

# Impact of Russia/Ukraine War on World Natural Gas & Oil Markets

ALTERNATIVE POWER PLAYS PODCAST

THE BRATTLE GROUP

BUCHANAN INGERSOLL ROONEY

MARCH 28, 2022



# Introduction

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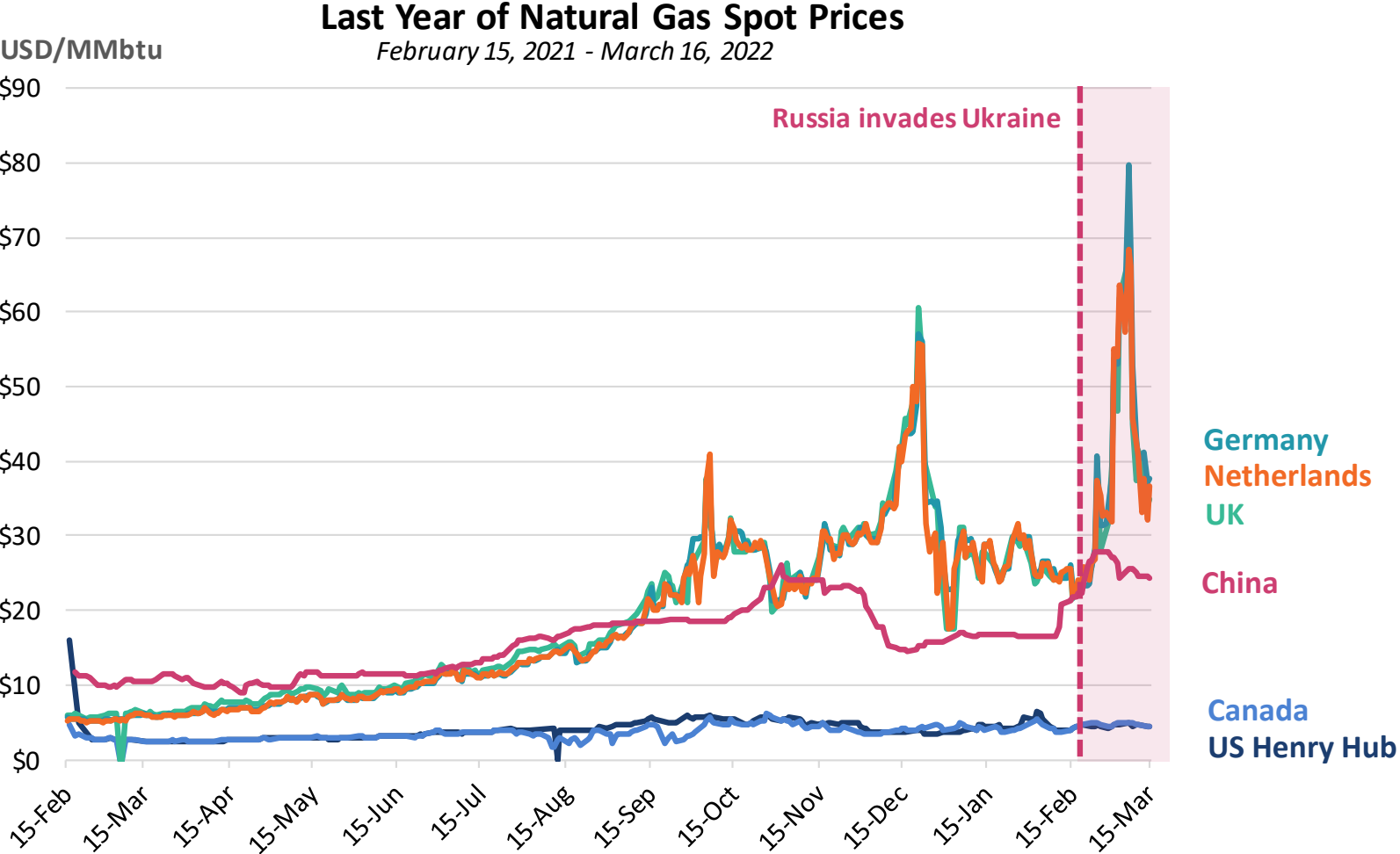
Today's topic is how the Ukraine war by Russia is likely to affect world energy markets, with primary focus on natural gas. This is a topic widely mentioned in the news, but often discussed briefly without the additional context needed to fully assess the risks and possible outcomes. We will be discussing recent price spikes, Russia oil & gas supplies in relation to world needs, LNG and the US gas market, and key takeaways for this year and 3-5 years in the future.

To provide an expert view, we will interview Mr. Steve Thumb, who is a nationally noted oil & gas expert, who was in charge of oil and gas forecasting for three decades at the widely used source, Energy Ventures Analysis, until he recently retired. Previous to that, he was Vice President of Strategic Planning at the energy divisions of three Fortune 500 Companies. In addition, he has authored or co-authored over 40 EPRI and Gas Technology Institute reports on key oil & gas topics.

We will not be offering any forecasts today, but rather we will try to explain where the world's oil and gas supplies come from, how much they may be disrupted by the Ukraine War, and what the short and long run implications could be for the US, the EU, and Russia. Spoiler alert – *Steve regards the situation as a long run game changer, not just a bad stretch of extreme short run pain and market dislocation. He will explain.*

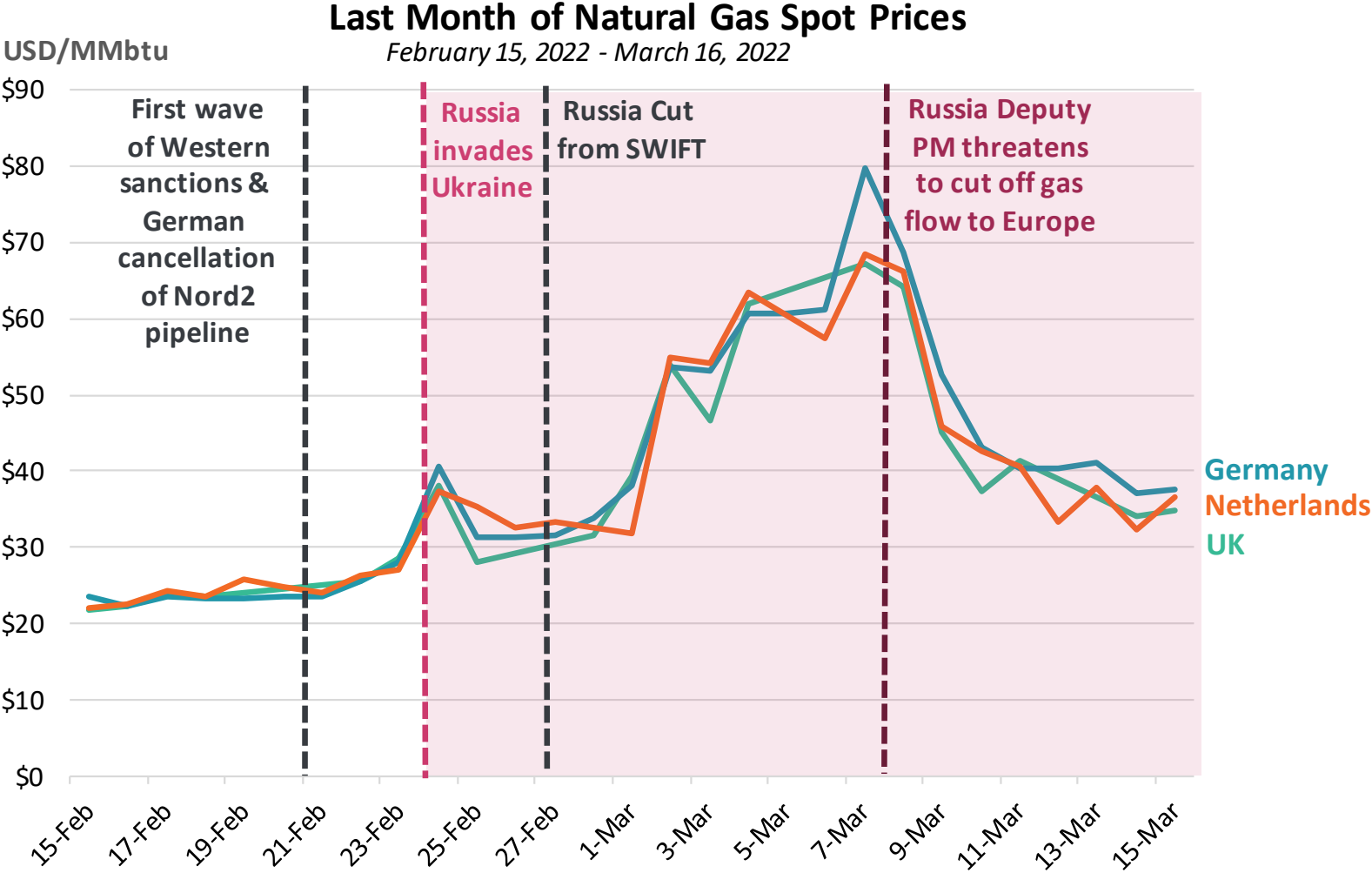
This will be a longer than usual segment because of the richness of the material. Numerical information will be presented and will be available to listeners on Brattle's and Buchanan's websites.

