



The Gas Crisis of 2022 – following the invasion of Ukraine

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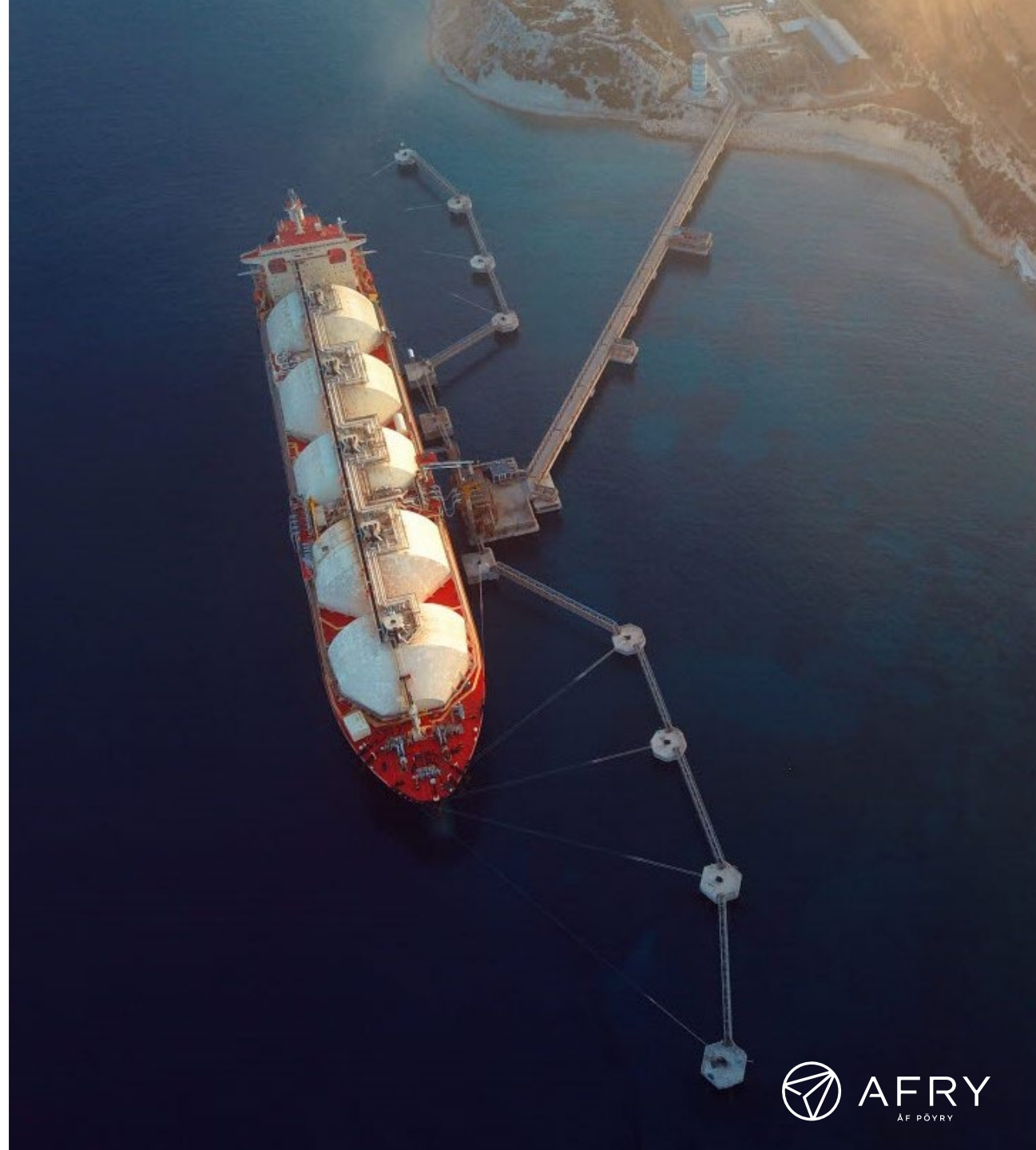
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The Gas Crisis in 2022 following the invasion of Ukraine

