IOGP Europe presentation on role of gases in building a resilient energy system

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1. Key takeaways from the 2nd Edition of the 'Rebalancing Europe's Gas Supply' study

2nd Edition of the Rebalance of Europe's Gas Supplies study (release Dec. 2023)

Chapters

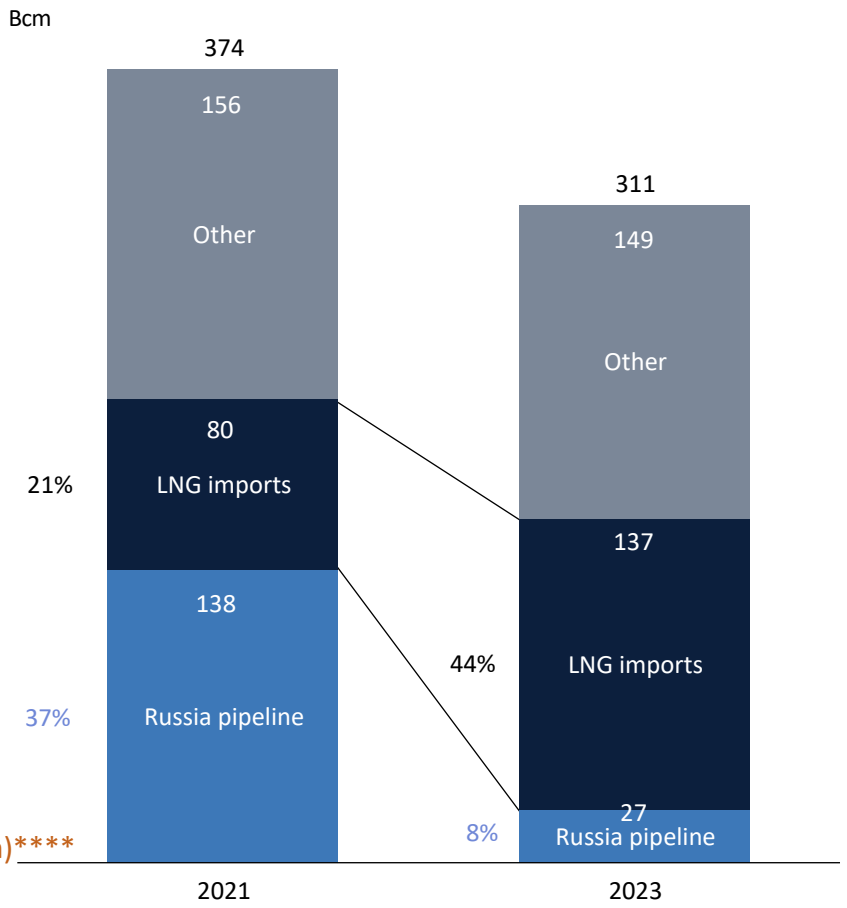
1	2	3	4
Review 2022/23	**Mid-term outlook 2024-2027**	**Long-term outlook 2028-2040**	**Case for low carbon H_2 in EU**

- EU's 2022 Versailles Declaration called for **phase out of coal, oil, gas supplies from Russia** a.s.a.p.
- **Study co-sponsored by IOGP Europe & API**
  - Value chain approach: data also from GIE, ENTSO-G
- **Scope: supplies sources available to Europe 2023 – 2040** (EU27, UK, NO, UA, CH, Western Balkan)
- **Note:**
  - Supply cost, price assessments exclusively developed by Rystad Energy; not discussed as part of study
  - Analysis by Rystad, policy conclusions by IOGP Europe

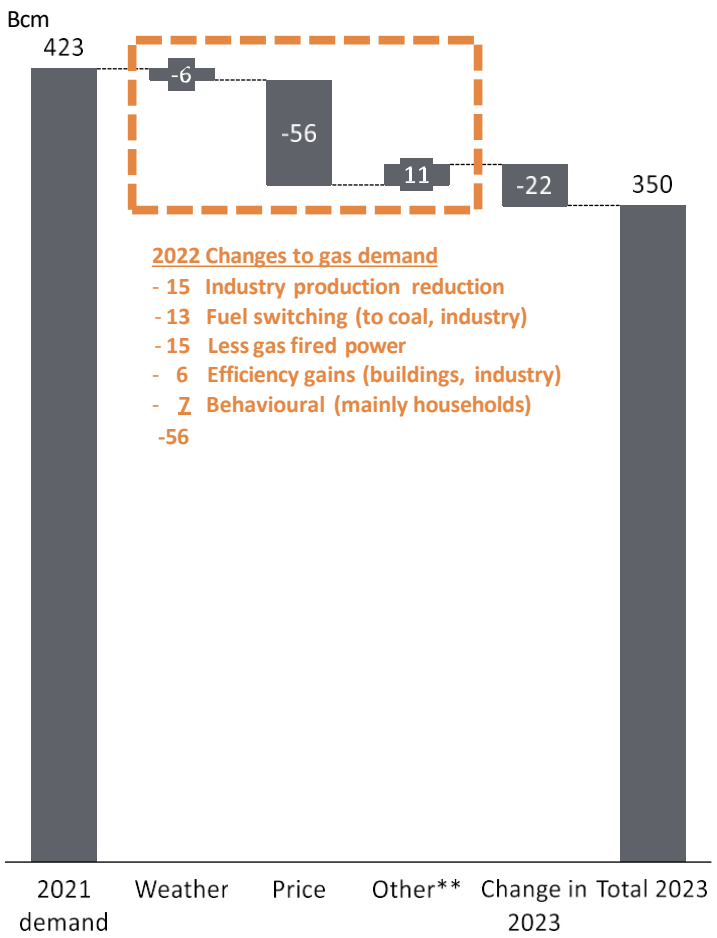
High gas price reduced demand and attracted LNG to replace Russian gas

