RYSTAD ENERGY

REBALANCING EUROPE'S GAS SUPPLY

OPPORTUNITIES IN A NEW ERA

18 OCTOBER 2022

AXEL SCHEUER
IOGP, HEAD OF ENERGY & CLIMATE POLICY

Co-sponsors

International Association of Oil & Gas Producers

American Petroleum Institute

Technical input from

entsog

Gas Infrastructure Europe

Rebalancing Europe's gas supply – September 2022

Purpose of the study

Versailles Declaration and its response RepowerEU plan call for **phase out of coal, oil, gas supplies from Russia** as soon as possible; and Russia threatens to **stop supplies.**

How to do it?

- **Study scope** covers supplies to Europe (EU27 plus UK, NO, UA, CH, Balkan) in 2023 – 2040
- Study assesses:
  - ✓ **supply sources available to Europe in short and longer term, and their cost of supply**
  - ✓ **infrastructure capabilities**
  - ✓ **annual** and **peak-day demand / supply** balances (including by **region)**
- Study uses EU demand forecasts

NB: Supply cost and price assessments are exclusively developed by Rystad Energy and were not discussed as part of the study

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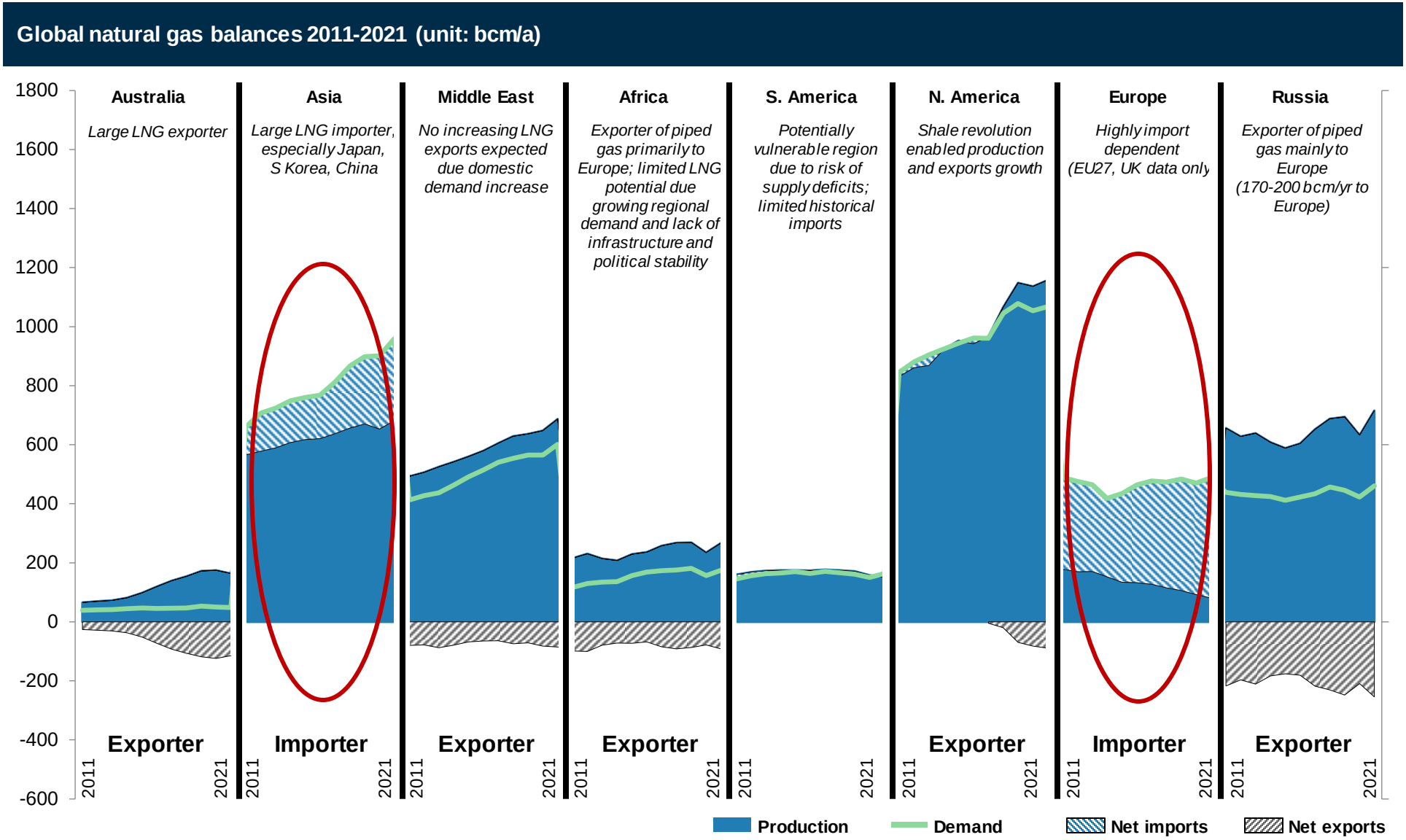
NEEDED BACKGROUND INFORMATION

Europe and Asia compete for LNG supplies from global sources



Source: Rystad Energy research and analysis; Rystad Energy GasMarketCube

The study groups supplies by source, increment and timing

Gas source	Increment group	Timing	Full resource potential 2022-2040 BCM	Comment
Domestic	Base	Both	2099	• Domestic resources connected to the European demand via pipelines • Includes reserves in key fields such as Troll, Ormen Lange and Culzean
	Increment contingent	Long term	653	• Includes all domestic resources not yet sanctioned for development • Numerous small and low cost developments that benefit from existing infrastructure
	Increment exploration		150	• Exploration expected to yield limited potential given the mature nature of the domestic hydrocarbon basins
Special domestic increment	Troll max	Short term	32.9	• Short term potential in maximizing the Troll field output according to 2021 levels
	Higher GCV		23.6	• Volume equivalent impact of increasing energy content in gas export
	Groningen		382	• Key short term domestic production increment, should the politically guided curtailment be reversed
	Barents pipe	Long term	144	• Key long term domestic production increment • Connects resources in the Barents Sea to the existing Norwegian pipeline network
	European shale		455	• Possible to produce 30 Bcm/yr from 2027, however politically sensitive
Piped gas	Europe piped gas imports	Both	564	• Expected minimum imports from North Africa (Algeria and Libya) and Azerbaijan
	Algeria increase	Short term	606	• Potential increase in Algerian exports, should gas be marketed instead of reinjected • Export increase has been staggered to capture increasing marginal cost
	Turkey pass-through		89.5	• Potential re-routing of Turkey's share of TANAP gas from Azerbaijan • Export increase has been staggered to capture increasing marginal cost
	TR/Azerbaijan expansion	Long term	387	• Long term expansions of the TANAP/TAP infrastructure • Includes multiple phases which have been staggered to capture increasing marginal cost
LNG	LT Contracted	Both	858	• All known LNG contracts with Europe as destination
	Spot/FOB LNG	Short term	1522	• Maximum potential of spot and US LNG FOB imports • The market will be shared with Asia and 100% market share is therefore unlikely
	Available for LT contracts	Long term	7863	• The global pool of expected long term LNG production to meet global LNG demand • Europe will be able to capture a market share of this vast potential

*Full resource potential is based on resources that are already producing or under development

Source: Rystad Energy research and analysis

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KEY RESULTS

Domestic supplies important but challenged by resource potential, political environment