1. Flows and prices

2. Contracts and shortfalls

3. Desperate measures?

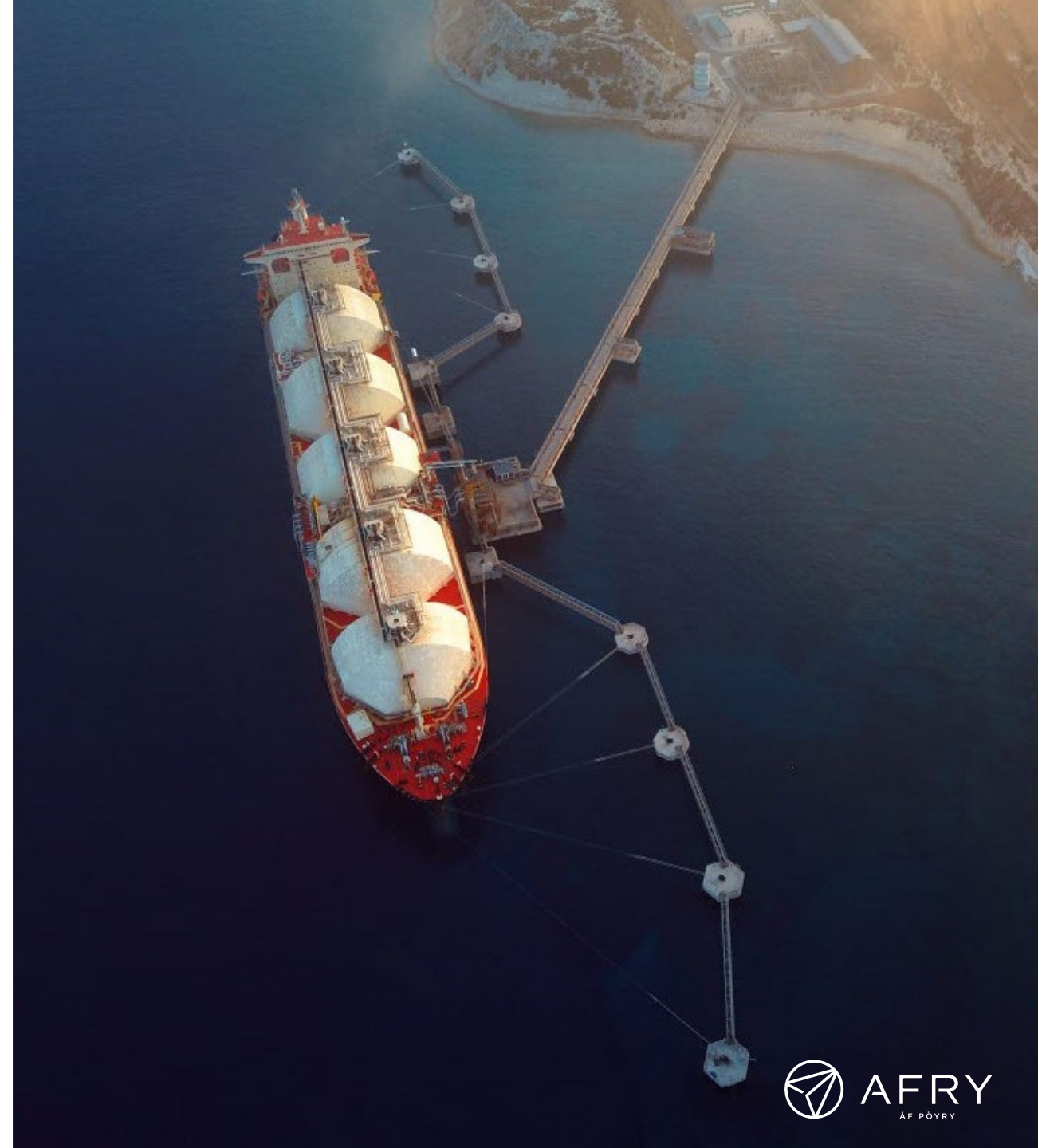


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During February flows of Russian gas have increased slightly

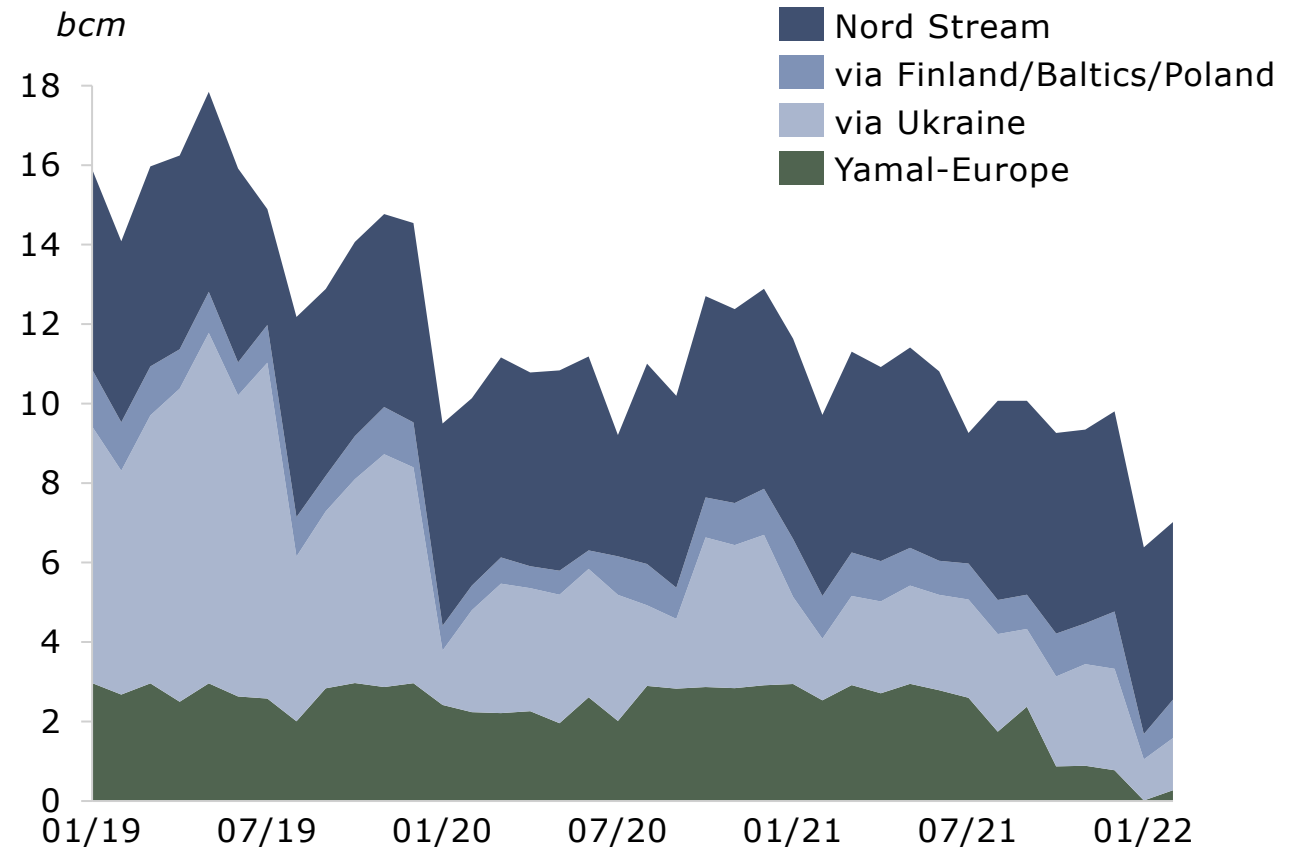
The Russian Energy Minister has threatened to cut off Nord Stream if Russian oil imports are banned
Source: BBC