2022 average gas wholesale prices by region*

Gas supplies to EU27 from Russia, LNG, and other imports**



EU 27 gas demand declined 17% compared to 2021

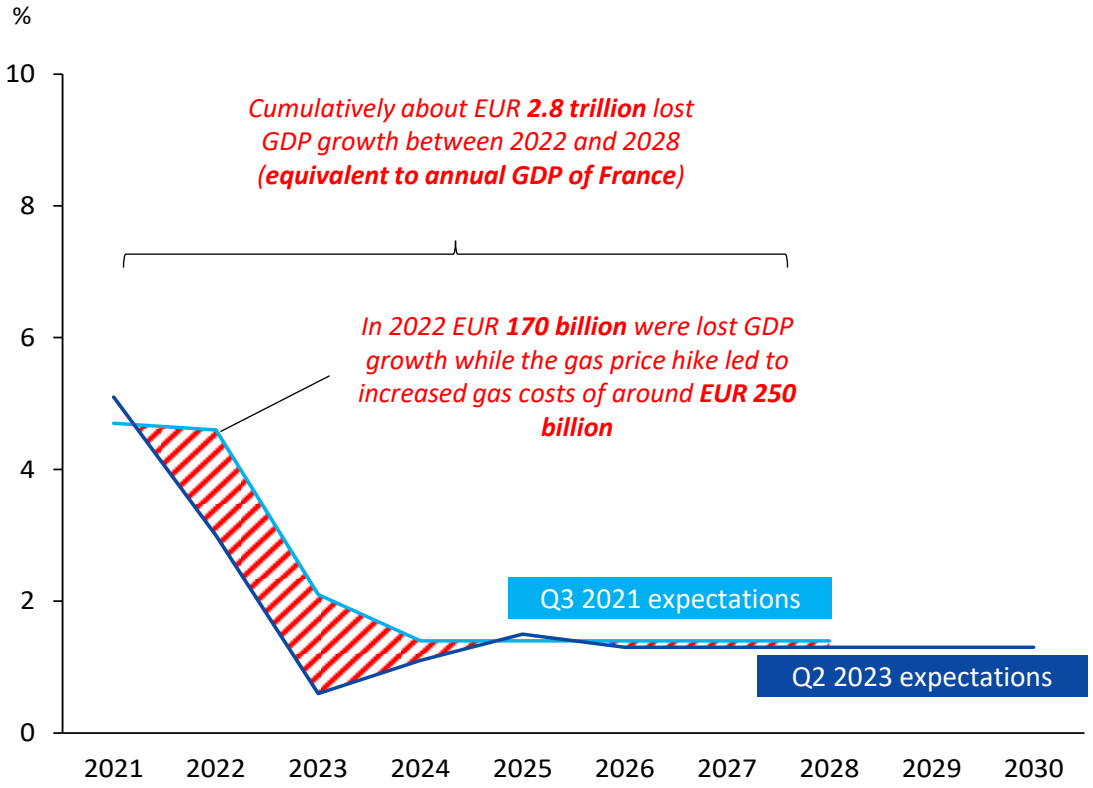


*EUR/USD as of Oct 11th 2023 at 0.94; **Other imports are defined as Norway pipeline, Africa pipeline, and Central Asia pipeline; ***Other is defined as net effect of less nuclear and more renewable power generation ****Sourced from Eurostats' non-consumer household gas price survey for EU27