Gas source	Increment group	Timing
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	Increment exploration	
Special domestic increment	Troll max	Short term
	Higher GCV	
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	Barents pipe	Long term
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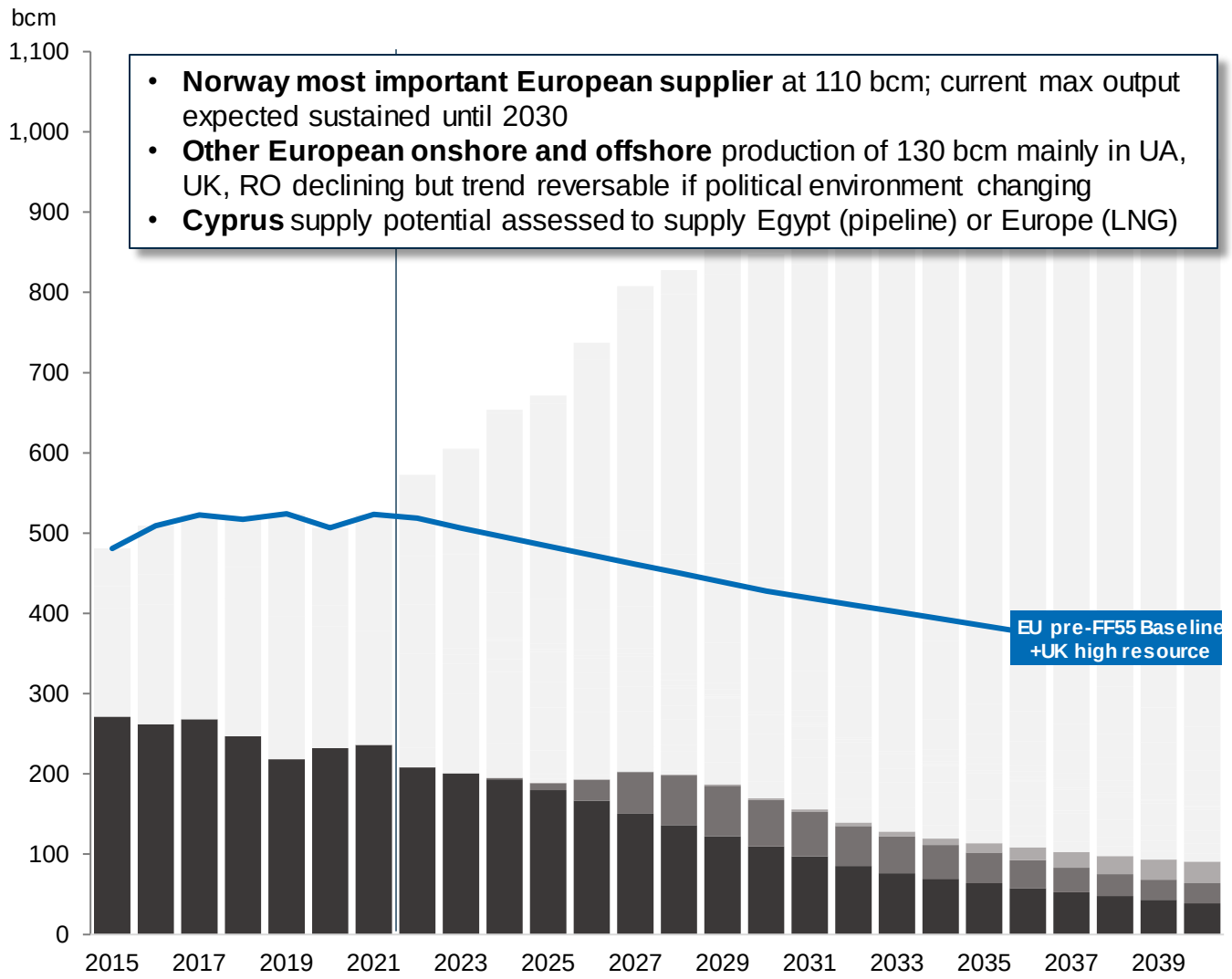

Source: Rystad Energy research and analysis

Moderate maximization of domestic supplies possible

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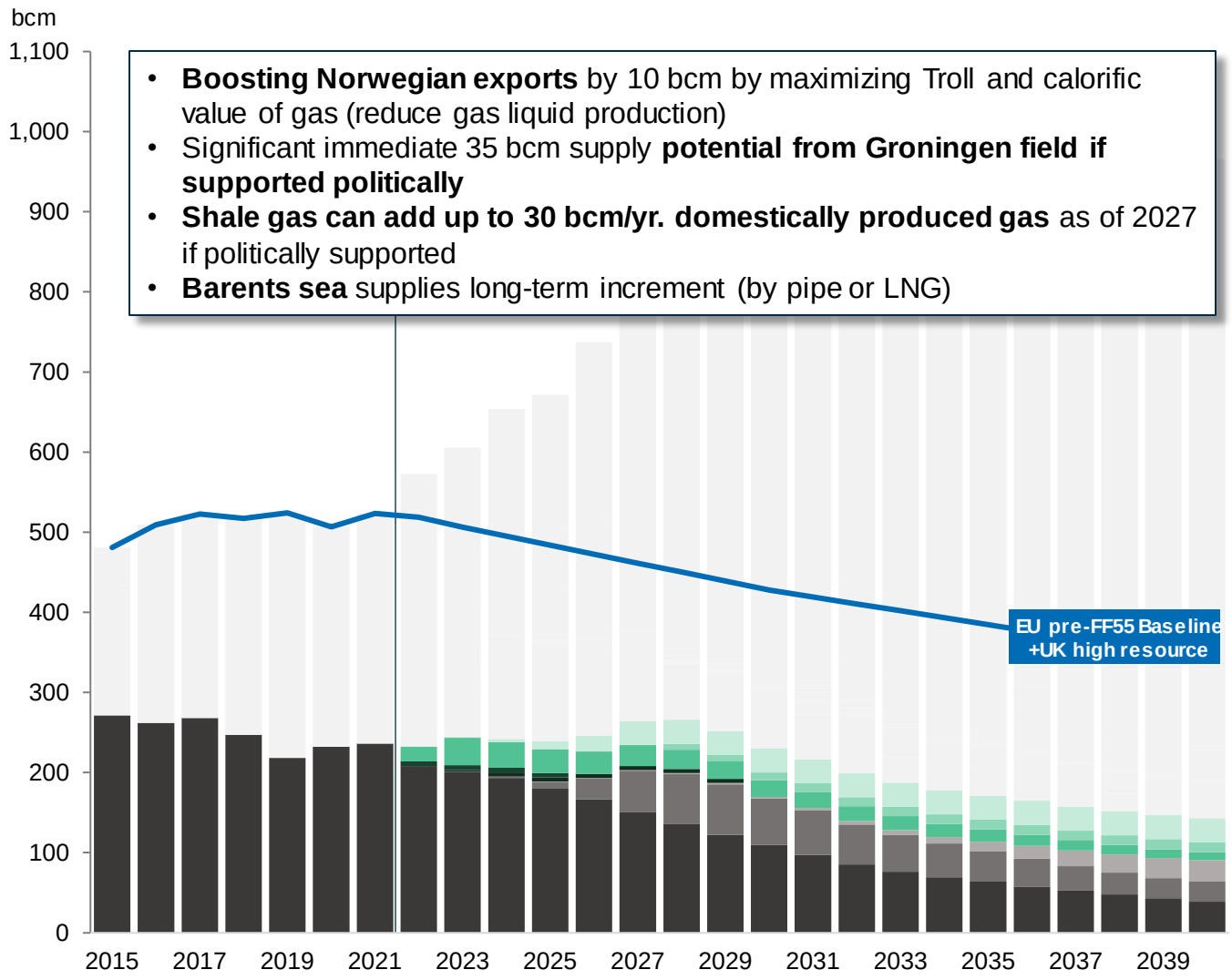