# International Natural Gas Prices over Past Year



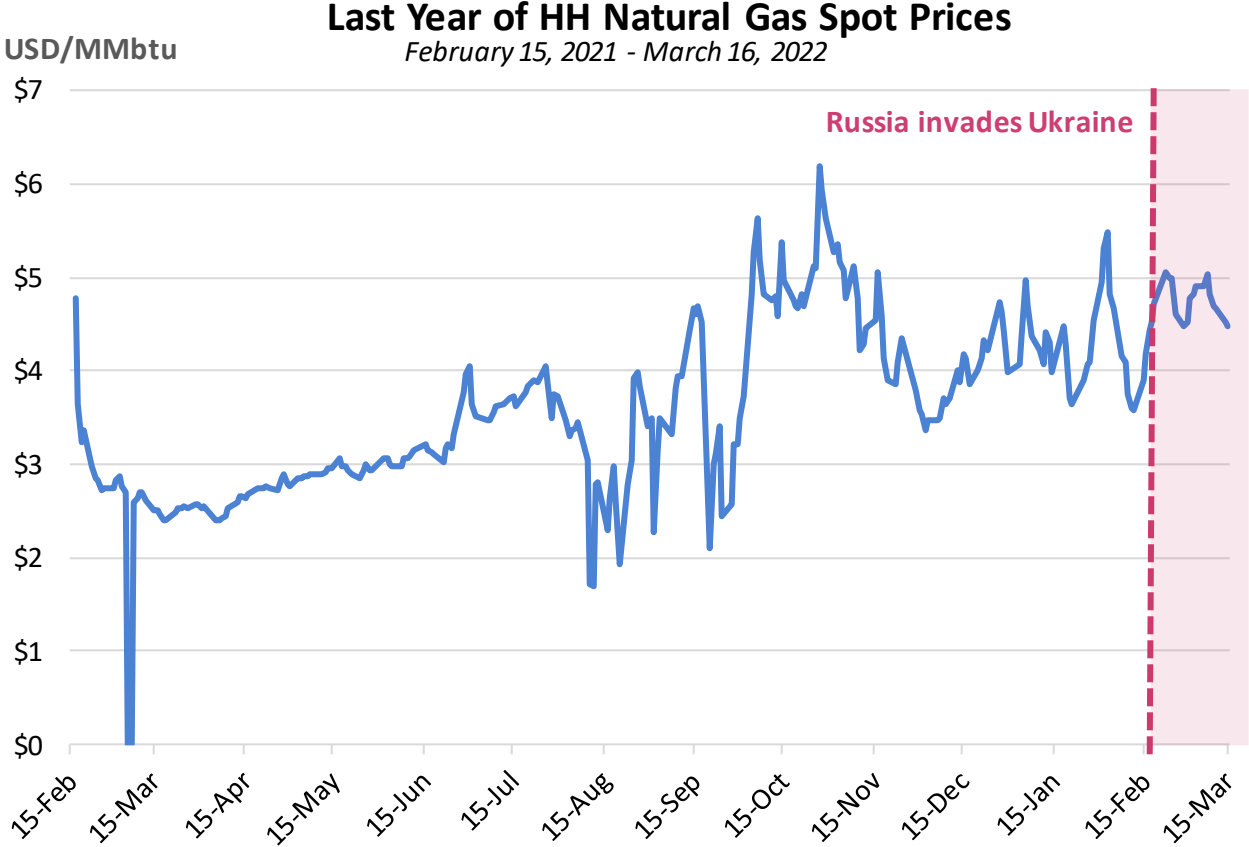
Source: Bloomberg Spot Price Indices.  
Note: China prices are Hebei delivered prices.

# EU Gas Prices – Up to and during the war



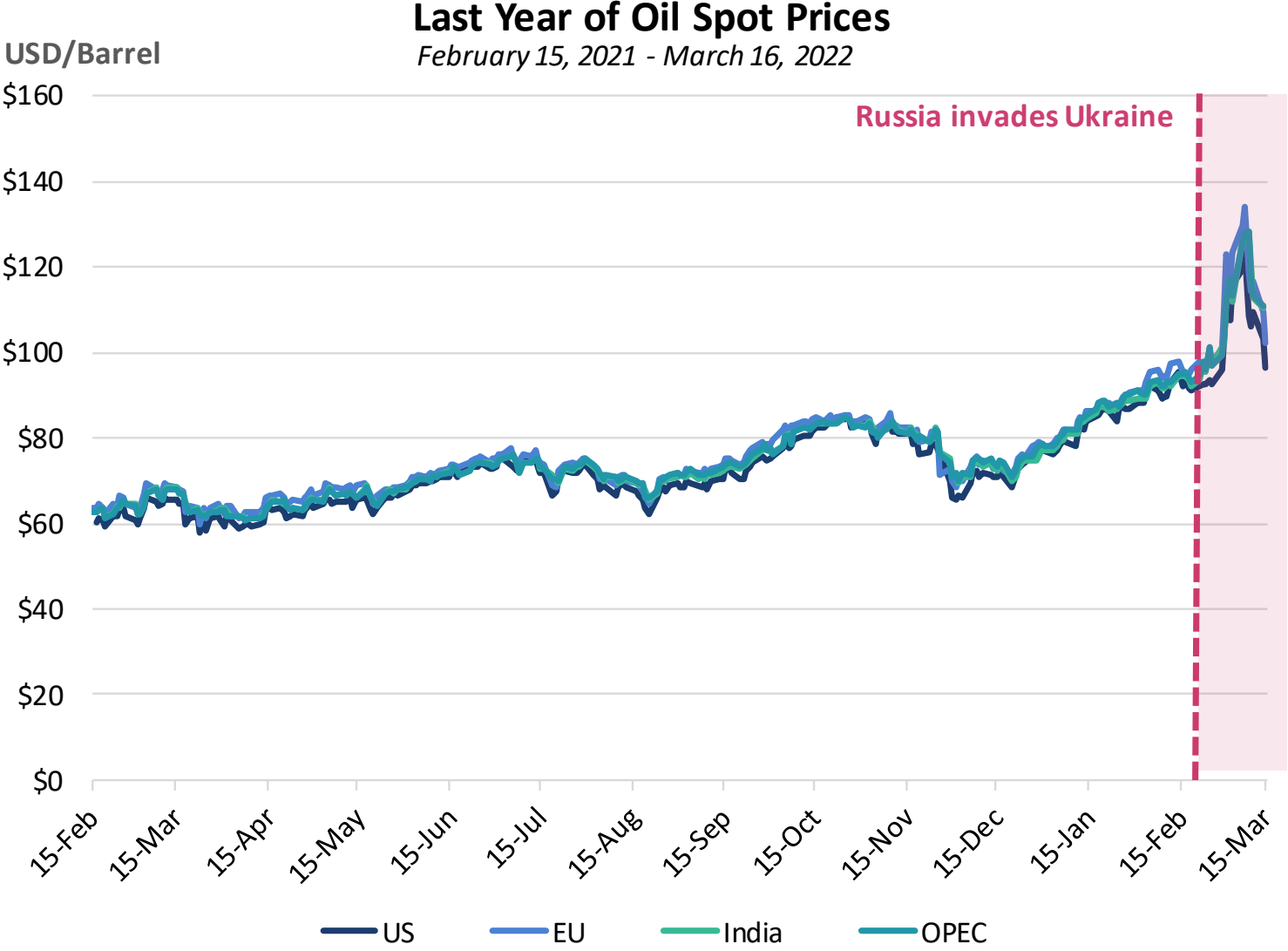
Source: Bloomberg Spot Price Indices.

# U.S. Henry Hub Spot Gas Prices – past year



Source: Bloomberg Spot Price Indices.

# Oil Prices in the Past Year

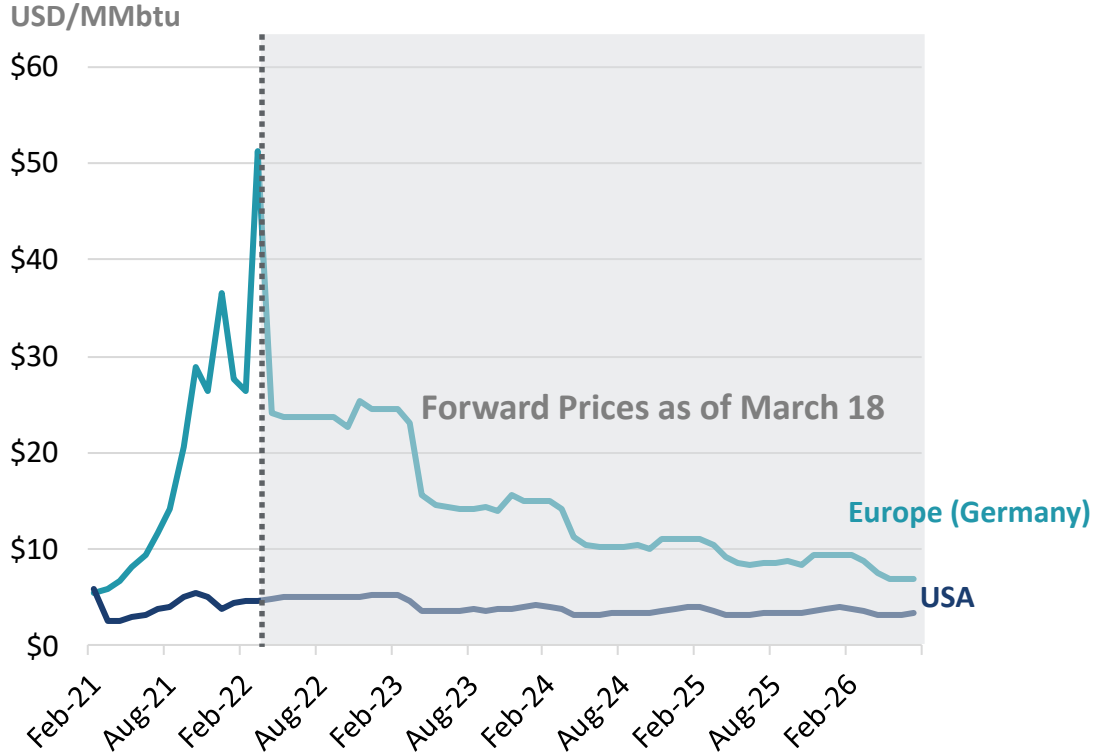


Source: Bloomberg Spot Price Indices.