ROUTES TO IMPORT GAS FROM RUSSIA

There will be no Nord Stream 2



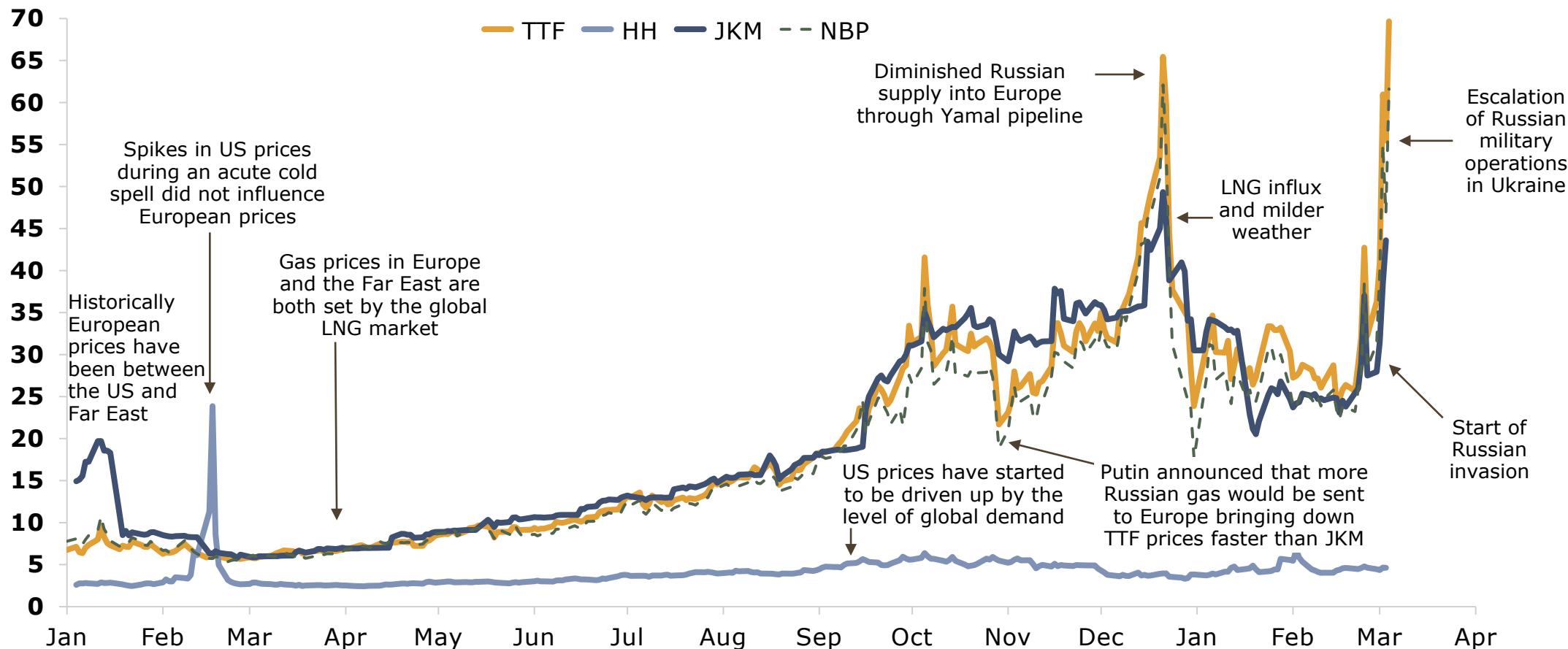
THE LARGEST AND MOST CONSISTENT VOLUMES HAVE BEEN DELIVERED VIA NORD STREAM



Sources: IEA WDS, ENTSOG

Russian behaviour has been driving global gas prices since October 2021

USD/mmbtu



Source: Refinitiv

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1. Flows and prices

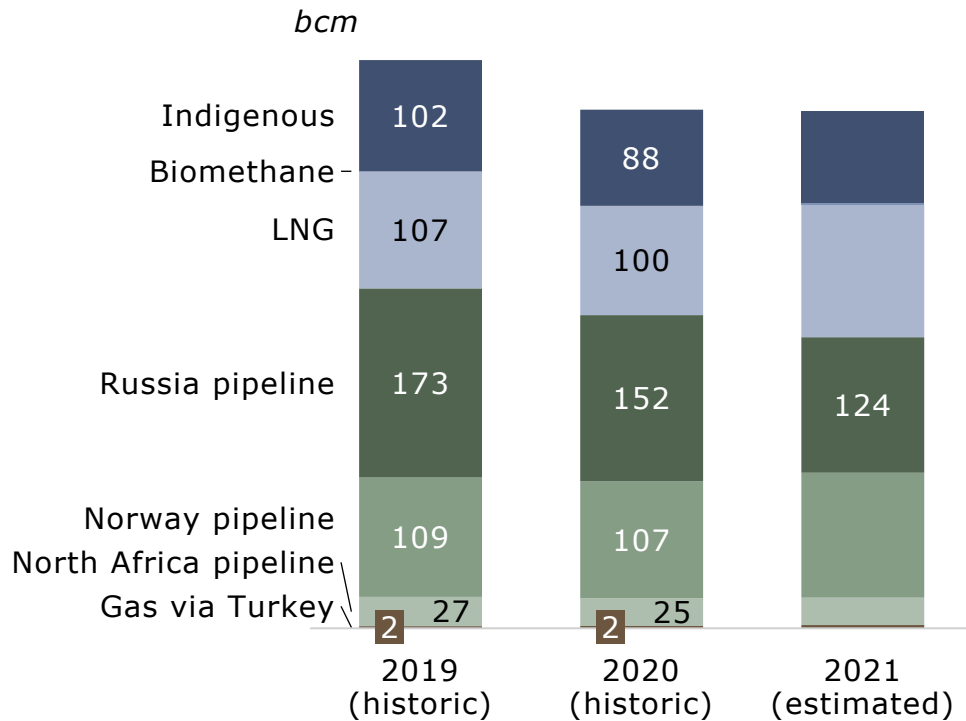
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Russian contracts to Europe have been kept at a minimum during 2021

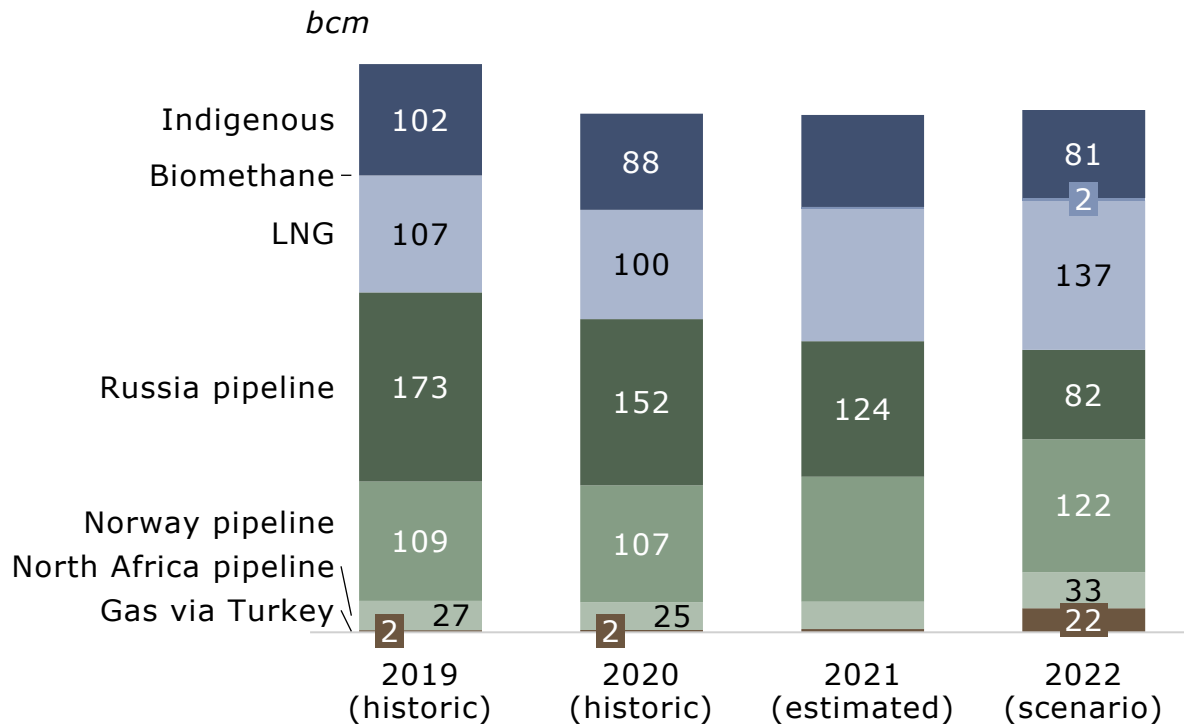
- European contracts from Russia amount to about 157bcm/year (this is, the sum of the annual contracted quantities, ACQs)
- These appear to have been kept at around the take-or-pay level of 80% in 2021 (that is, the minimum annual quantity, MinAQ)