- **Boosting Norwegian exports** by 10 bcm by maximizing Troll and calorific value of gas (reduce gas liquid production)
- Significant immediate 35 bcm supply **potential from Groningen field if supported politically**
- **Shale gas can add up to 30 bcm/yr. domestically produced gas** as of 2027 if politically supported
- **Barents sea** supplies long-term increment (by pipe or LNG)

Source: Rystad Energy research and analysis

Russian piped gas supply assumed to reduce by 2/3 as of 2023 and cease in 2027

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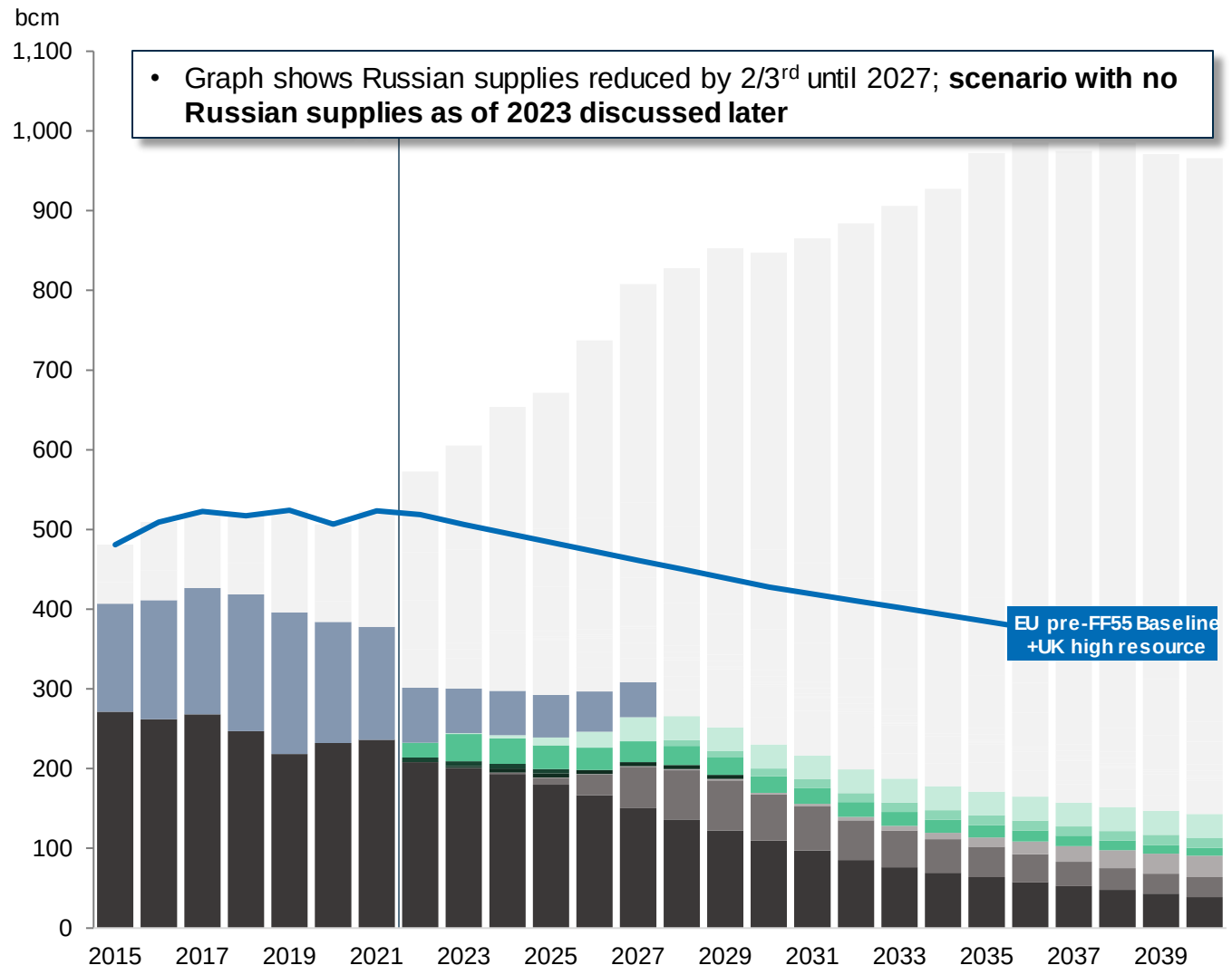

Source: Rystad Energy research and analysis

Non-Russian other pipeline imports to Europe contribute about 10% of overall supplies

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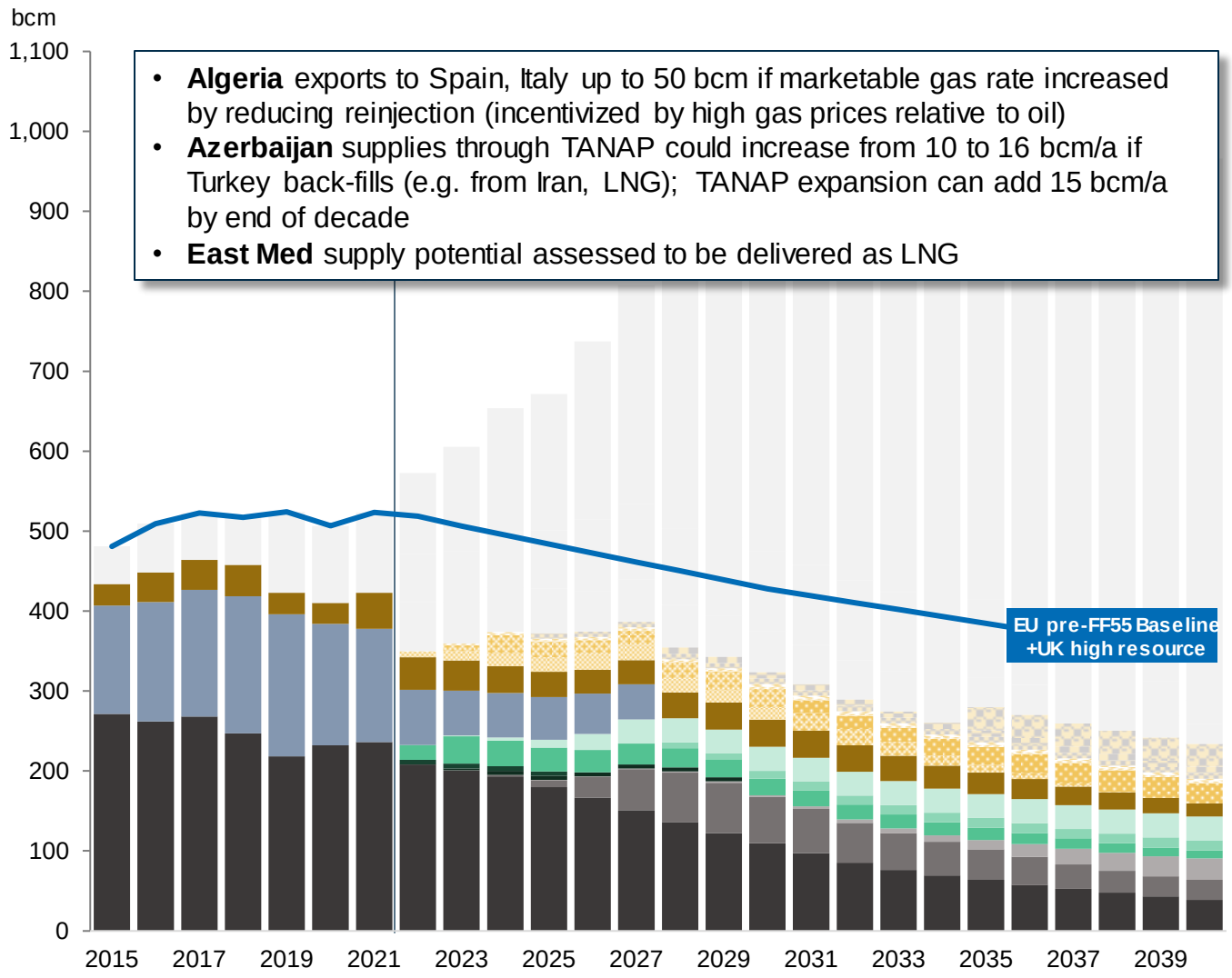