# Gas & Oil Prices and Futures

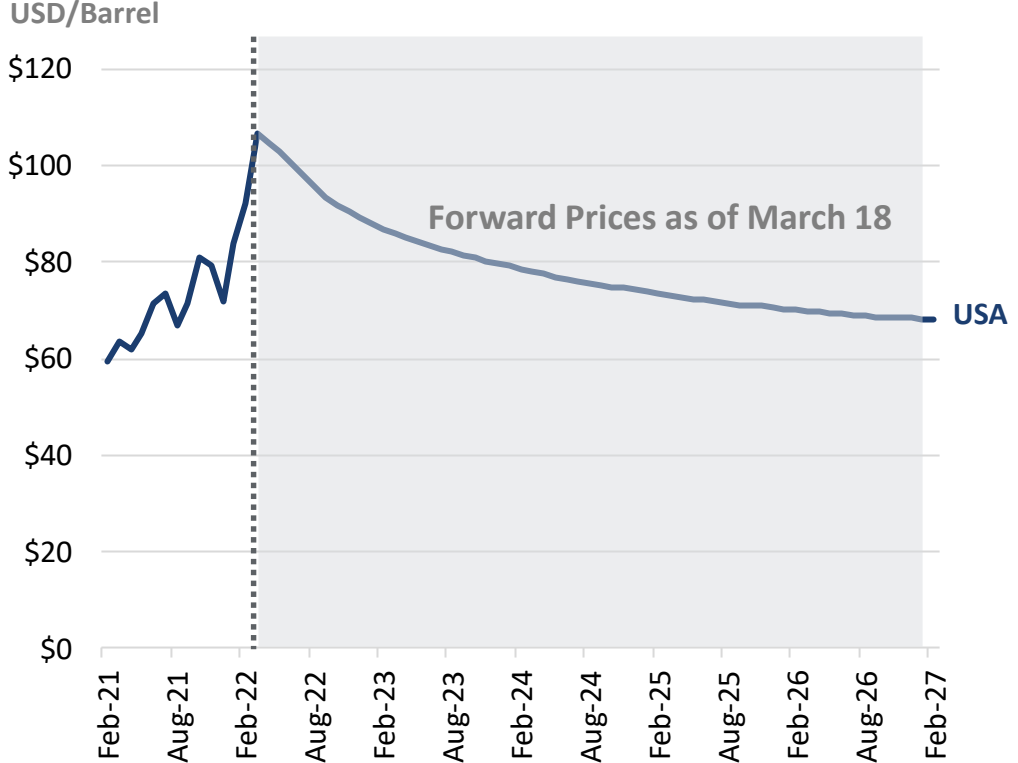


### Natural Gas Spot and Futures Prices



Source: Bloomberg Price Indices.

### Oil Spot and Futures Prices



Source: Bloomberg Price Indices.

# 2019 World Oil and Gas Production

## Oil Production (thousand barrels/day)

U.S.	17,045	18%
Saudi Arabia	11,832	12%
Russia	11,540	12%
Other Middle East	9,720	10%
Africa	8,399	9%
South & Central America	6,174	6%
Canada	5,651	6%
Iraq	4,779	5%
UAE	3,998	4%
China	3,836	4%
Other Asia Pacific	3,814	4%
Other Europe	3,414	4%
Other CIS	3,074	3%
Mexico	1,918	2%
<b>Total</b>	<b>95,194</b>	<b>100%</b>

Source: BP Statistical Review of World Energy 2020, PDF pg. 19

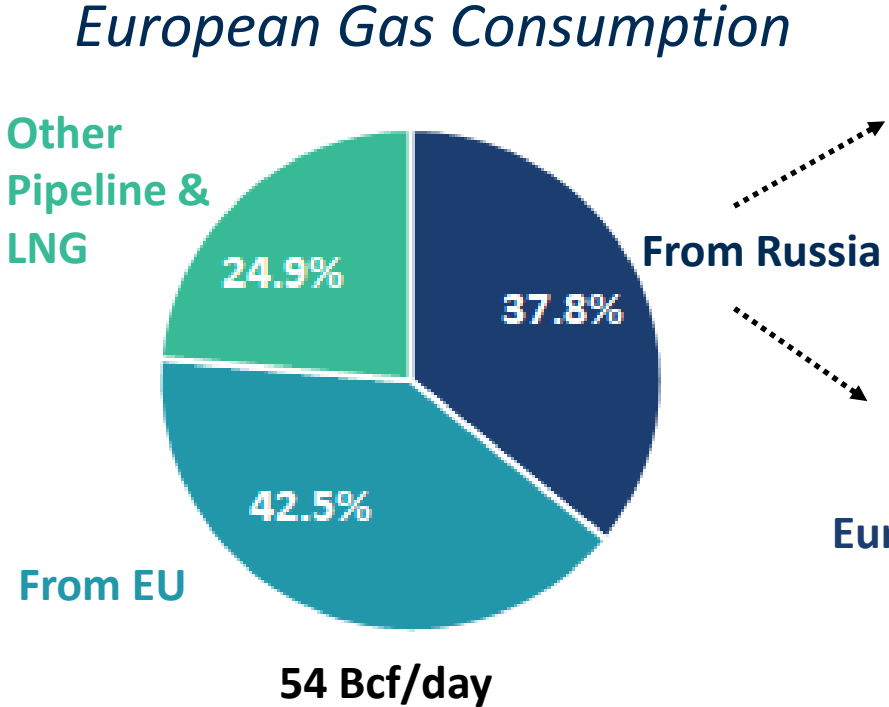
## Gas Production (bcf/day)

U.S.	89	23%
Russia	66	17%
Other Asia Pacific	48	12%
Other Middle East	26	7%
Iran	24	6%
Africa	23	6%
Other Europe	23	6%
Qatar	17	4%
China	17	4%
South & Central America	17	4%
Canada	17	4%
Other CIS	16	4%
Mexico	3	1%
<b>Total</b>	<b>386</b>	<b>100%</b>

Source: BP Statistical Review of World Energy 2020, PDF pg. 36

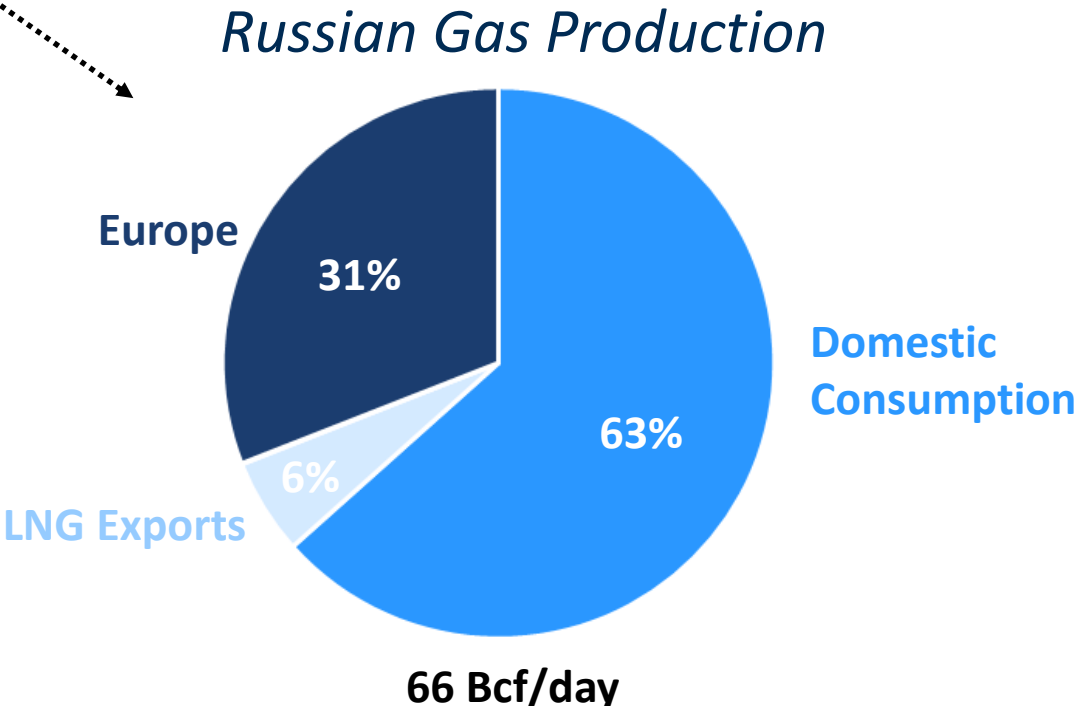


# 2019 European Gas Consumption / Russian Gas Production



90% of Russian Imports are via pipelines:

- Nord Stream I to Germany
- Brotherhood through Ukraine
- Yamal through Poland
- TurkStream through Southern Europe