Sources: BP Energy Statistics, ENTSOG transparency, AFRY analysis; Pegasus projections

Modelling Russian gas as the least attractive source draws in alternatives

- In this scenario Russian gas has been priced up to reflect 'conflict gas' prices (based on recent forward prices)
- Contracts have been allowed to drop below ToP levels as European countries minimise Russian gas imports
- (and we have disregarded contractual provisions on make-up gas or the consequences of not paying ToP volumes)

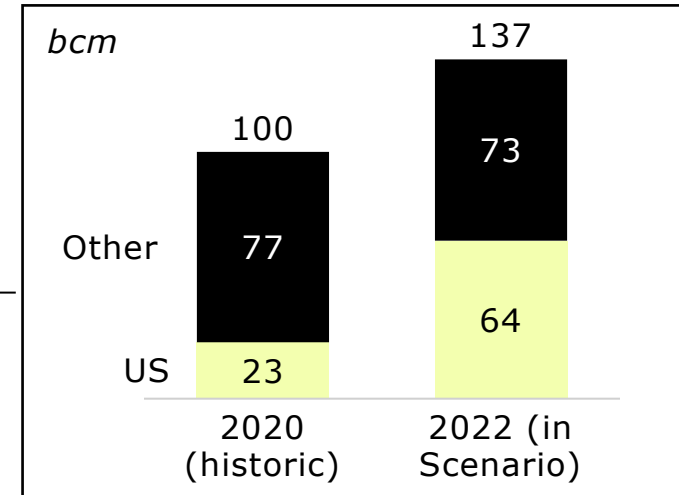
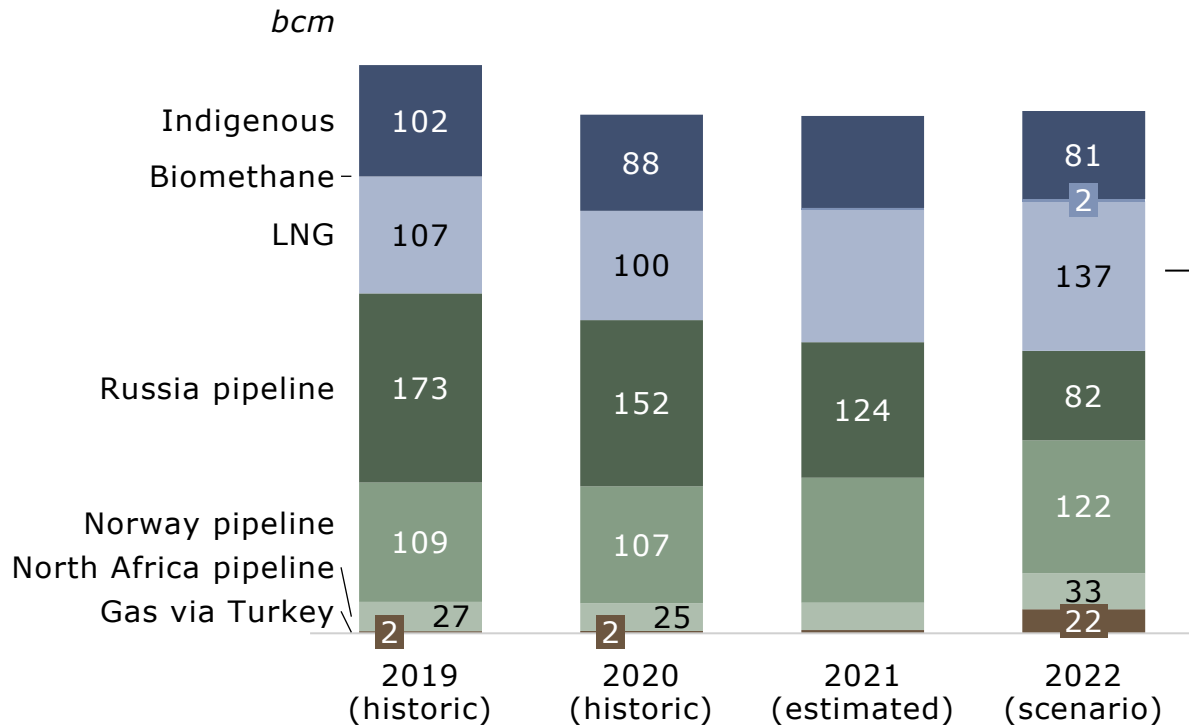


For Force Majeure to be called governments may have to have declared contracts illegal or sanctioned payments methods such that payment cannot be made

Sources: BP Energy Statistics, ENTSOG transparency, AFRY analysis; Pegasus projections

If Russian gas is minimised, much more LNG is needed from the US

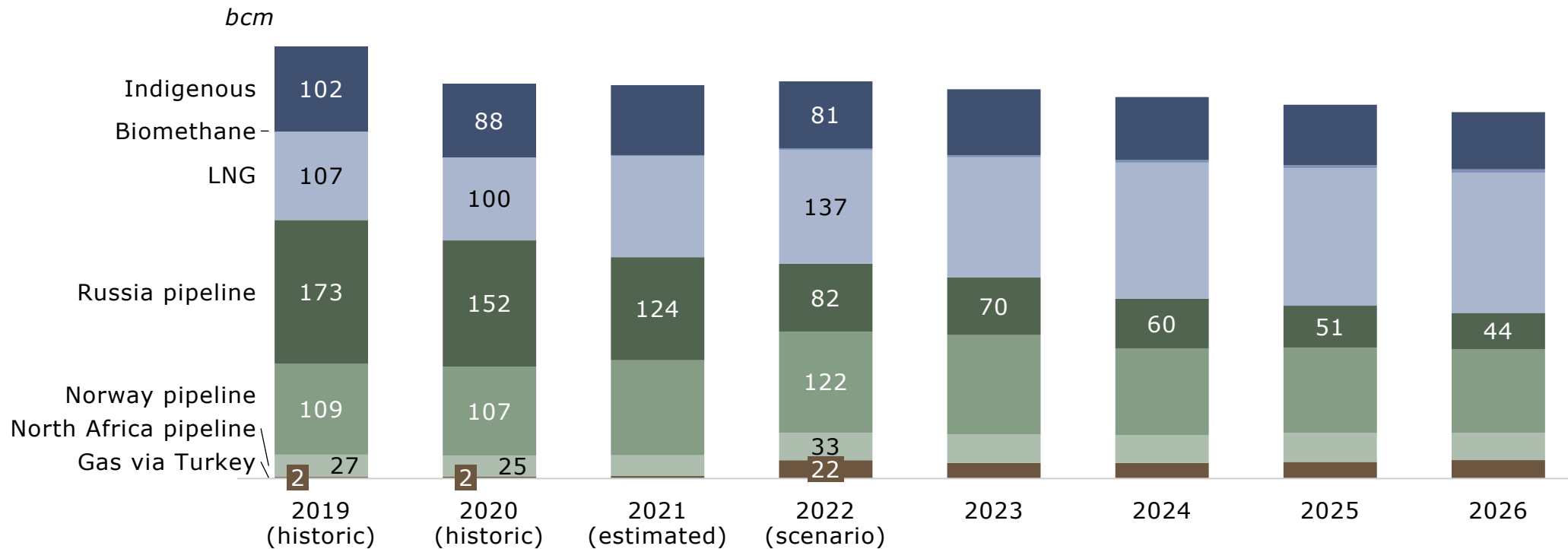
- If all alternative imports are maximised, 82bcm of Russian gas is still required to avoid interruptions
- Volumes increase from Azerbaijan, North Africa, Norway and much more LNG is imported (which is sourced from the US)