Source: Rystad Energy research and analysis

LNG is a crucial market balancing factor for Europe, both in the short and long-term

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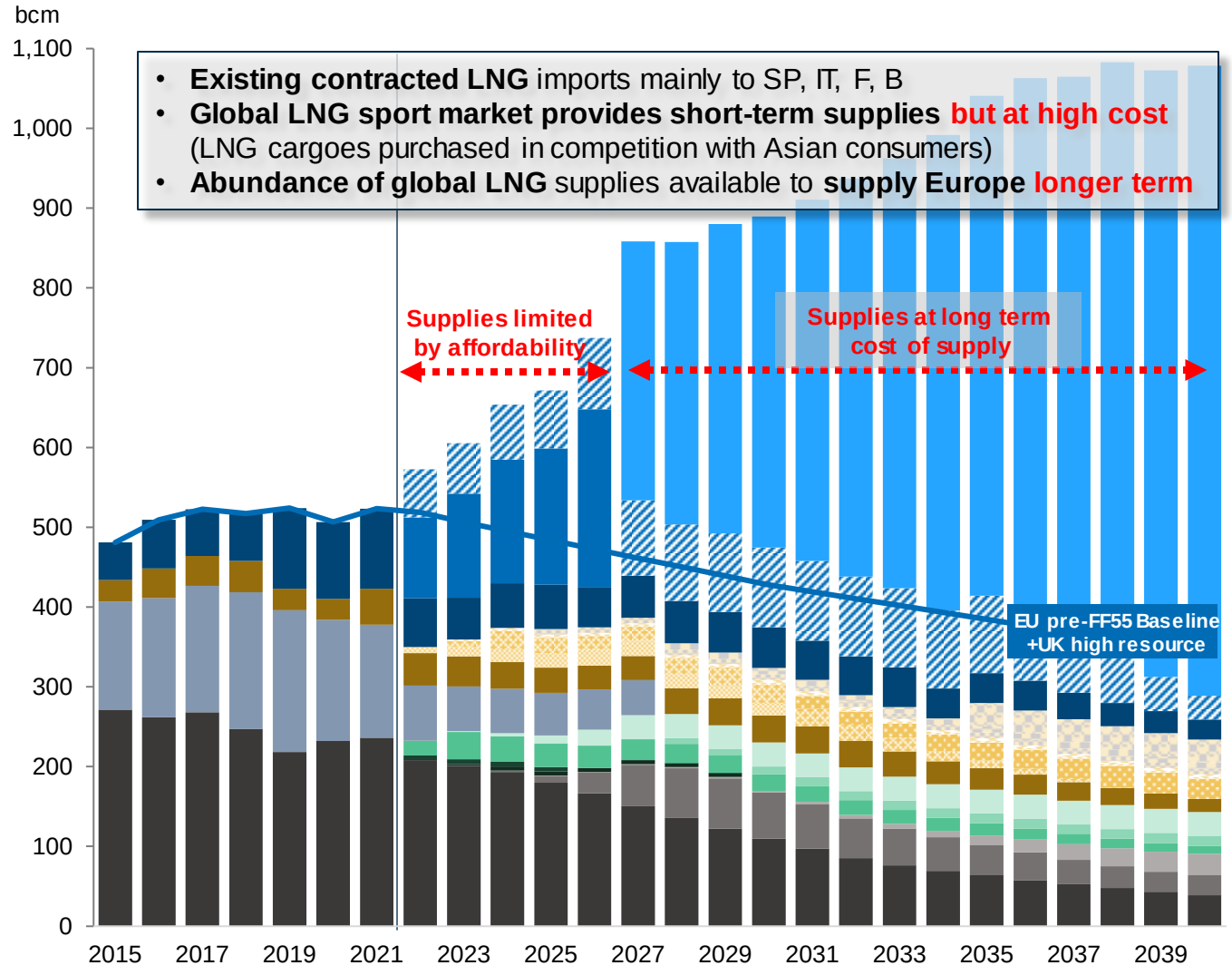

Source: Rystad Energy research and analysis

Ranking supplies by cost of supply filters out high-cost LNG, pipeline imports, politically challenged gas

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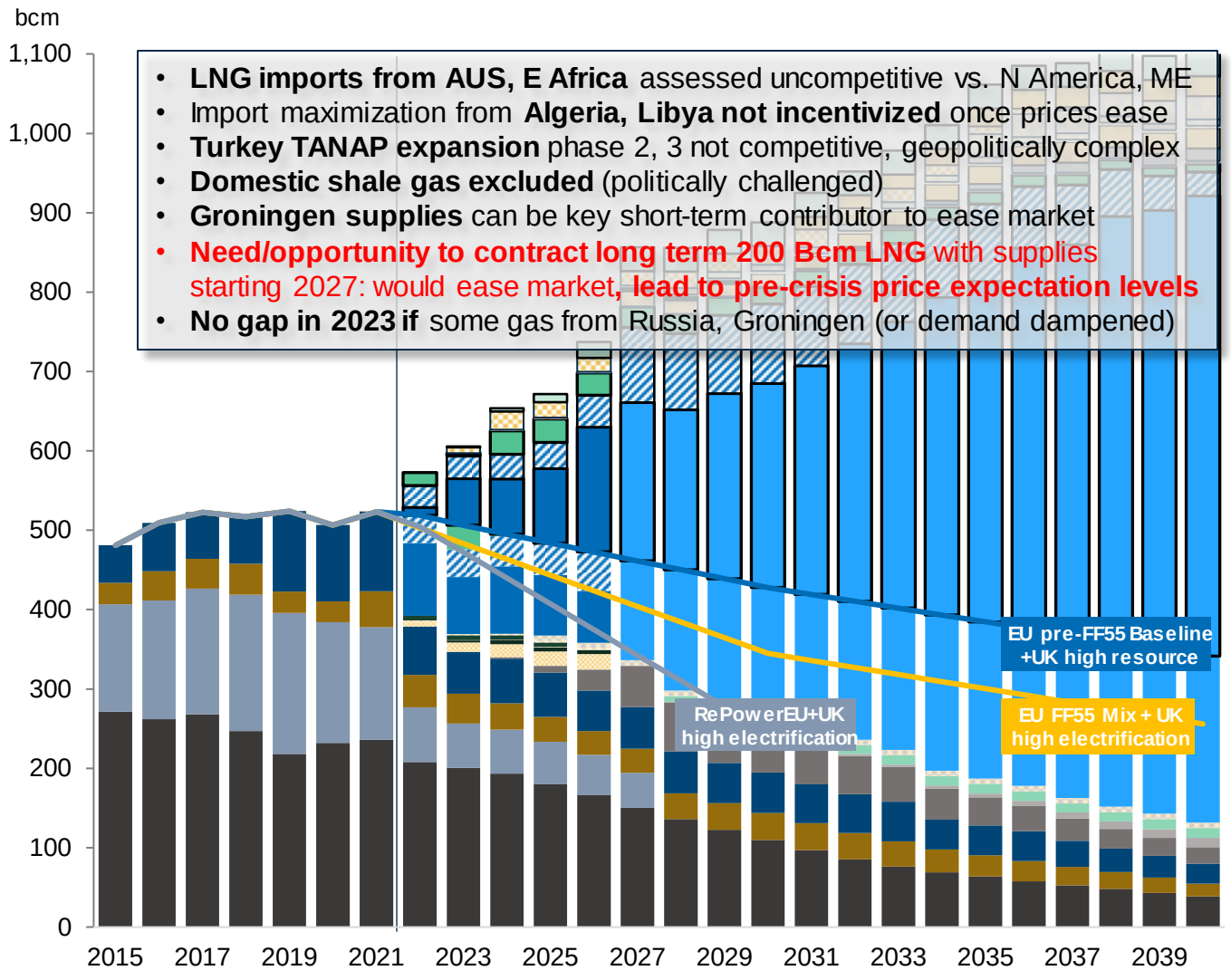

