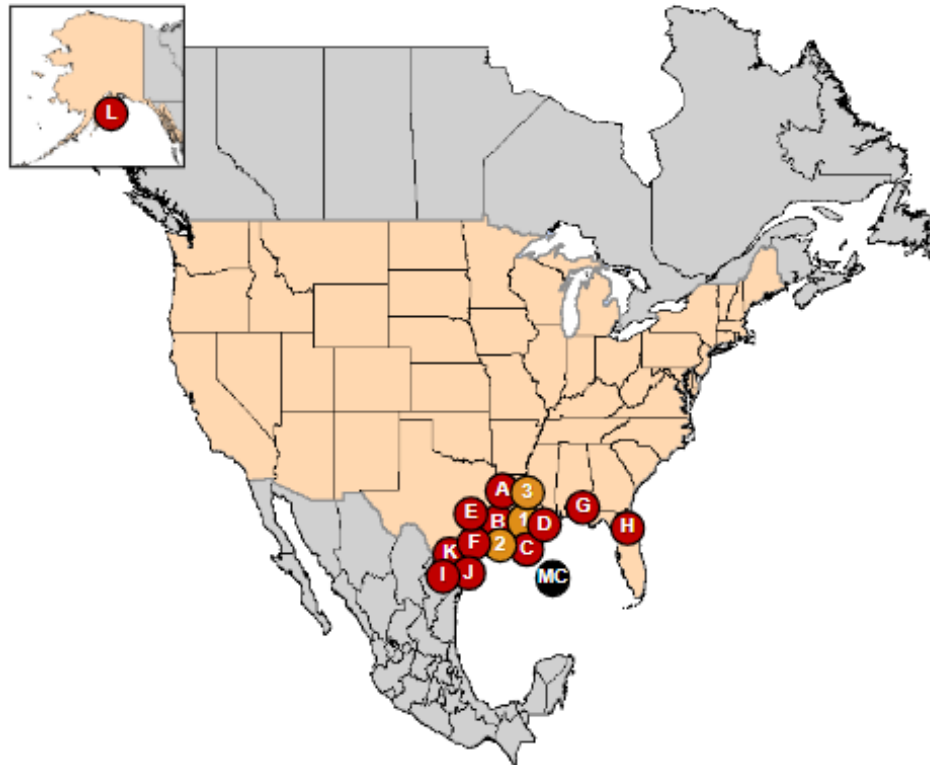
MEXICO (Projects in advanced planning/development stages)

- M1. Baja California, MX: 0.4 Bcf/d (Sempra - Energia Costa Azul Phase 1)

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No updates since previous issuance

North American LNG Export Terminals

Approved, Not Yet Built



Export Terminals

UNITED STATES

FERC – APPROVED, UNDER CONSTRUCTION

1. Cameron Parish, LA: 0.92 Bcf/d (Venture Global Calcasieu Pass Units 5-9) (CP15-550)
2. Sabine Pass, TX: 2.26 Bcf/d (ExxonMobil – Golden Pass) (CP14-517, CP20-459)
3. Plaquemines Parish, LA: 3.40 Bcf/d (Venture Global Plaquemines) (CP17-66)

FERC – APPROVED, NOT UNDER CONSTRUCTION

- A. Lake Charles, LA: 2.2 Bcf/d (Lake Charles LNG) (CP14-120)
- B. Lake Charles, LA: 1.186 Bcf/d (Magnolia LNG) (CP14-347)
- C. Hackberry, LA: 1.41 Bcf/d (Sempra - Cameron LNG Trains 4 & 5) (CP15-560)
- D. Calcasieu Parish, LA: 4.0 Bcf/d (Driftwood LNG) (CP17-117)
- E. Port Arthur, TX: 1.86 Bcf/d (Sempra - Port Arthur LNG Trains 1 & 2) (CP17-20)
- F. Freeport, TX: 0.72 Bcf/d (Freeport LNG Dev Train 4) (CP17-470)
- G. Pascagoula, MS: 1.5 Bcf/d (Gulf LNG Liquefaction) (CP15-521)
- H. Jacksonville, FL: 0.132 Bcf/d (Eagle LNG Partners) (CP17-41)
- I. Brownsville, TX: 0.55 Bcf/d (Texas LNG Brownsville) (CP16-116)
- J. Brownsville, TX: 3.6 Bcf/d (Rio Grande LNG – NextDecade) (CP16-454)
- K. Corpus Christi, TX: 1.86 Bcf/d (Cheniere Corpus Christi Stage III) (CP18-512)
- L. Nikiski, AK: 2.63 Bcf/d (Alaska Gasline) (CP17-178)