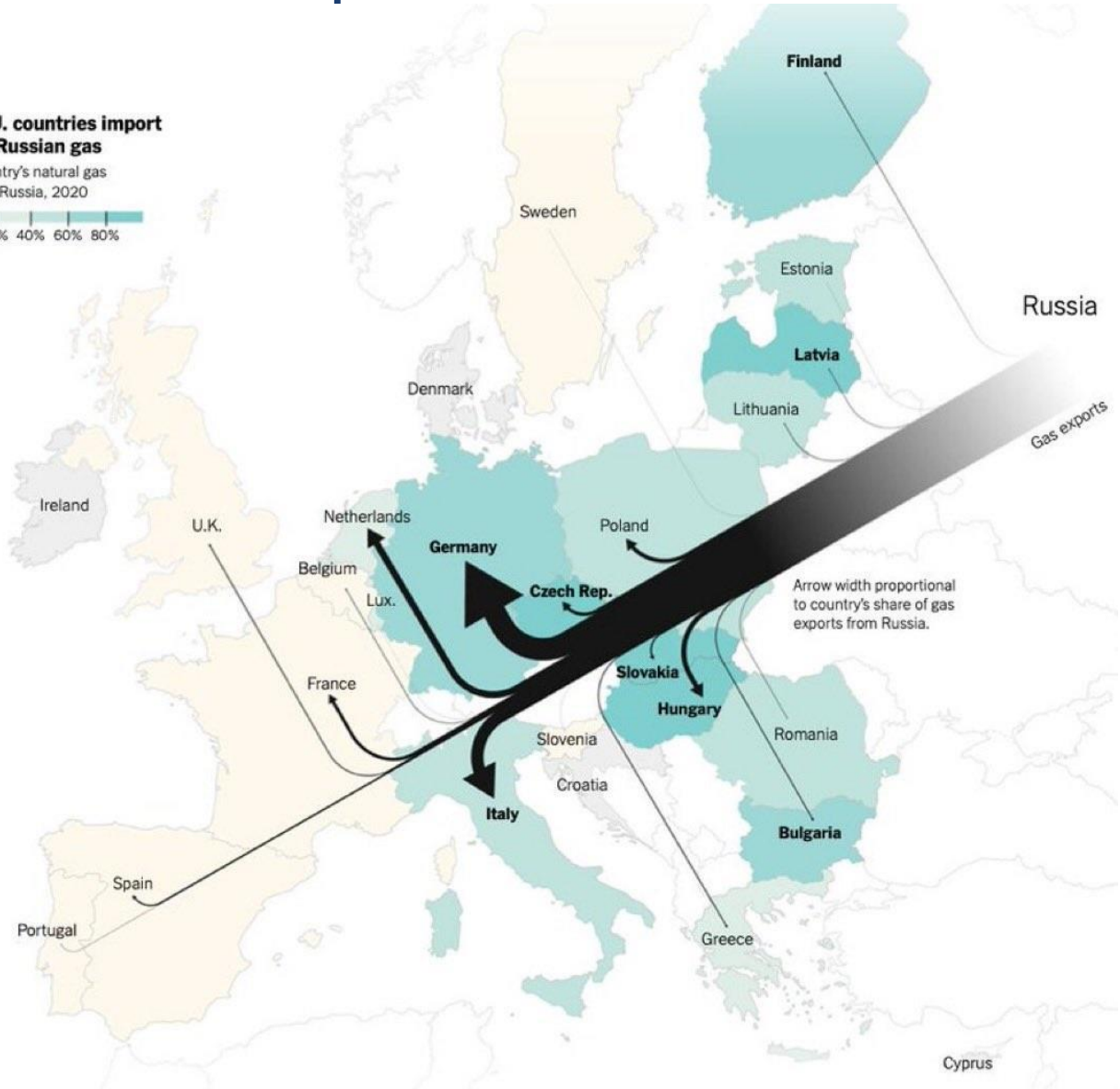


Source: BP Statistical Review of World Energy 2020.

# Russian Gas Flows to Europe

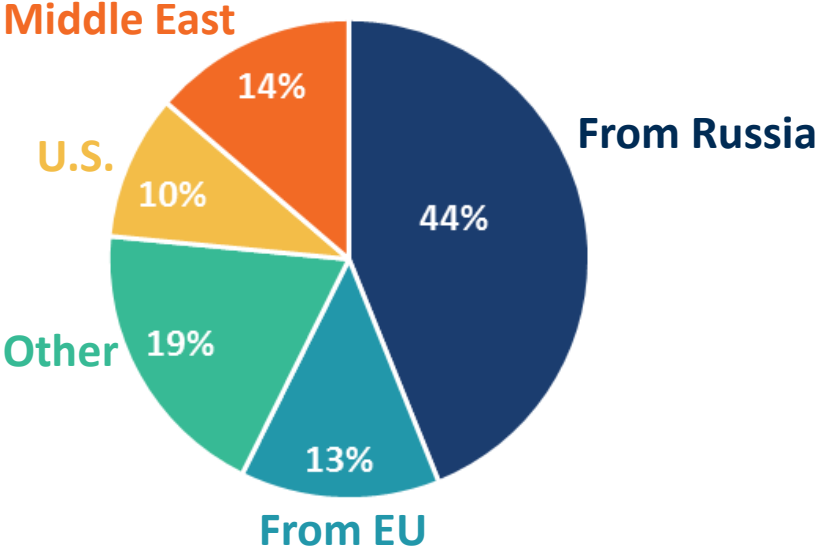
**Which E.U. countries import the most Russian gas**  
Share of country's natural gas imports from Russia, 2020

None 20% 40% 60% 80%



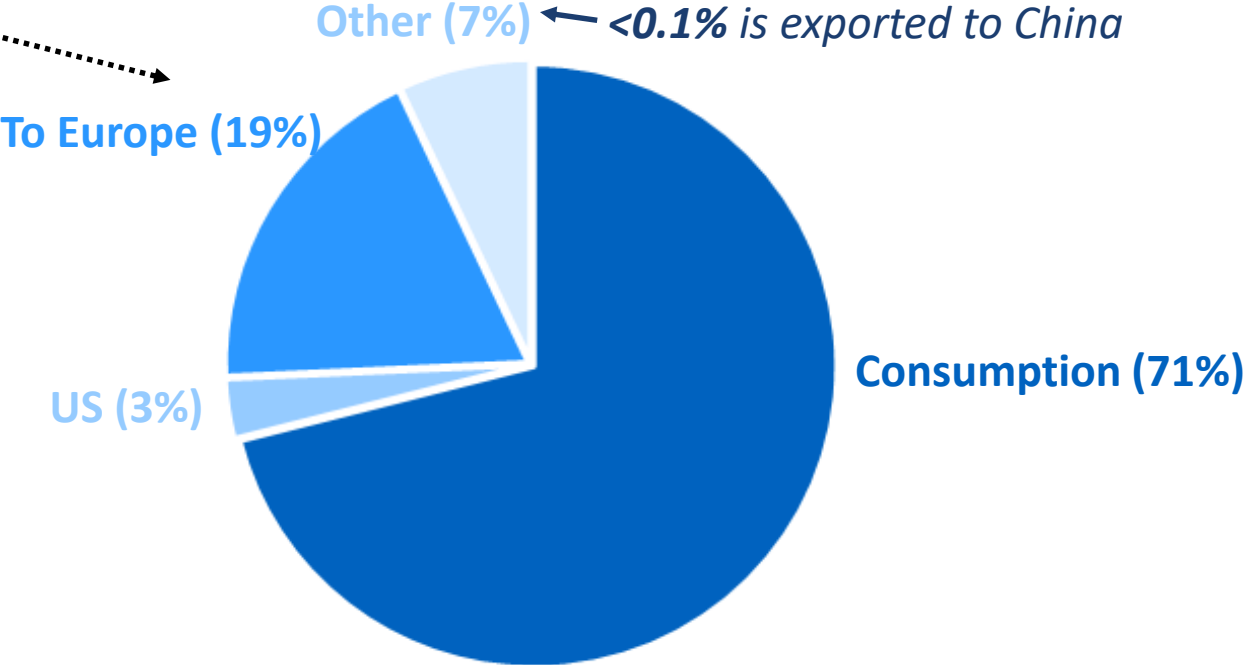
# 2019 European Oil Consumption and Russian Production

*European Oil Consumption*



4.9 million barrels/day

*Russian Oil Production*



11.5 million barrels/day

# Current Sanctions Against Russia

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## Sanctions now prevailing against Russia include:

- **Banking** – 7 banks are cut-off from SWIFT messaging system
- **Frozen assets** – affects at least \$284B (~45%) of holdings of Bank of Russia
- **Bans on Russian goods**
  - Import ban on nonindustrial diamonds, seafood, and alcohol (Vodka)
  - Export ban on luxury goods (tobacco products, clothing items, jewelry, vehicles, art and antique goods)
- **Transportation** – Russian aircrafts and ships are banned from their airspace and ports
- **Technology** – semi-conductors, chips, sensors, et al. are blocked for sale to Russia, which will affect the compressor stations and pipeline flow management technology

### Sources:

1. Reuters. <https://www.reuters.com/business/finance/eu-excludes-seven-russian-banks-swift-official-journal-2022-03-02/>
2. NBC News. <https://www.nbcnews.com/data-graphics/russian-bank-foreign-reserve-billions-frozen-sanctions-n1292153>
3. NBC News. <https://www.cnbc.com/2022/03/11/biden-to-ban-us-imports-of-russian-vodka-diamonds-and-seafood.html>
4. Reuters. <https://graphics.reuters.com/UKRAINE-CRISIS/SANCTIONS/byvrjenzmve/>
5. European Commission. [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_1511](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511)

# European Goals

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## **Aspirations or declarations to reduce further commerce with Russia include:**

- Following the invasion of Ukraine, the European Union announced REPowerEU, which diversifies gas supplies through LNG and pipeline imports and reduces faster the use of fossil fuels.
- This will **reduce the demand from Russian gas by two thirds within a year and eliminate the dependence on Russian gas by 2027-2030**