Sources: BP Energy Statistics, ENTSOG transparency, AFRY analysis; Pegasus projections

More LNG will become available in the global market

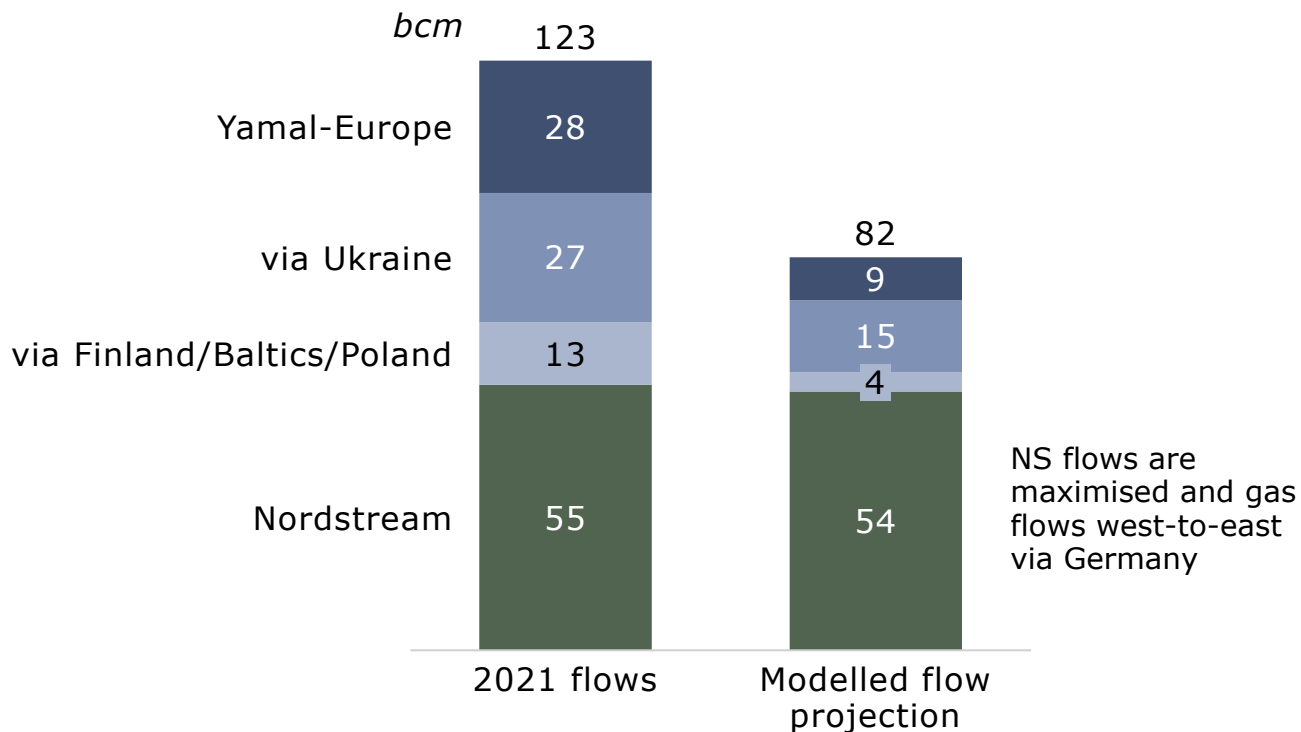
- 2022 demand is projected as AFRY's current Central Scenario, after that we have built in a 2% demand reduction year-on-year
- But, could demand be reduced much faster?



Sources: BP Energy Statistics, ENTSOG transparency, AFRY analysis; Pegasus projections

And if no Russian gas turns up, the EU needs to coordinate flows to keep 'protected' consumers on

WHICH ROUTES ARE PRIORITISED?



WHAT IF RUSSIAN GAS WAS CUT OFF COMPLETELY?

Countries facing interruptions are likely to include:

- Germany
- Hungary
- Chechia
- Poland
- Slovakia
- Bulgaria
- Romania
- Finland and the Baltics...