Source: Rystad Energy research and analysis, Rystad Energy GasMarketCube, European Commission, UK Department for Business, Energy & Industrial Strategy

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WHAT IS THE SUPPLY GAP IF RUSSIA STOPS SUPPLIES?

Bad news, good news…

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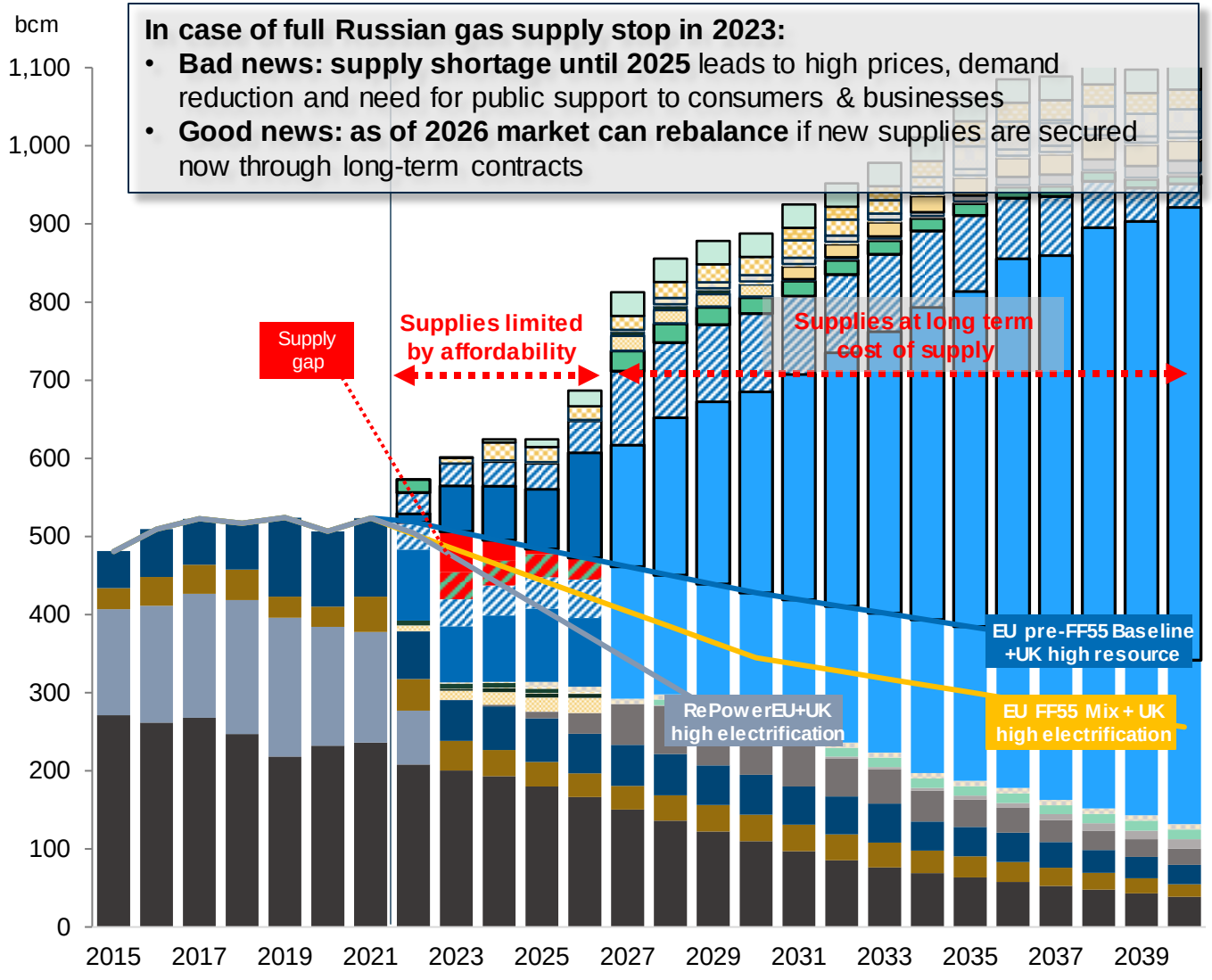
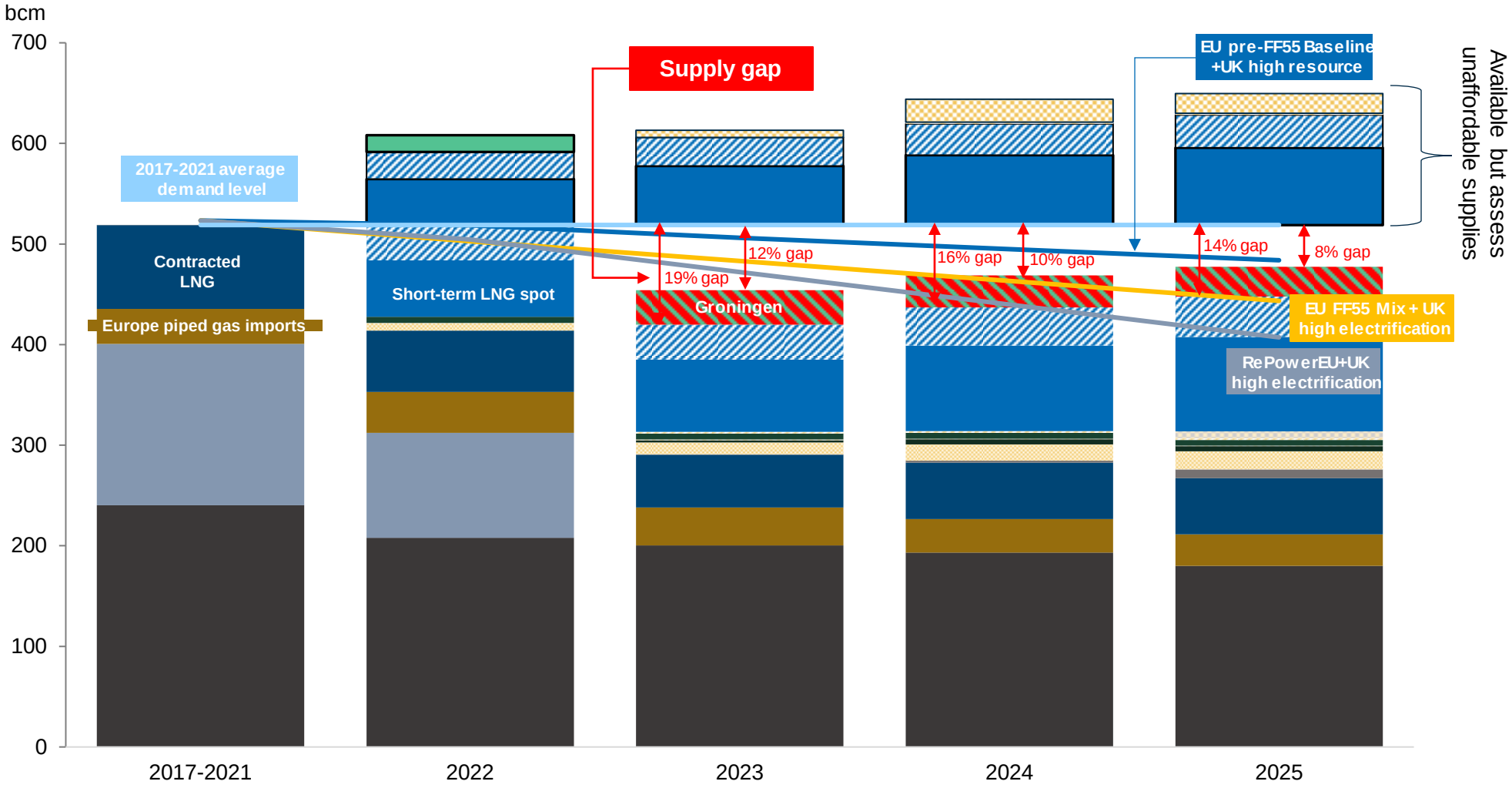