### **Europe Has a Two Part Plan**

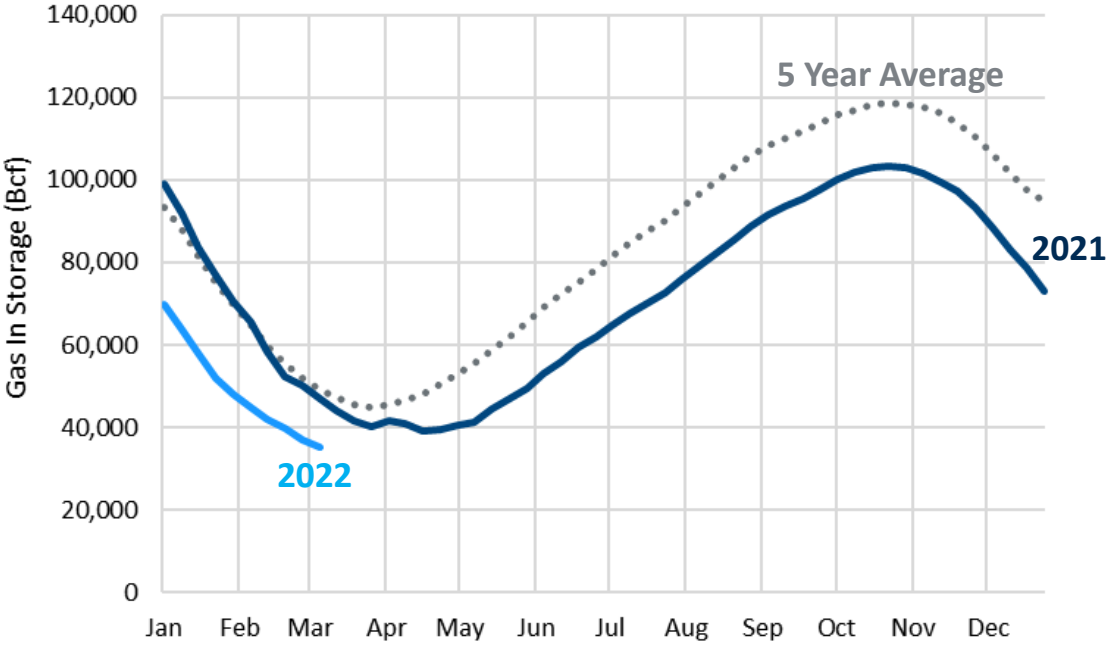
#### **Part I: Reduce Russian Gas Imports**

- \* Increase LNG imports
- \* Increase pipeline imports from other countries
- \* Increase European gas production
- \* Increase biomethane and hydrogen imports
- \* Conservation and/or fuel switching within the power sector.

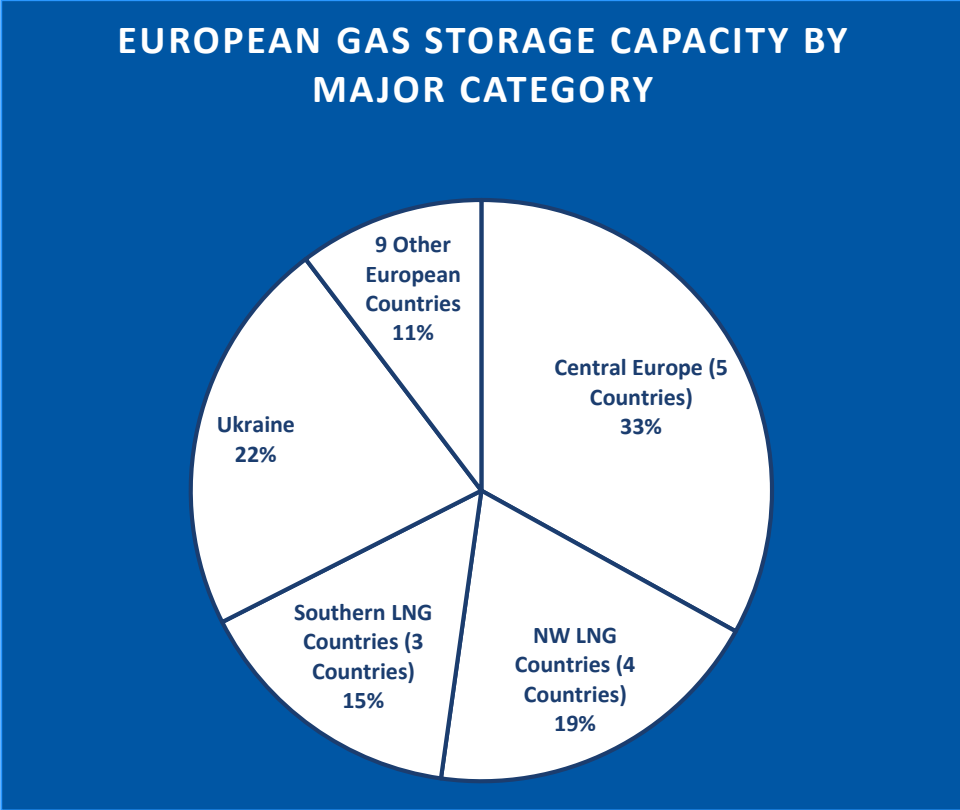
#### **Part II: Fill Storage**

- \* Attain 90% a capacity factor before winter starts

# European Gas Storage Inventories



Source: GIE AGSI, [AGSI+ \(gie.eu\)](http://AGSI+.gie.eu).  
 Note: Contains only EU + UK storage. Does not include Ukraine or Serbian data.