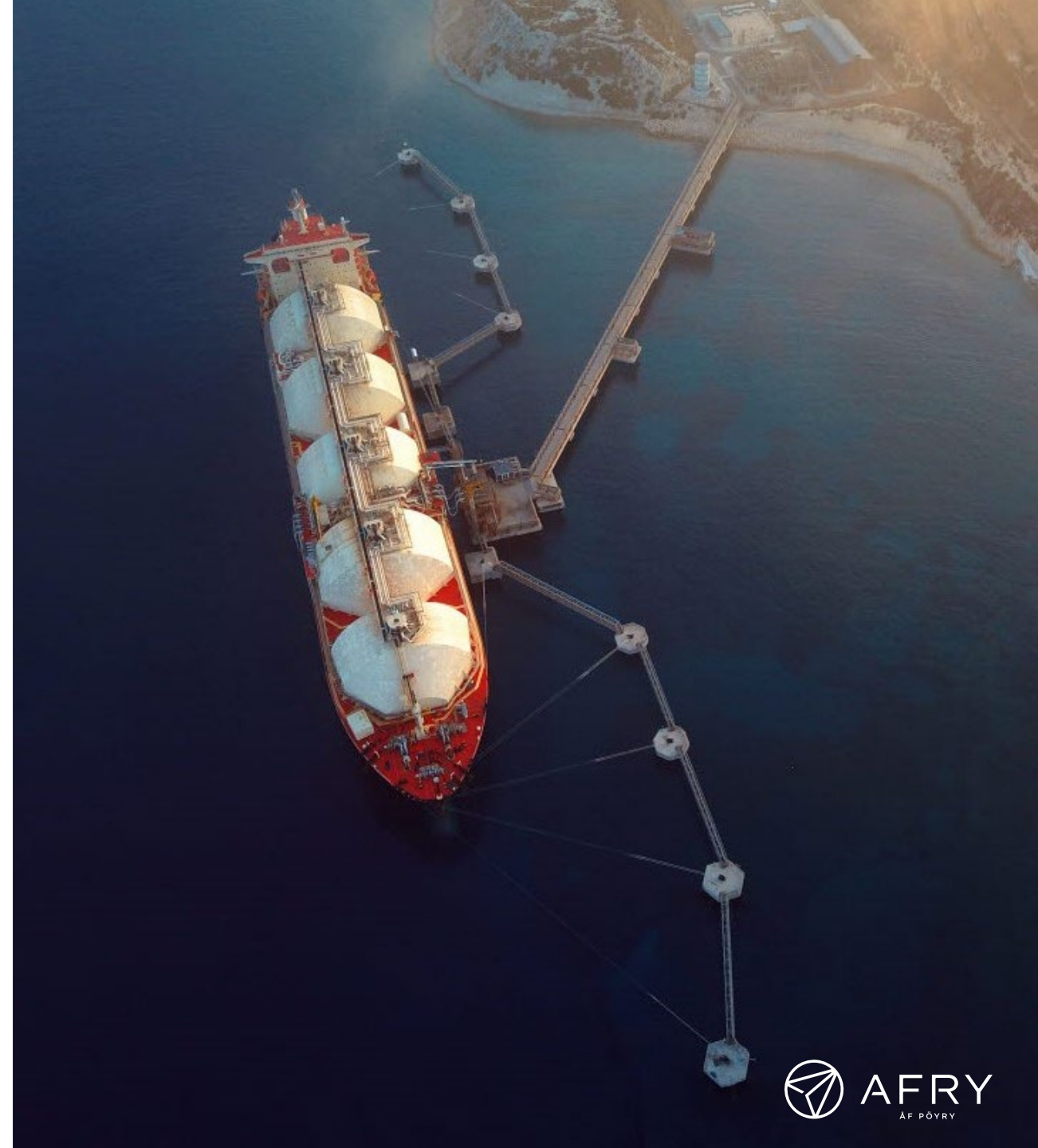
Although, the EU should spread the pain by transiting gas around in line with the Security of Supply Directive which identifies "protected" consumers

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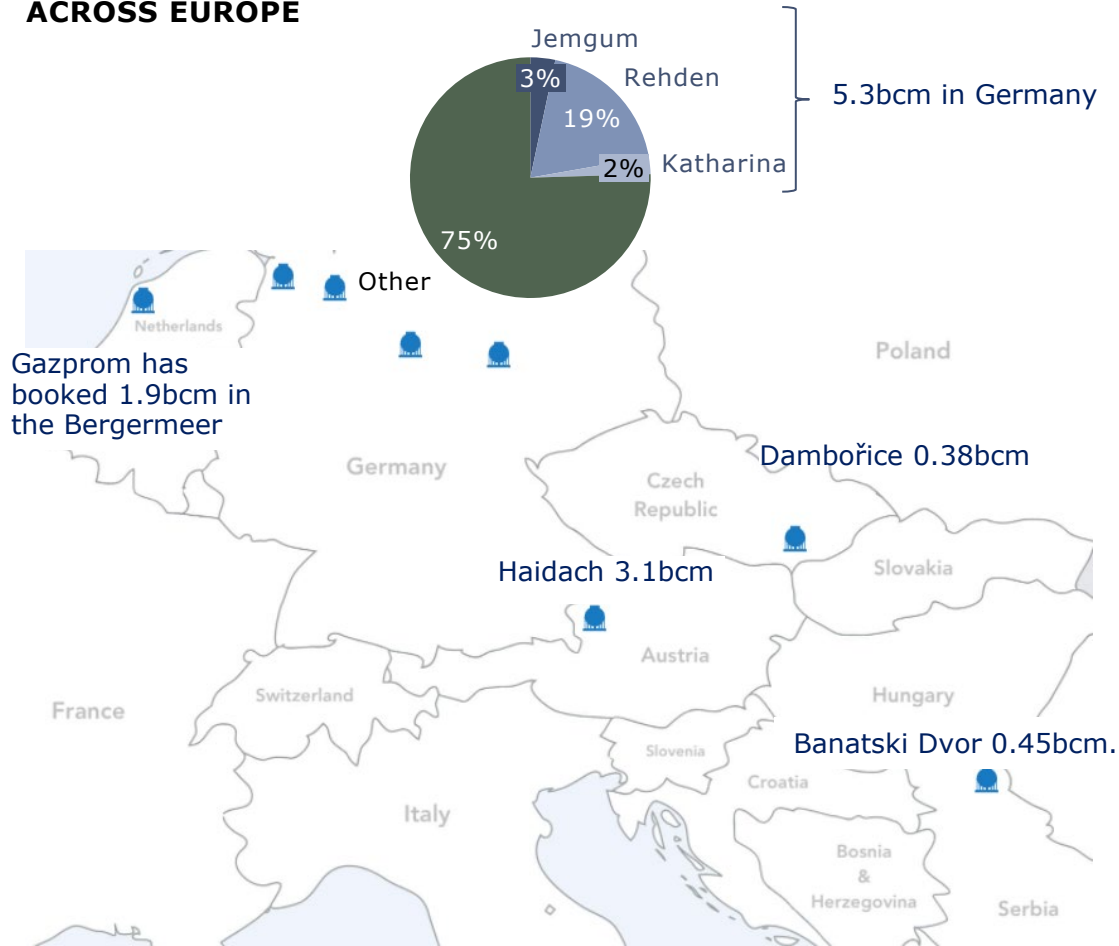
3. Desperate measures?



DESPERATE MEASURES?

Germans are taking measures to secure gas in storage

GAZPROM OWNS/OPERATES OR HAS BOOKED KEY GAS STORAGE ACROSS EUROPE



NEW GERMAN LAW

- The Economic Affairs and Climate Action Ministry in Germany is making legal changes as quickly as possible to improve energy security in the country
- A new law for gas storage is to be introduced in Germany's parliament, expected to take effect from **May 1, 2022**
- The law states that gas storage facilities are to be filled to no less than 80% capacity by October, 90% by December, and still at least 40% by February of any given year
- The Ministry is also looking into buying more gas from other countries such as the Middle East and LNG from the US
- In addition, the 16 German states have called for an examination of longer operating times for nuclear and coal-fired plants

Source: <http://www.gazpromexport.ru/en/projects/storage/>; GSE; AFRY analysis

DESPERATE MEASURES?