Source: Rystad Energy research and analysis, Rystad Energy GasMarketCube, European Commission, UK Department for Business, Energy & Industrial Strategy

Supply gap versus 2017-2021 average demand: gap of up to 19%

Short-term supply with high-cost / non-affordable gas filtered out, and without Russia from 2023



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DEEP DIVE ON LNG

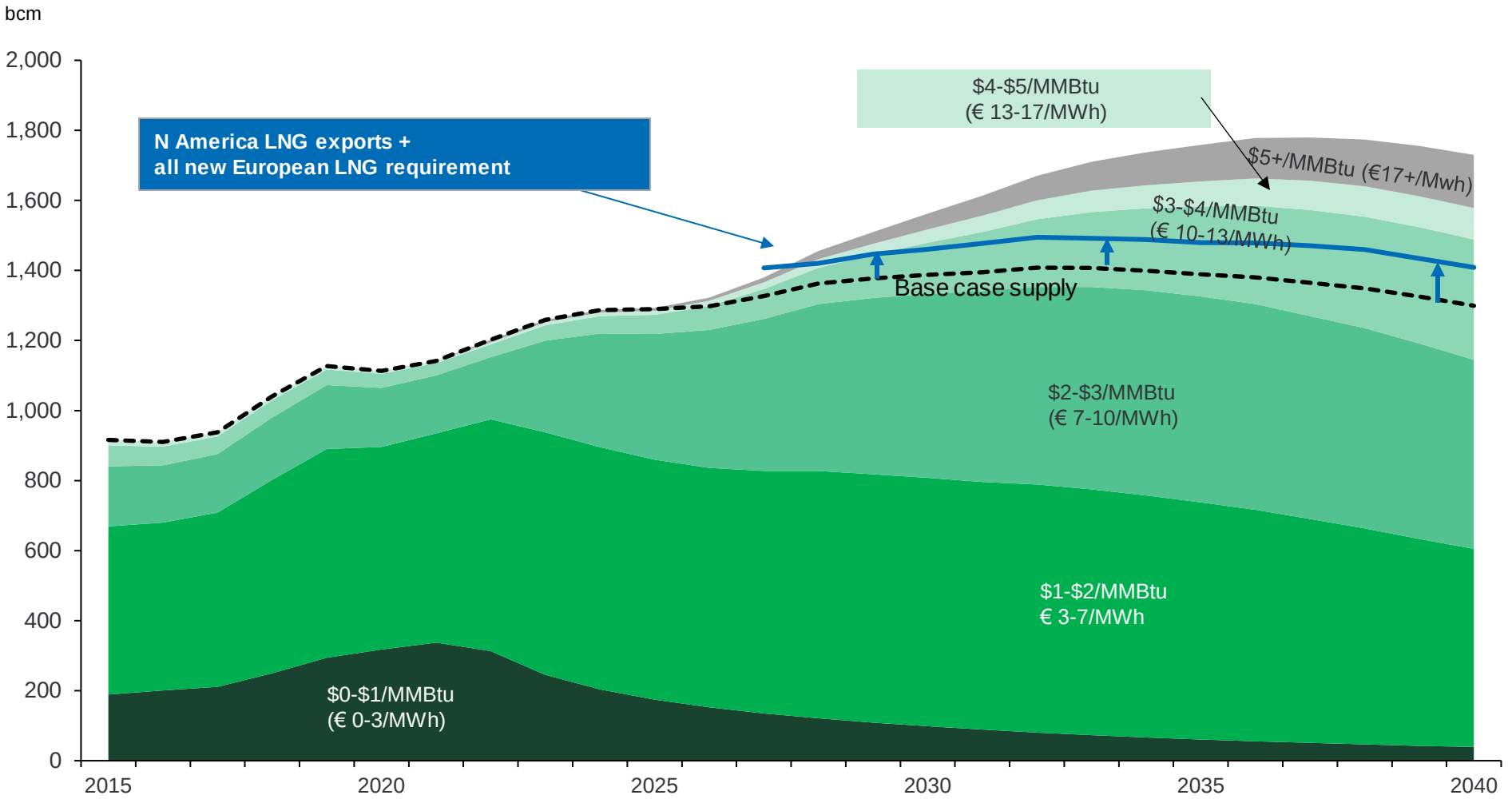
Atlantic basin LNG projects are the most likely LNG suppliers to Europe