**The goal is to reach 90% full by end of October**

# Major gas pipelines serving Europe

From Russia

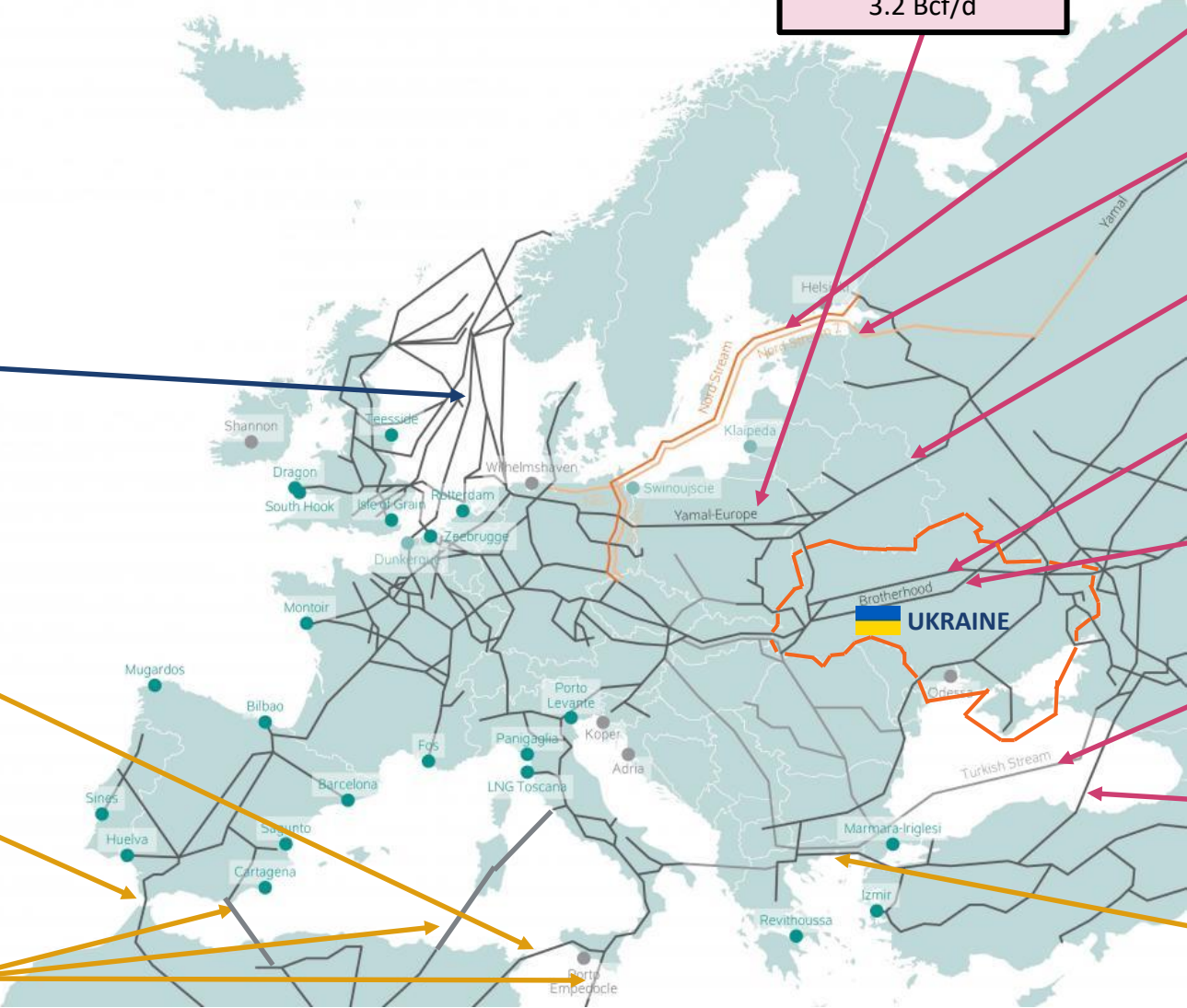
From other Sources

**European Gas Production**  
(North Sea and Onshore)  
21.1 Bcf/d

**Trans-Mediterranean**  
ALG ->TUN->ITL  
2.9 Bcf/d

**Maghreb-Europe**  
ALG ->MOR->SPN  
1.2 Bcf/d

**MedGaz (1.0 Bcf/d)**  
**GALSI (1.0 Bcf/d)**  
**Greenstream (1.1 Bcf/d)**  
ALG ->SPN and ALG ->ITL



**Yamal Europe**  
(parallel to Northern Lights)  
RUS->BEL->POL/GER  
3.2 Bcf/d

**Nord Stream I**  
RUS->GER  
5.3 Bcf/d

**Nord Stream II**  
RUS->GER  
5.3 Bcf/d (Expected)

**Northern Lights**  
RUS->BEL->POL  
4.9 Bcf/d

**Progress Pipeline**  
RUS->UKR->HUN/ROM/SLO  
2.5 Bcf/d

**Brotherhood**  
RUS->UKR->HUN/ROM/SLO  
3.1 Bcf/d

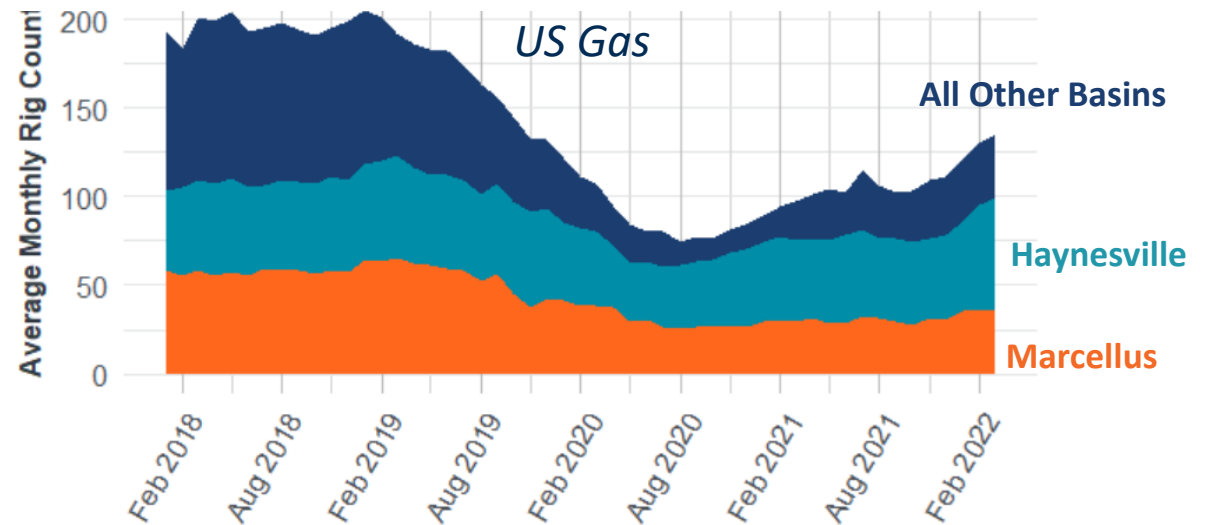
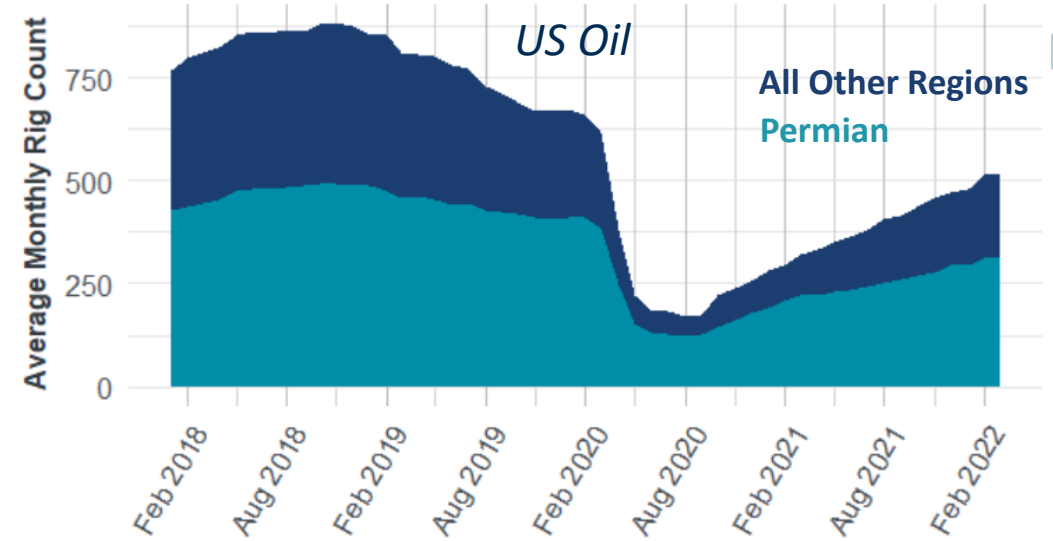
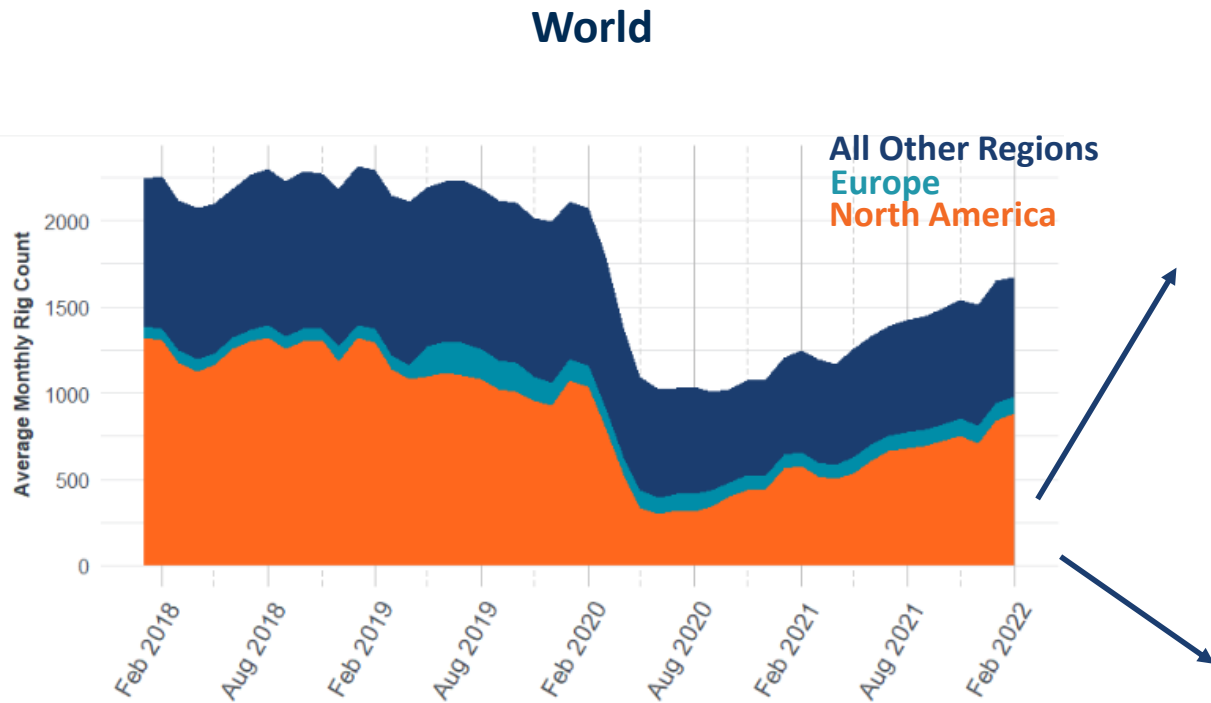
**TurkStream**  
RUS->TUR->BUL  
3.0 Bcf/d

**Blue Stream**  
RUS->TUR->BUL  
1.5 Bcf/d

**Trans Adriatic Pipeline**  
AZR->TUR->GRC->ITL  
1.0 Bcf/d (expanding to 2.0)



# World Oil and Gas Rig Count, 2018 – Present





# World LNG Production

## Trade Movement for LNG in 2020 (Bcf/day)



FROM	TO							Total	
	Asia Pacific	Europe	South and Central	Middle East & Africa	North America				
Australia	10.26	-	0.01	-	0.01	<b>10.28</b>	21.8%		
Qatar	6.94	2.92	0.09	0.31	-	<b>10.26</b>	21.8%		
<b>US</b>	<b>2.55</b>	<b>2.47</b>	<b>0.69</b>	<b>0.13</b>	<b>0.09</b>	<b>5.94</b>	12.6%		
<b>Russian Federation</b>	<b>2.17</b>	<b>1.67</b>	<b>0.01</b>	<b>0.06</b>	-	<b>3.91</b>	8.3%		
Malaysia	3.18	-	-	-	-	<b>3.18</b>	6.7%		
Other	8.32	4.04	0.55	0.39	0.24	<b>13.53</b>	28.7%		
<b>Total</b>	<b>33.42</b>	<b>11.11</b>	<b>1.34</b>	<b>0.89</b>	-	<b>47.10</b>			

Source: BP Statistical Review of World Energy 2020, PDF pg. 44

# LNG Expansion Projects

## LNG Capacity Under Construction as of May 2021 (Bcf/day)

Country	Liquefaction	Country	Regasification
Qatar NFE	16.8	China	7.9
<b>USA</b>	<b>6.6</b>	India	3.9
<b>Russia</b>	<b>3.4</b>	Kuwait	1.1
Kuwait	2.1	Egypt	1.0
Canada	1.4	Europe	0.8
Mexico	0.7	Thailand	0.7
Other (5 countries)	1.4	Japan	0.4
		Other (9 countries)	2.8
<b>Total by 2025</b>	<b>22.1</b>	<b>Total</b>	<b>18.6</b>
<b>Total by 2027</b>	<b>32.4</b>		

Notes: Qatar North Field expansion Phase 1 will be online in 2025 and Phase 2 in 2027. LNG Canada will be online in 2025. Europe includes Finland, Poland, Turkey, Cyprus and Italy. Following countries are constructing both liquefaction: Kuwait, Mexico, Indonesia and Egypt.

An additional 13 LNG projects have been approved by FERC, but have not started construction. These consist of 3 expansions of existing terminals (5.7 Bcf/Day) and 10 new terminals (20 Bcf/day).