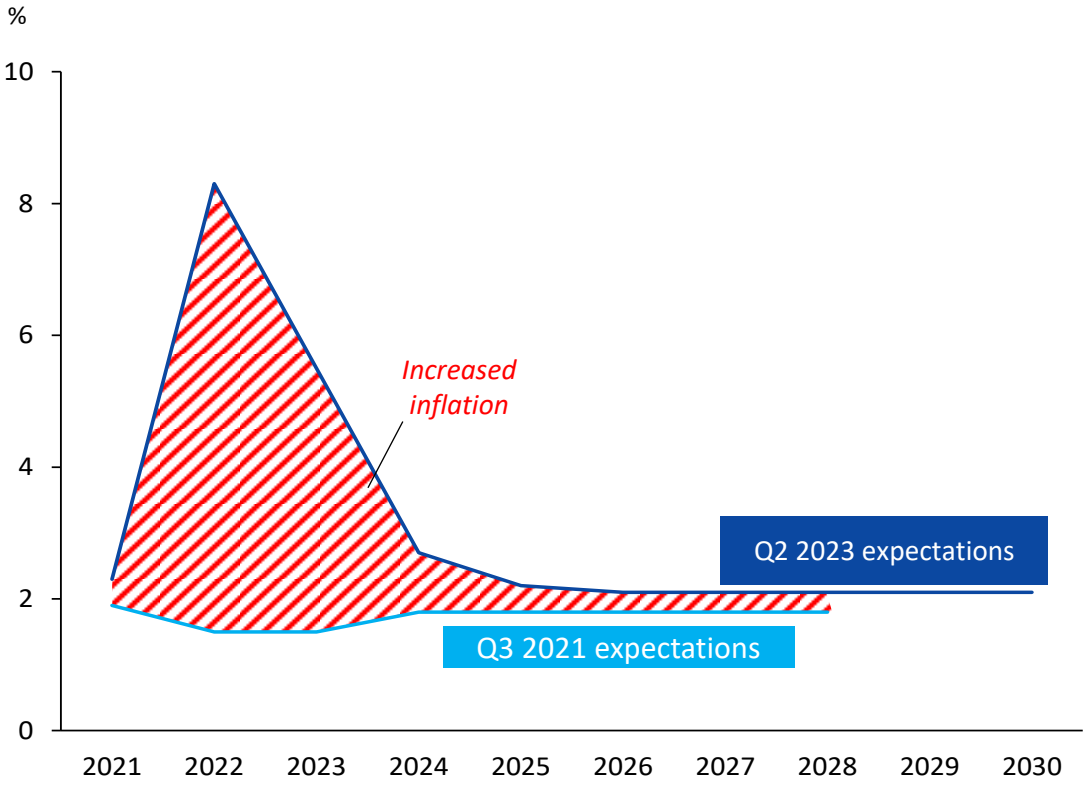
Source: Rystad Energy research and analysis, Rystad Energy GasMarketCube; IGU; Eurostat

Supply shock triggered €2.8 trillion lost GDP, increased inflation

European Central Bank real GDP growth expectations 1



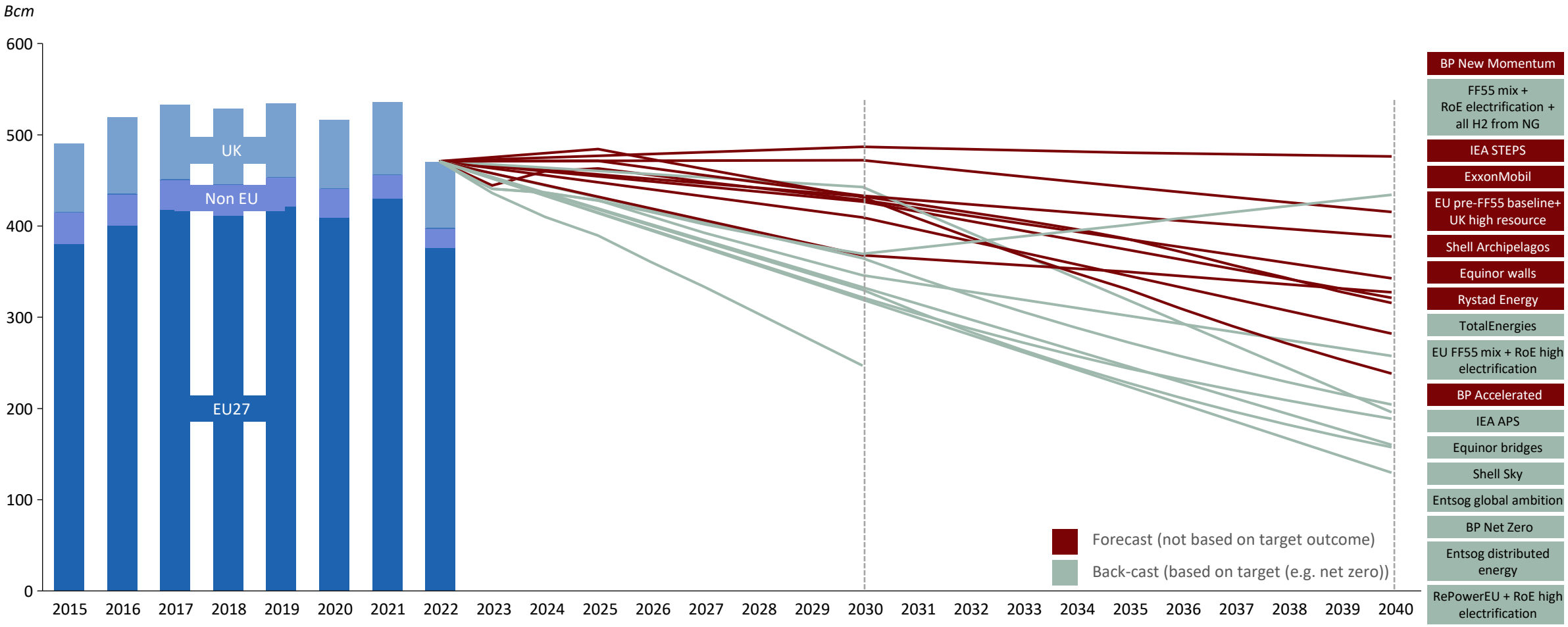
European Central Bank inflation expectations 2