Global potential LNG supply in 2040 split on LNG project and life cycle status

Source: GasMarketCube

Low-cost supplies in N America; new European demand ~7% production increase

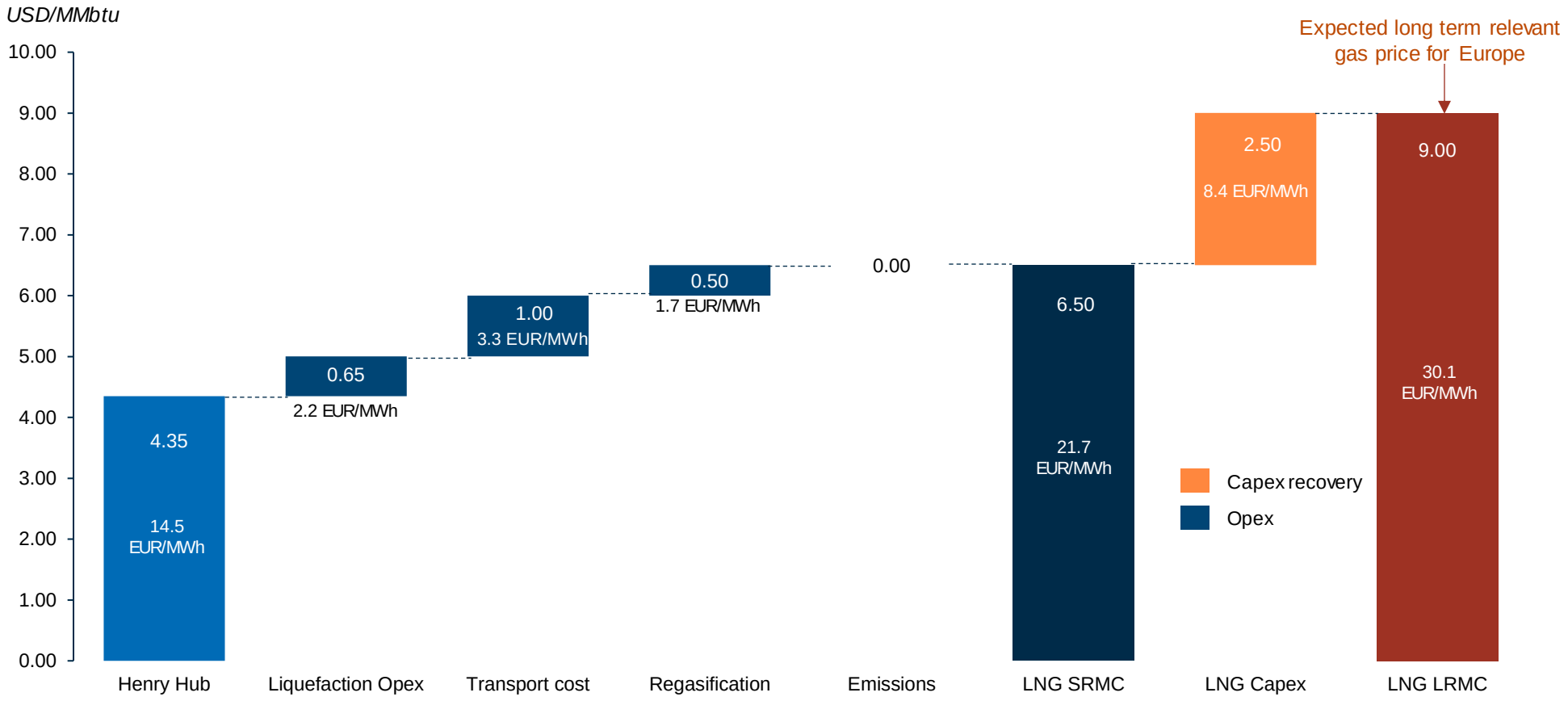
US and Canada natural gas supply potential by lifecycle and breakeven price



Note: Breakeven based on a 7.5% real hurdle rate. Prices are in real terms. Assumed exchange rate: 1 EUR = 1.02 USD
Source: Rystad Energy GasMarketCube

Long-term European LNG supply cost expectations compare with pre-crisis levels once market distressed

LNG price forecast buildup based on long term Henry Hub assumption



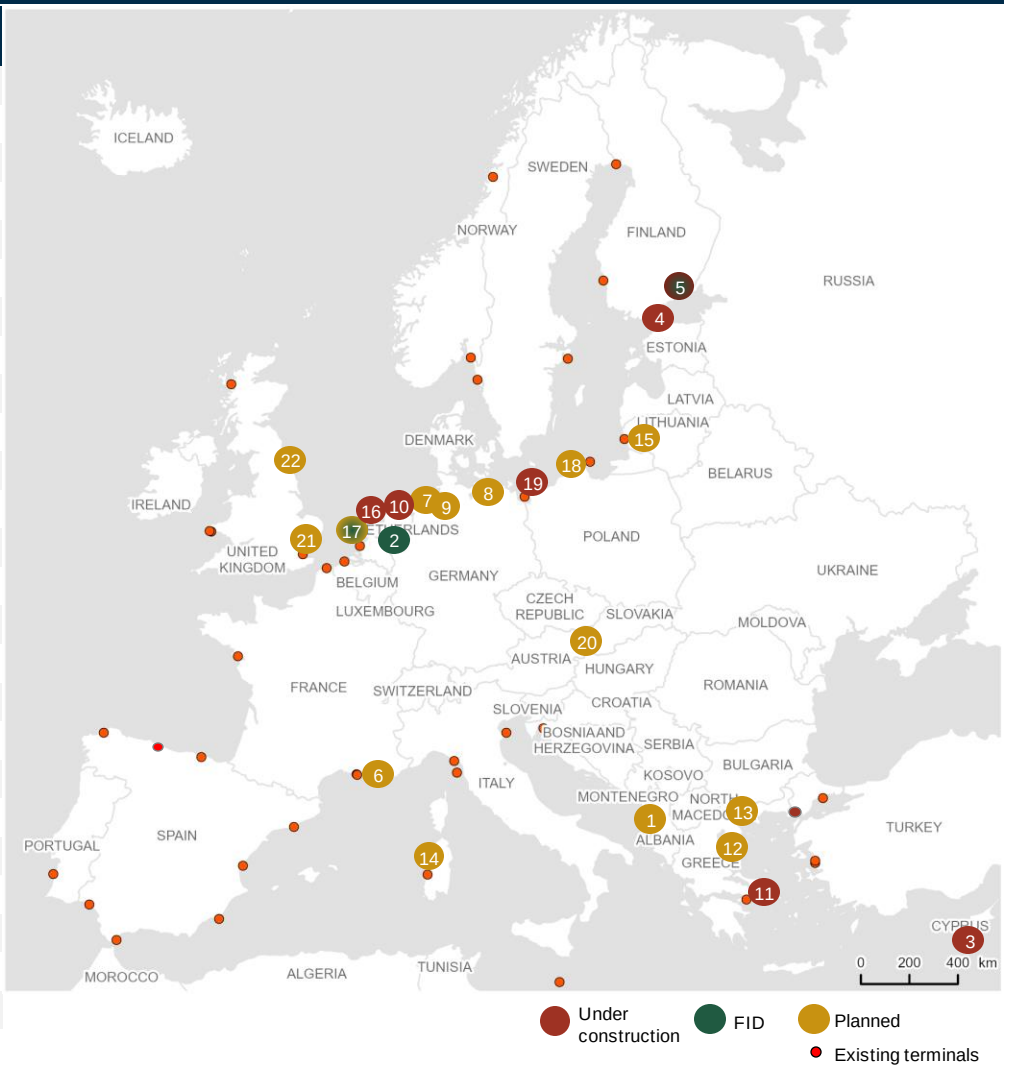
Assumptions						
US trading point 'Henry Hub'	*15% cost of gas feedstock*	*Transport via 150,000 m3 tanker using fuel oil from US to Europe*	*Based on what is understood to be standard regas rates*	*Emission tax would increase LNG cost*		*Based on common $2-3 uplift in global LNG contracts*

Prices are in real terms. Assumed exchange rate: 1 EUR = 1.02 USD Source: Rystad Energy research and analysis

European LNG regas/import capacity can grow by 120 bcm to 330 bcm p.a.