# Major pipelines (Eastern Russia)



**Altai Gas Pipeline  
(Power of Siberia 2)**  
(Not shown)  
RUS->Western China  
4.8 Bcf/d (expected)

**Power of Siberia**  
RUS->CHN  
3.7 to 4.6 Bcf/d  
Came online 2019;  
expanding to 2023

**Sakhalin-Khabarovsk-  
Vladivostok Pipeline**  
RUS->CHN & LNG Exports  
3.5 Bcf/d (Expected)

Source: Energy & Power Magazine

# Russian Difficulty Selling Oil



## Even without sanctions, there is emerging reluctance to buy Russian oil

- Shell, after initially announcing a purchase of crude Russian oil, reversed its stance and will close its 500 service stations in Russia (with net closing costs of over \$3B)
- International Energy Agency forecasts a potential reduction of 3 million bpd of Russian oil production beginning in April 2022
- Some Russian shipments have been discounted in order to sell -- likely to be marketed privately to get around sanctions
- In addition to reputational risks, there are financial risks like the risk that banks might stop issuing credit to buyers

**However, other experts predict an uptick in oil purchases from Russia;** a recent Bank of America report notes, there is “no way US E&P and OPEC+ can displace the 8 mn b/d oil exports from Russia in the near term for reasons including supply chain bottleneck and lack of excess supply”

#### Sources:

1. Oil Price, [Russian Oil Exports Rise Despite Reluctant Buyers | OilPrice.com](#)
2. Bank of America, Research Marketing (confidential), March 22, 2022.
3. Bloomberg, “Russian Oil Sales Going Underground as Cheap Crude Tempts Buyers”, March 15, 2022, [Russian Oil Sales Going Underground as Cheap Crude Tempts Buyers – Bloomberg](#)
4. Reuters, [Remorseful Shell abandons Russian oil | Reuters](#)

# Major Takeaways – Gas Importing vs. Exporting Countries



## Gas Importing Countries

- Heightened tension between energy security and decarbonization
- Economics for electric vehicles, hydrogen, biomethane have improved
- High gas prices
  - Era of worldwide (2020/Covid-19) gas-on-gas competition is over
  - Regional boundaries and linkages become permanent (for next 5-10 years)
- Europe reduces Russian gas and oil imports
  - However, results below its goal
- Europe greatest challenge will be next winter
  - Unclear if storage will be 90% full
- If Russian oil is curtailed, there is room for UAE, Iraq, Iran, Venezuela to provide capacity
- Tension in solving problem with permanent fossil fuel expansion versus renewable development

## Gas Exporting Countries

- Demand for LNG has increased, and potential profit very high
  - Some 13 projects before FERC approved are developed; US can supply much of the Russian gas lost to Europe
  - Back to long term contracting for LNG? At cost-basis, or opportunity cost margins?
- Higher drilling activity for both gas and oil
  - Less seasonality to natural gas? Prices higher than in 20-teens
  - Depends on how much the majors change their strategies from risk-averse buybacks to expansion
- Economics for electric vehicles improved, eventually damping LR oil sales
- Tension in solving problem with permanent fossil fuel expansion versus renewable development

# Major Takeaways – by time frame and geography

	Europe	Russia	USA
<b>Short run – thru winter 2022/23</b>	Attempt at 2/3 reduction in ngas by winter. Need to fill storage to 90%, if possible via increased existing LNG flows; shift electric dispatch towards coal;	High prices offset volume losses. Ruble down 50%, hard currency starvation Buyers reluctant to take Russian oil, many majors unfold their involvement.	Higher consumer prices, esp. for gasoline. Accelerated ngas and oil expansion, LNG capacity plans
<b>Mid/long – 2025- 2030</b>	Attempt at 2/3 reduction in all Russian energy imports; tension over switching to gas vs. renewables; new supplies are LNG, not new pipelines, but will take years to build new LNG capacity	Iron Curtain reestablished? Unlikely to divert lost EU sales to China due to pipeline limits, LNG development expense, blocked access to capital and technology. Oil rerouting competition from expanded OPEC production?	Substantial LNG production and export to EU; Tension over US support for expanded oil and gas vs. renewables, but geopolitical balance favors O&G

# About Brattle

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\$30 Billion+  
in energy transactions managed

150+ Years  
of direct energy experience

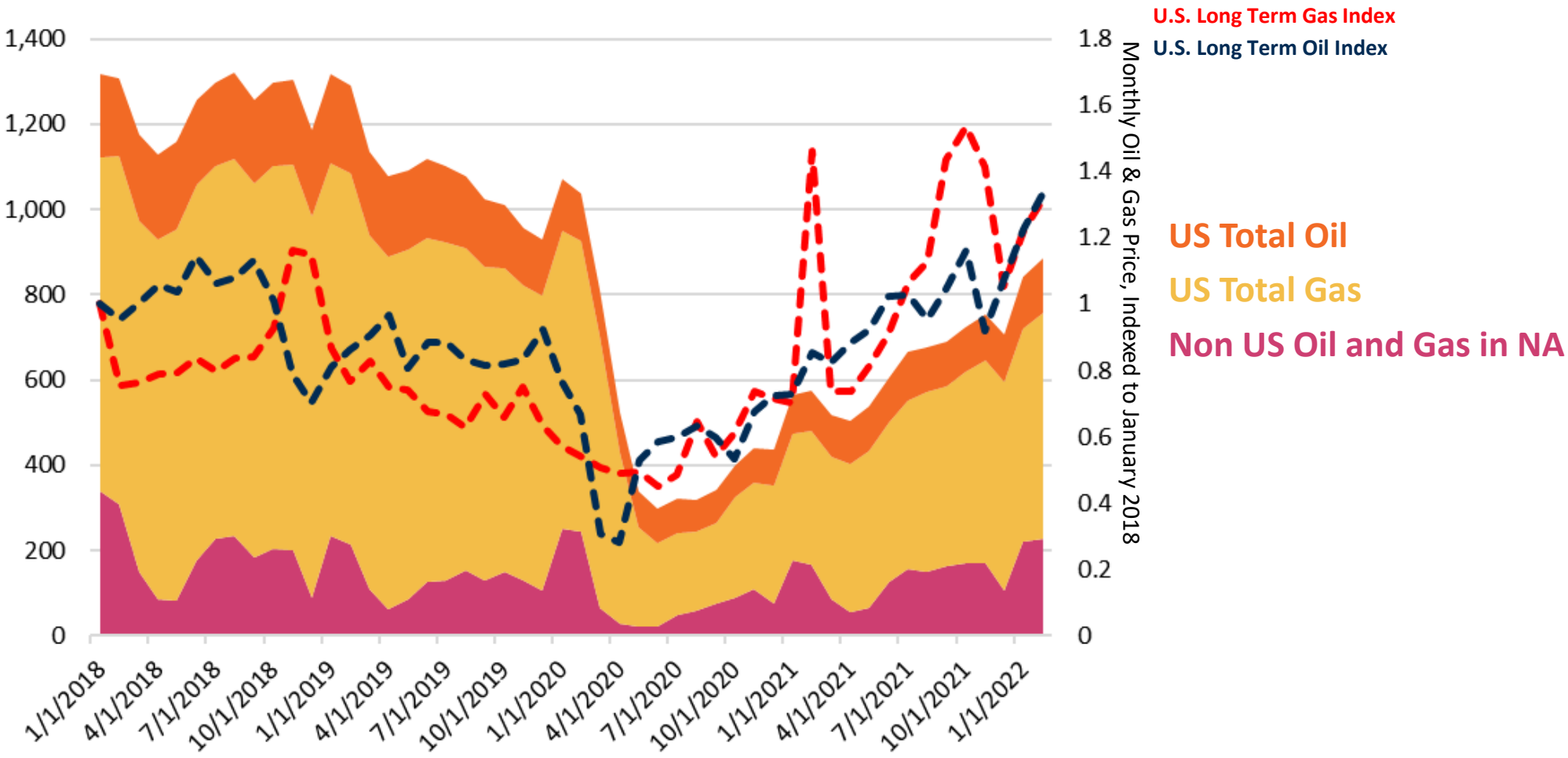
3 Landmark Litigation  
Wins  
that opened doors for energy  
production in the Appalachian basin



# Supplemental Slides



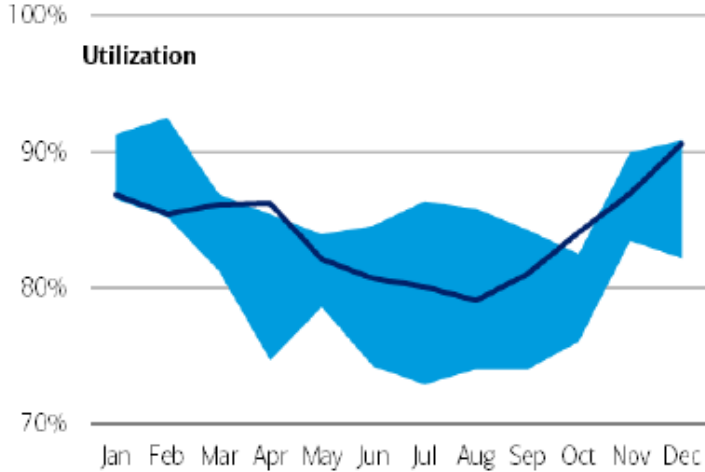
# U.S. Oil and Gas Rigs vs. Long Term Prices



# LNG Capacity and Utilization

### Exhibit 4: Global LNG Utilization

LNG capacity utilization is already running near 5yr highs and there is little spare capacity available

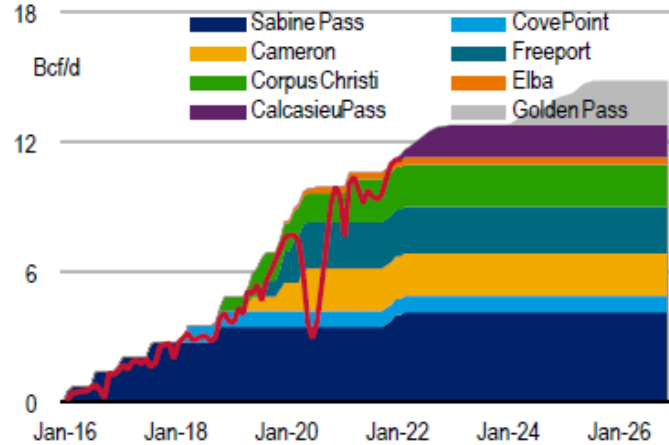


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

### Exhibit 6: US LNG projects, operational and under review

Despite global need, the US has limited LNG export capacity and is already running at maximum levels, which helps insulate the US from global prices...