There are further measures that can be adopted to reduce reliance on Russian gas



Replace Russian supplies with gas from alternative sources

AFRY's modelling suggests ~40bcm from other sources could replace Russian gas in 2022



Three degrees plus – demand reduction

This may prove to be the single most powerful tool for reducing reliance on Russian gas, and can at the same time help with consumer bills and carbon reductions. High prices may deliver much of this, but further dissemination of the right measures to take is key – our analysis suggests up to 30bcm



Produce power from coal/lignite in the short-term as well

Use nuclear and bioenergy, but also lignite and indigenous coal. Carbon emissions may go up in the short term, but if combined with accelerated RES deployment, this may not have an impact on the overall carbon budget in the medium term. We estimate 26 bcm in power generation switching is possible



Short-term taxation on windfall profits

Some form of cross-subsidisation may be inevitable in a high commodity price world to help protect vulnerable consumers, industry competitiveness and potentially even some investments in new energy infrastructure. This would need to be done carefully considering the wider socioeconomic impacts this may have.



Increase energy efficiency investment in buildings and industry

There is scope for energy efficiency improvements, and the focus should be on 'quick wins' in the very short term



Accelerate the deployment of new wind and solar

Wind and solar are now mainstream technologies with relatively short lead times, and there is an extensive pipeline of projects across Europe that can be brought forward



Further collaboration across European countries for sharing of resources

A coordinated approach will most likely give more efficient outcomes and will be key for effectively reducing reliance, in Europe we must work together

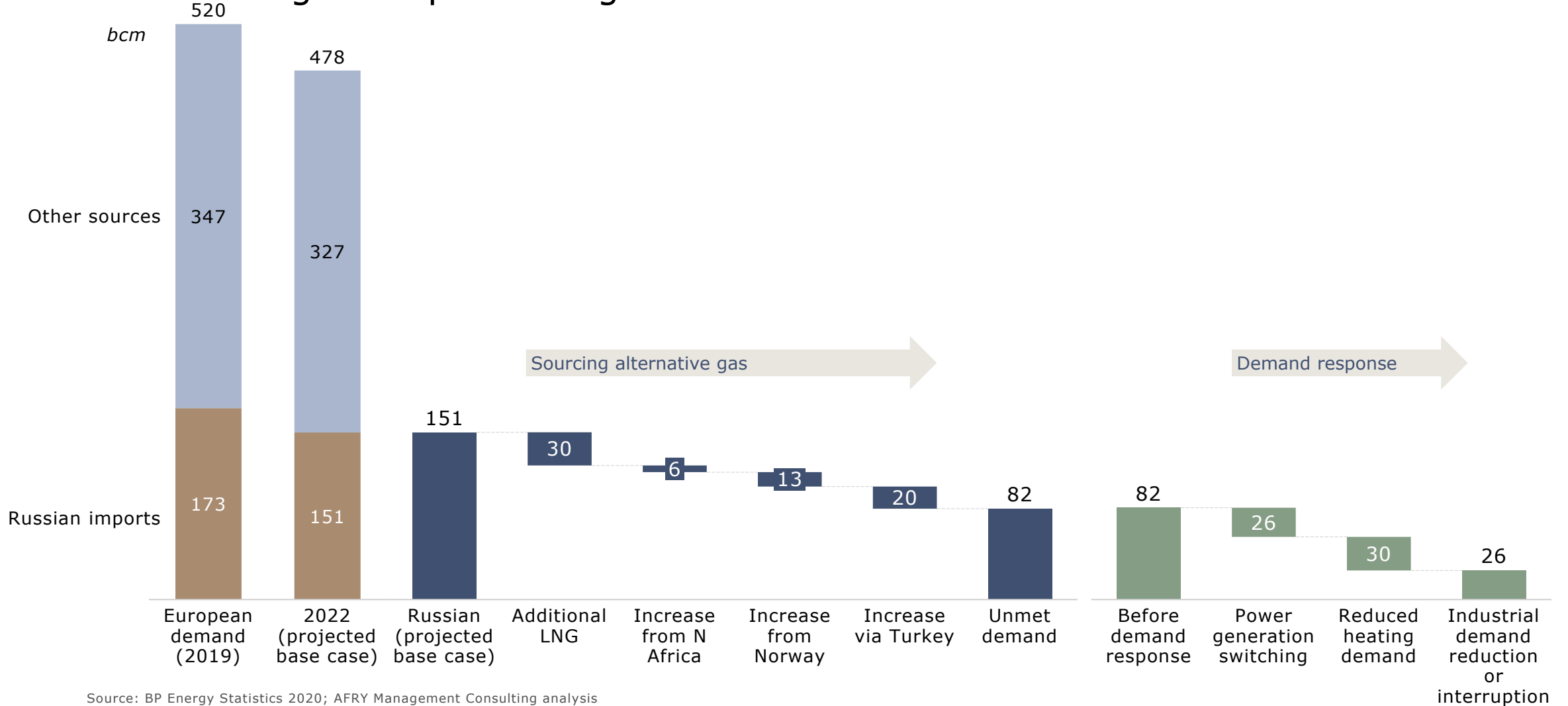


Industrial demand destruction of up to 26bcm in 2022 if Russian gas stops flowing?

We are left with up to 26bcm of additional demand destruction when taking into account all alternative supply options and reducing demand in the power sector and heat sector (82bcm or remaining Russian supply less 30bcm and 26bcm as on the left of the slide). This amount depends on how much impact the 3 measures above on the right can have.

DESPERATE MEASURES?

If Russian gas stops flowing in 2022



Source: BP Energy Statistics 2020; AFRY Management Consulting analysis

European energy markets will be reshaped



Higher gas and electricity prices

Behavioural change and a gradual move away from using gas should mean lower demand, mitigating price increases to some extent. However, it is unlikely the expected gas and electricity price increases would be fully offset as more expensive gas sources are used.



Accelerated deployment of RES

This will most likely mean some form of fast-tracking at the licensing stages, but also potentially expansion of RES support schemes in some European countries.



Development of additional LNG capacity

More LNG terminals will go ahead to help with diversifying the gas mix.



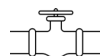
Windfall profits for some technology types

Nuclear, hydro and weather variable RES benefit from high commodity prices, but we would expect that there is some form of regulatory intervention to re-distribute economic surplus and protect consumers from high prices.



Lower gas and electricity demand

We expect gas and electricity demand to drop as a sign of solidarity and also in response to higher prices.



Stranded assets

An accelerated move away from gas will inevitably result in some gas stranded assets much sooner than expected.



Deeper cooperation and integration of European energy markets

The current events may act as a spark for accelerating existing initiatives for greater sharing of resources across Europe.