Future LNG regasification capacity in Europe between 2022 and 2040

Country	Plant name	Capacity Mtpa	
Albania	Albania LNG terminal (Port of Vlora)	2.5	1
Belgium	Zeebrugge 2 Expansion Step 1	4.7	2
Belgium	Zeebrugge 2 Expansion Step 2	1.3	2
Cyprus	Cyprus FSRU	0.6	3
Estonia	Paldiski LNG	1.8	4
Finland	Hamina FSRU	3.7	5
Finland	Hamina LNG	0.6	5
France	Fos Cavaou 2	6.2	6
Germany	Brunsbuettel LNG Terminal	5.9	7
Germany	Rostock LNG	6.0	8
Germany	Stade LNG	9.8	9
Germany	Wilhelmshaven FSRU	7.4	10
Greece	Alexandroupolis LNG	4.0	11
Greece	Argo FSRU	3.4	12
Greece	Thrace INGS FSRU	4.0	13
Italy	ENI FSRU, location pending	3.7	
Italy	FSRU near Sardinia	3.7	14
Lithuania	Klaipedos Nafta FSRU 2	3.0	15
Netherlands	Eemshaven FSRU	5.9	16
Netherlands	Gate LNG terminal (LNG Rotterdam) expansion 1	1.1	17
Netherlands	Gate LNG terminal (LNG Rotterdam) expansion 2	4.8	17
Poland	Gaz-System Gdansk FSRU	3.2	18
Poland	Swinoujscie	4.3	19
Slovakia	Bratislava LNG terminal	0.6	20
United Kingdom	Port Meridian LNG	5.0	21
United Kingdom	Teesside GasPort - Trafigura	5.5	22



*The Turkish Gulf of Saros FSRU has been added despite Turkey being out of the study's scope as the investment may provide additional supply to southeast Europe
Source: Rystad Energy research and analysis; Rystad Energy GasMarketCube

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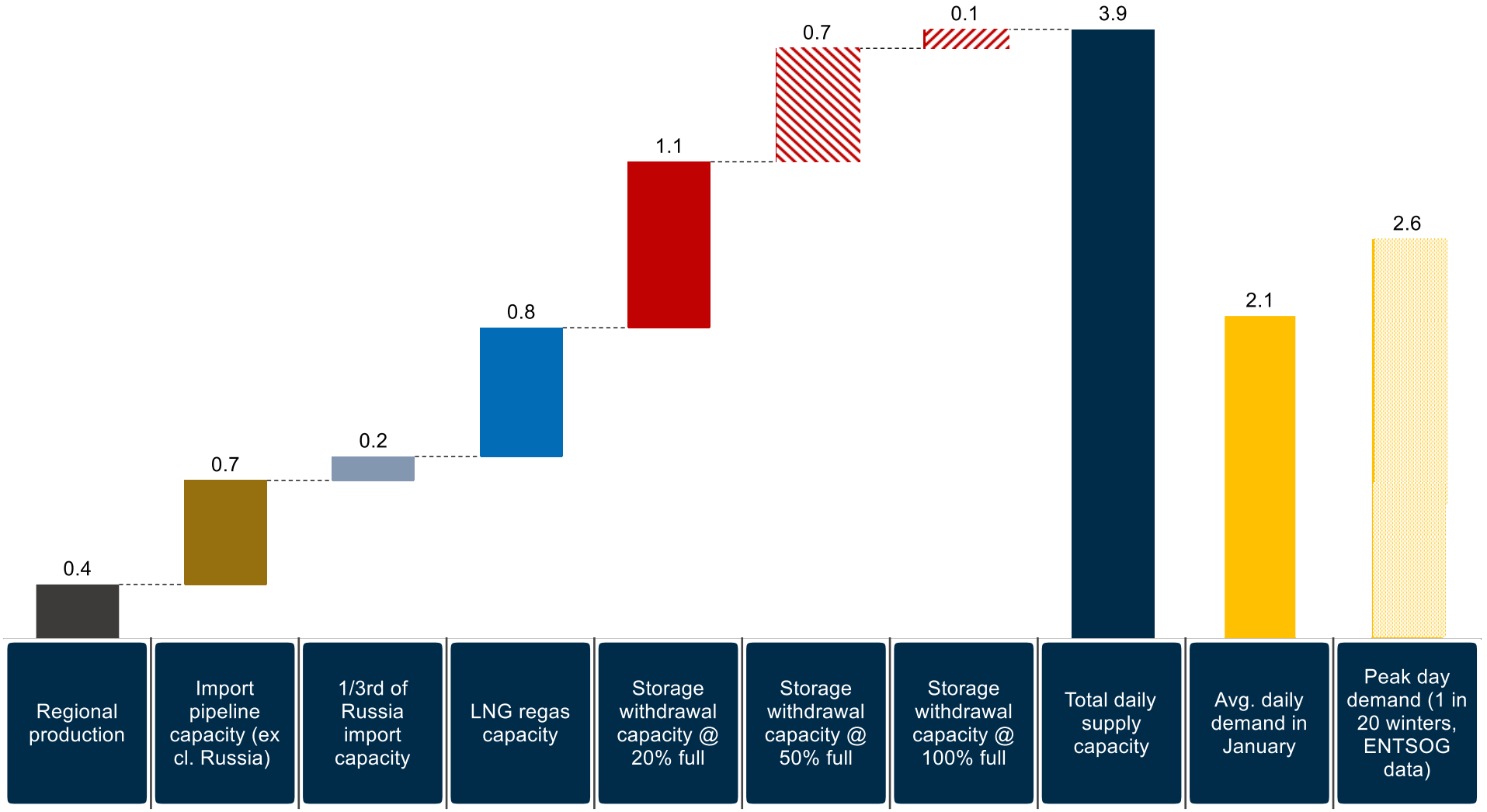
INFRASTRUCTURE CAPABILITIES

Europe has significant gas infrastructure capacity to supply peak day demand

Peak day supply capacity build-up, Jan 2023 (unit: bcm/day)



Source: Rystad Energy research and analysis

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CONCLUSIONS

Main findings of the study

2023-2025

It will not be possible to substitute Russian imports *(155 Bcm in 2021)* **with alternative supplies; the shortage can be progressively reduced if new supplies are procured**

1. **The shortage will lead to high prices**, which attract LNG cargoes *(from 100 Bcm in 2021 to 160 Bcm in 2023),* incentivize the full production of existing fields in Europe and maximize pipeline imports from neighboring countries *(halting the decline by maintaining supplies at about 280 Bcm)*
2. **Europe's interconnected gas infrastructure and integrated gas market** make a significant contribution to energy resilience by rebalancing flows across the regions
3. **However, significant demand reduction is needed** *(note: a 15% reduction vs. prior years reduces demand by 75 Bcm)*

Main findings of the study

2026 onwards

New long-term supplies from abundant and low-cost global resources can fully substitute Russian supplies and rebalance the market

1. **Long-term contracts are needed** to underpin the necessary LNG projects while some adjustments to the European gas infrastructure are needed
2. **Domestic resources and pipeline imports** are important complements
3. The relative low cost of developing and supplying these alternative volumes to Europe is **expected to let European gas prices drop to pre-Crisis expectation levels**

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POLICY CONSIDERATIONS

IOGP policy recommendations

In a nutshell

1. For Europe to rebalance its gas supply market, **LNG projects and domestic production need to be incentivized through long term contracts** and a favourable regulatory framework allowing investments in E&P activities (reflected in NECPs)
2. **Abundance of natural gas at affordable prices after 2026 reaffirms its role in energy transition**
   - As reliable source of energy able to balance the energy mix compensating intermittency of REs
   - Underpinning the development of a Hydrogen economy in Europe (through blue hydrogen/CCS)
3. **Any delay in making the right decisions will prolong the period of suffering**
   - And would risk to permanently damage Europe's industrial base
4. Europe can decide what happens next: **we need a vision, grounded in reality** protecting the European citizens and the European economy

International Association of Oil & Gas Producers

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