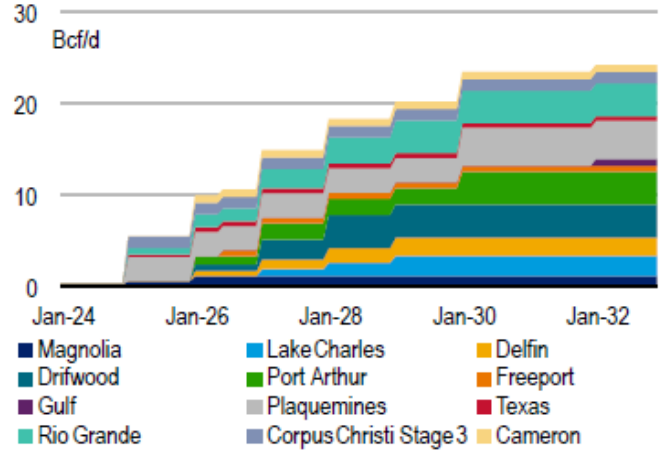


Source: Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

### Exhibit 7: US LNG projects, approved but no FID

13 US Liquefaction projects (22 Bcf/d) have received DOE and FERC approval, but have yet to make a final investment decision

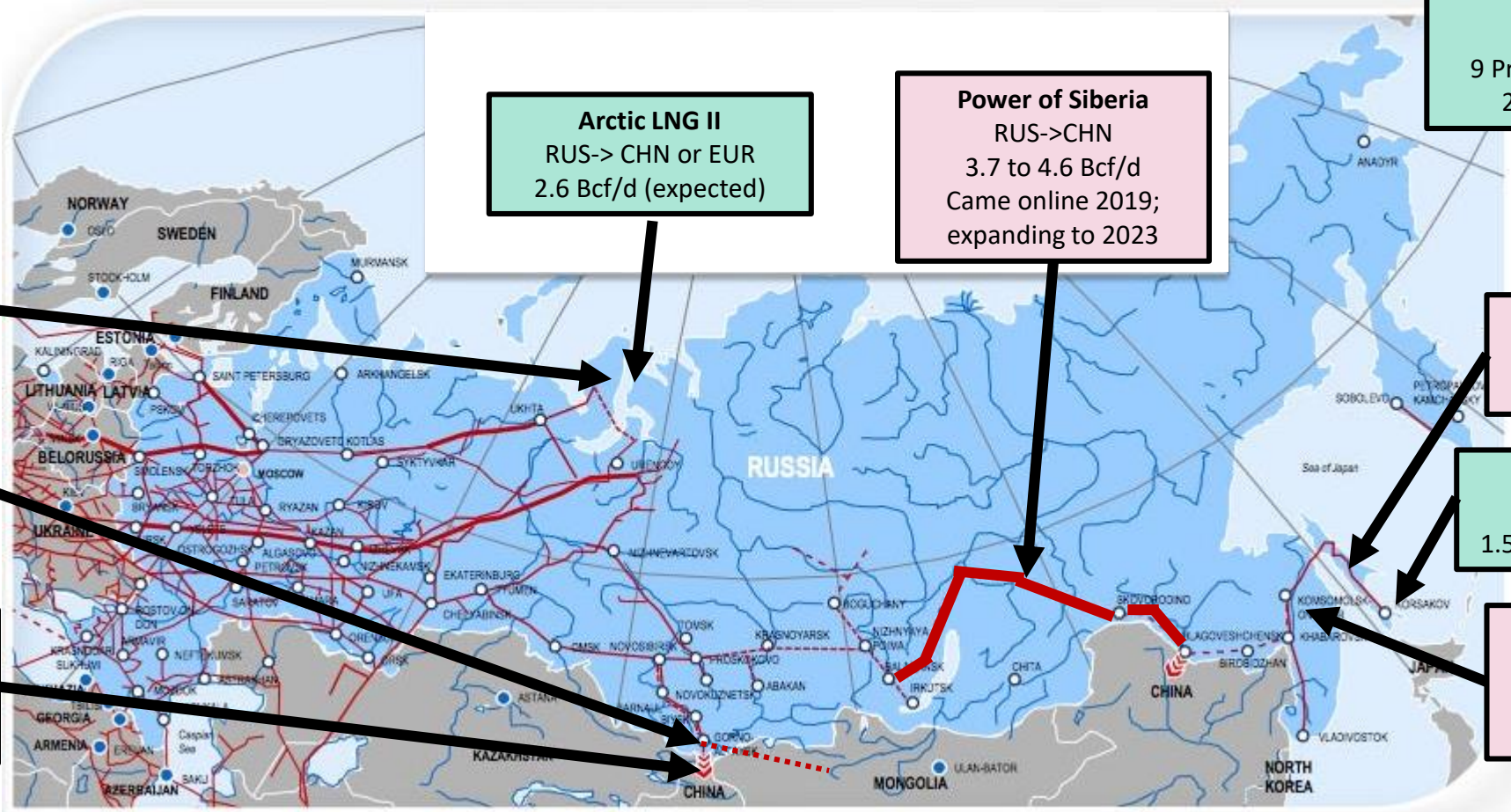


Source: Platts

BofA GLOBAL RESEARCH

# Major pipelines (Eastern Russia)

- From Russia
- Russian LNG



**Yamal LNG**  
 RUS-> CHN or EUR  
 2.3 Bcf/d

**Soyuz-Vostok Pipeline**  
 (Not shown)  
 RUS->MON->CHN  
 Size TBD

**Altai Gas Pipeline (Power of Siberia 2)**  
 RUS->Western CHN  
 4.9 Bcf/d (expected)

**Arctic LNG II**  
 RUS-> CHN or EUR  
 2.6 Bcf/d (expected)

**Power of Siberia**  
 RUS->CHN  
 3.7 to 4.6 Bcf/d  
 Came online 2019;  
 expanding to 2023

**Future Russian LNG**  
 RUS -> CHN or EUR  
 9 Projects planned by 2034  
 29.4 Bcf/d (expected)

**Sakhalin III Pipeline**  
 RUS-> JPN & CHN  
 2.0 Bcf/d (expected)

**Sakhalin II LNG**  
 RUS->JPN  
 1.5 Bcf/d (2.2 Bcf/d expected)

**Sakhalin-Khabarovsk-Vladivostok Pipeline**  
 RUS->LNG Exports to Asia  
 3.5 Bcf/d

Source: Gazprom via [Business Insider](#)

# Russian Gas Expansion and Routing Options

## Summary of Russian Gas Projects

Gas To The East That Can Go To West					
	To China	To China	To China	To China	To China
<b>Online Status</b>	<b>Yamal LNG</b> Nov. 2017 Train 4 (0.12 BCFD) online YE2021	<b>Siberia Power -2 Pipeline (Altai Gas P/L)</b> Plans to start construction; online date unclear	<b>Soyuz-Vostok Pipeline</b> Agreement for feasibility study Feb 2022, which will be completed in 2025	<b>Arctic LNG 2 LNG</b> 50% complete, but status in doubt <sup>(1)</sup>	<b>Future LNG Projects</b> 9 projects planned by 2035
<b>Capacity(BCFD)</b>	3 Trains: 2.2 BCFD	4.93		3 Trains - 2.6 BCFD	29.4
<b>Contract with China</b>	2014 contract for 0.4 BCFD	Feb. 2022 contract for 0.97 BCFD for 30 yrs.			
<b>Source of gas</b>	Yamal fields near Arctic circle	Siberia fields and interconnects with Yamal hub to Europe		Arctic gas fields; exports can go to China or Europe	Exports can go to China or Europe
<b>Purpose</b>					Goal is to bring online 2/3 of these projects to increase 2020 LNG capacity from 2.7 BCFD to 18.7 BCFD
<b>Comments</b>	China has a 29.9% ownership in project; Currently producing 14% above nameplate or 2.6 BCFD	Will sanctions have an impact?		China has a 20% ownership in project	Entire program in doubt due to financing and access to technology

Gas to The East Only			
To Far Eastern Russia	To Japan	To China	To China
<b>Sakhalin-Khabarovsk-Vladivostok (SKV Pipeline)</b> Sept. 2019 Currently at full capacity	<b>Sakhalin II LNG</b> Trains 1 & 2: 2009 Train 3: 2026 (0.64 BCFD)	<b>Siberia Power -1 Pipeline</b> Dec. 2019 Full Capacity in 20223	<b>Sakhalin III Pipeline</b> 2025/2026
3.53	Trains 1 & 2: 1.5 BCFD	3.67	2.0
		Signed in 2014 for 3.67 BCFD	
Krimnskoj field	Sakhalin II	Siberia fields	Sakhalin III
Provide power at Vladivostok			Pipeline under Sea of Japan to Herlongyang province
	Exxon leaves project; status of Train 3 questionable	Current capacity just over 1.0 BCFD	Sakhalin III - production starts in 2023 and peaks in 2034 at 2.0 BCFD

(1) Needs \$4.5 billion in financing of which 50% from China, 33% from Japan and rest unknown. Russia currently can't get sensors, semiconductors, chips, etc.