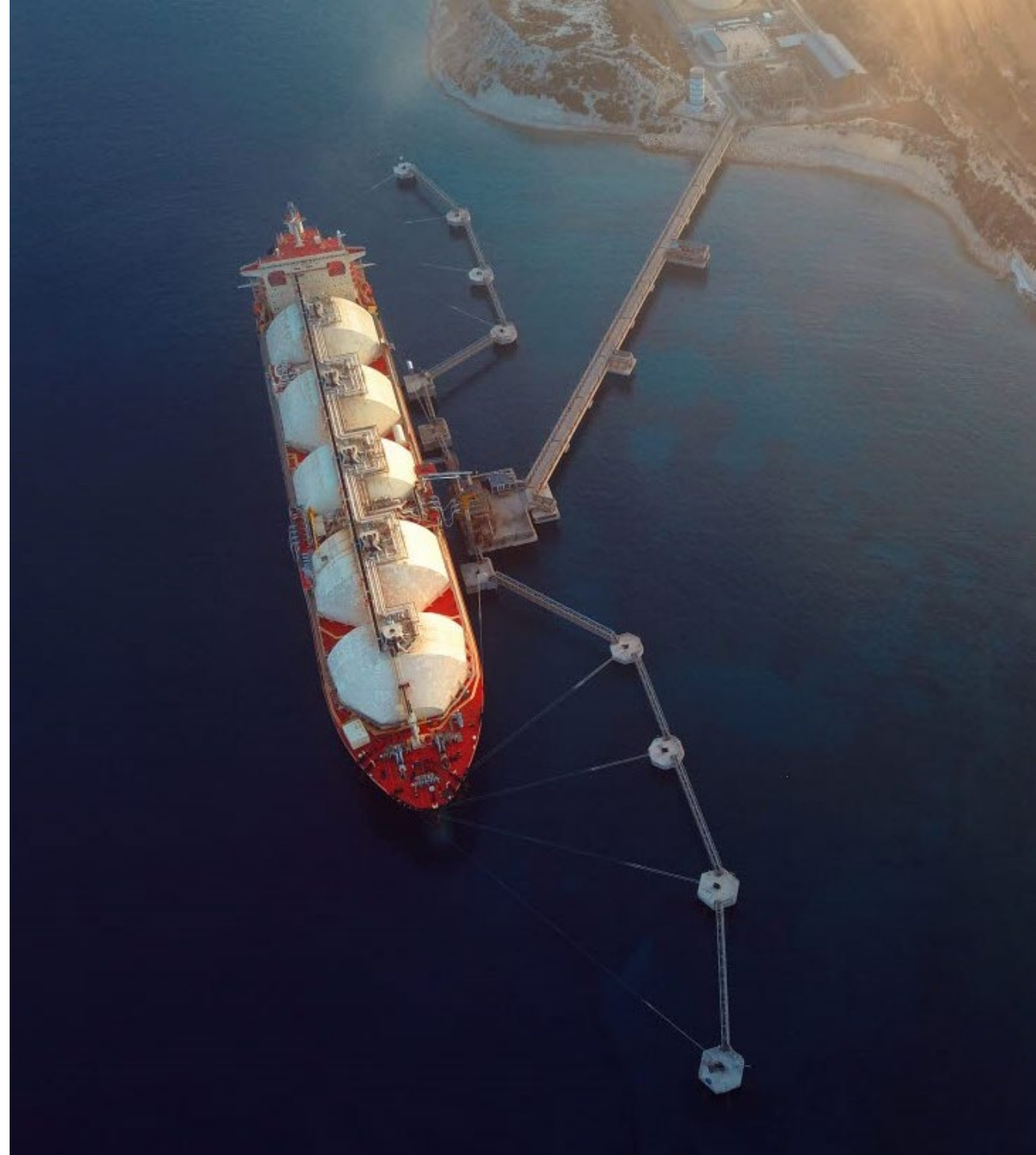
More control and regulation in some areas

We may expect to see greater levels of regulation and control in some parts of the energy market in line with e.g. Germany's new storage law

CONCLUDING REMARKS

Contact us

- **Reach out** to us for more information:
lucy.field@afry.com
- **More webinars** will follow with relevant topics, and any update on the evolving situation.
- Listen to our **Fuelling the transition** podcast, where experts join us to discuss how energy systems are responding to decarbonisation, digitalisation and decentralisation.



The IEA has published a 10-point plan on how Europe can reduce its reliance on Russian natural gas within a year



No new gas supply contracts with Russia

Impact: Allow for greater diversification of supply



Replace Russian supplies with gas from alternative sources

Impact: 30bcm increase in non-Russian gas supply within a year

Our Pegasus projections suggest ~40bcm increase in non-Russian gas supply to meet demand in Europe within a year



Introduce minimum gas storage obligations to enhance market resilience

Impact: Enhances resilience of the gas system by next winter

Feasibility concerns



Accelerate the deployment of new wind and solar projects

Impact: 6bcm reduction in gas use within a year

Risk of delays in the short-term



Maximise power generation from low-emitting sources – nuclear and bioenergy plants

Impact: 13bcm reduction in gas use within a year

A critical and fairly reasonable measure to implement



Enact short-term tax measures on windfall profits to shelter vulnerable electricity consumers from high prices

Impact: Cuts energy bills when gas prices remains high

Important to strike right balance between affordability and competitiveness



Speed up the replacement of gas boilers with heat pumps – simplify red tape

Impact: 2bcm reduction in gas use within a year

Short-term potential of implementation



Accelerate energy efficiency improvements in buildings and industry

Impact: Close to 2bcm reduction in gas use within a year

May be difficult to quantify



Encourage a temporary thermostat reduction of 1 °C by consumers

Impact: ~10bcm reduction in gas use within a year

A greater reduction than 1 °C could be implemented



Push efforts to diversify and decarbonise sources of power system flexibility

Impact: Loosens the strong links between gas supply and Europe's electricity security (long-term impact)

Feasibility concerns

AFRY's gas model captures interactions across the global markets and our GEDM models other energy vectors and emissions by region

GLOBAL GAS MARKET MODEL

- The input database to this model is very well-developed using sources such as Global Data (production costs), Cedigaz (for contracts), IEA (for demand, as well as other AFRY models) and EIA (US shale production); as well as country TSOs/ENTSOG and Regulators; journals and news sites
- AFRY has three standard scenarios which capture a good range of economic and decarbonisation outcomes

GLOBAL ENERGY DEMAND MODEL

- Experience has shown AFRY the importance of global energy demand and decarbonisation ambitions in projecting future levels of fossil fuel demand
- It is not reasonable to consider gas alone when modelling the global market as the impact of oil and coal; and development of renewables is vital to understand the dynamics in each region
- With this in mind, AFRY developed the GEDM to provide consistent global scenarios to take account of new pledges and strategies as they are announced