MARAD/USCG – APPROVED, NOT UNDER CONSTRUCTION

- MC. Gulf of Mexico: 1.8 Bcf/d (Delfin LNG)

CANADA - LNG IMPORT AND PROPOSED EXPORT FACILITIES

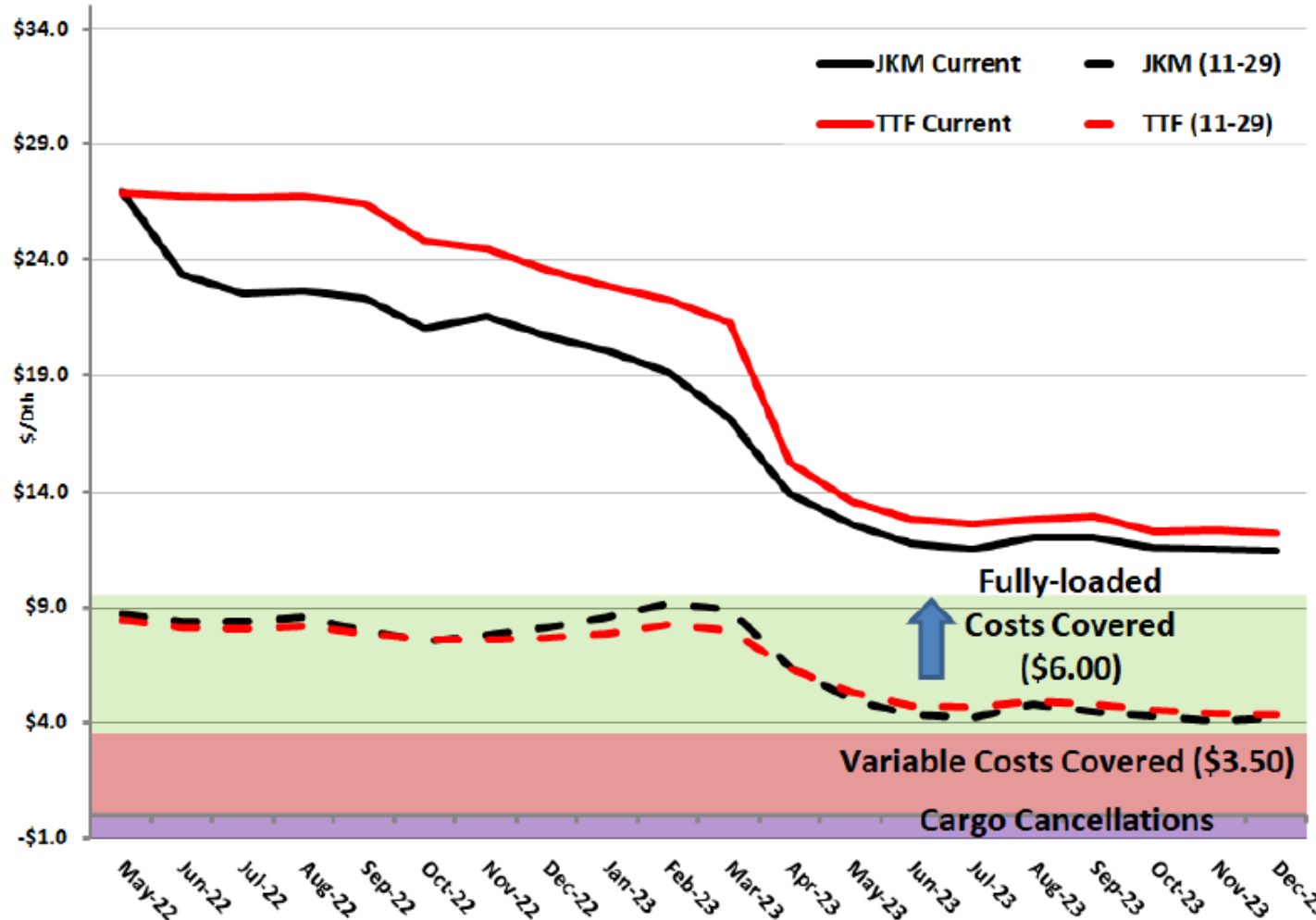
<https://www.nrcan.gc.ca/energy/natural-gas/5683>

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LNG Export Trends

Near Term Outlook Margins



Margins through '23 well above fully loaded costs. Supply demand balance remains tight due to greater demand in Asia and Europe. Competition for cargos between Asia and Europe and Russia/Ukraine conflict sustaining elevated prices in both markets.

Nord Stream 2 will not enter service for the foreseeable future with current situation in Europe