- Note that for 2023 the numbers for 2021 and 2022 are based on calendar year estimates from the survey in Q4 2021 and Q4 2022 respectively
- Source: Rystad Energy, ECB SPF

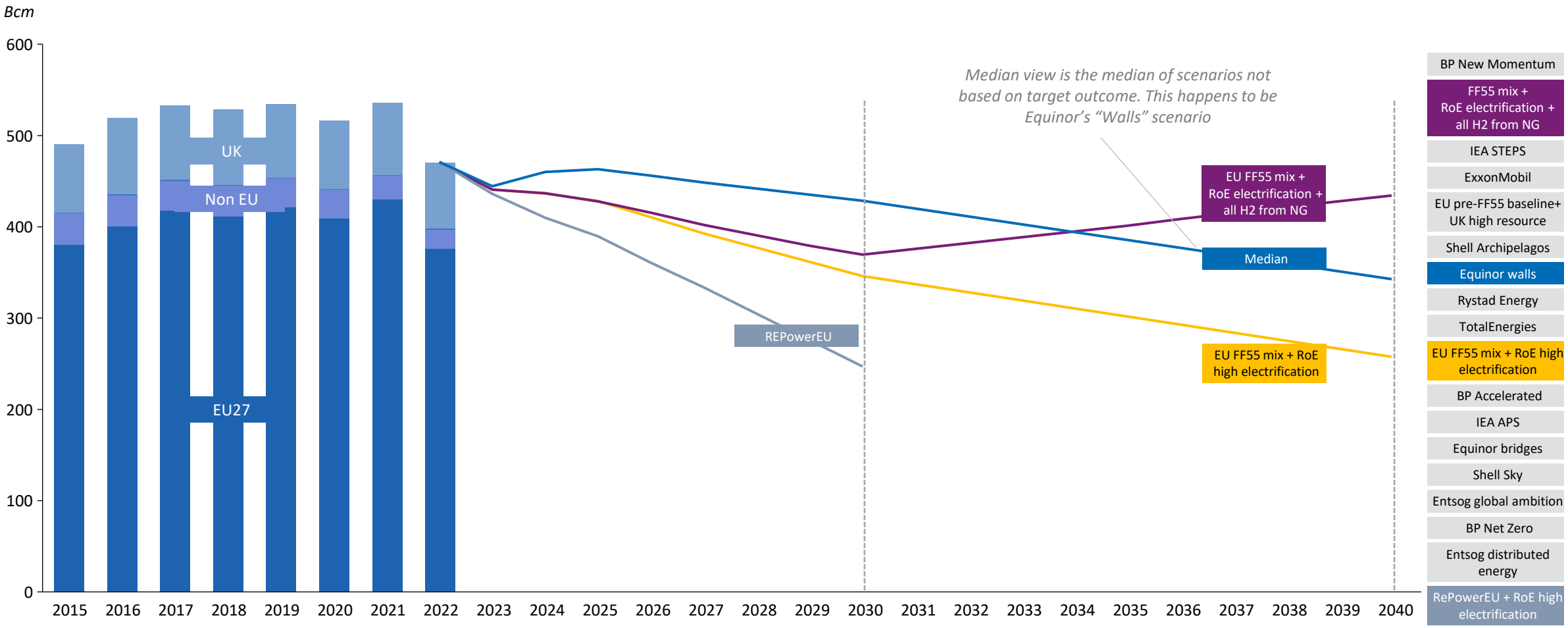
Scenarios not based on target outcome indicate higher gas demand

European demand outlook by scenario

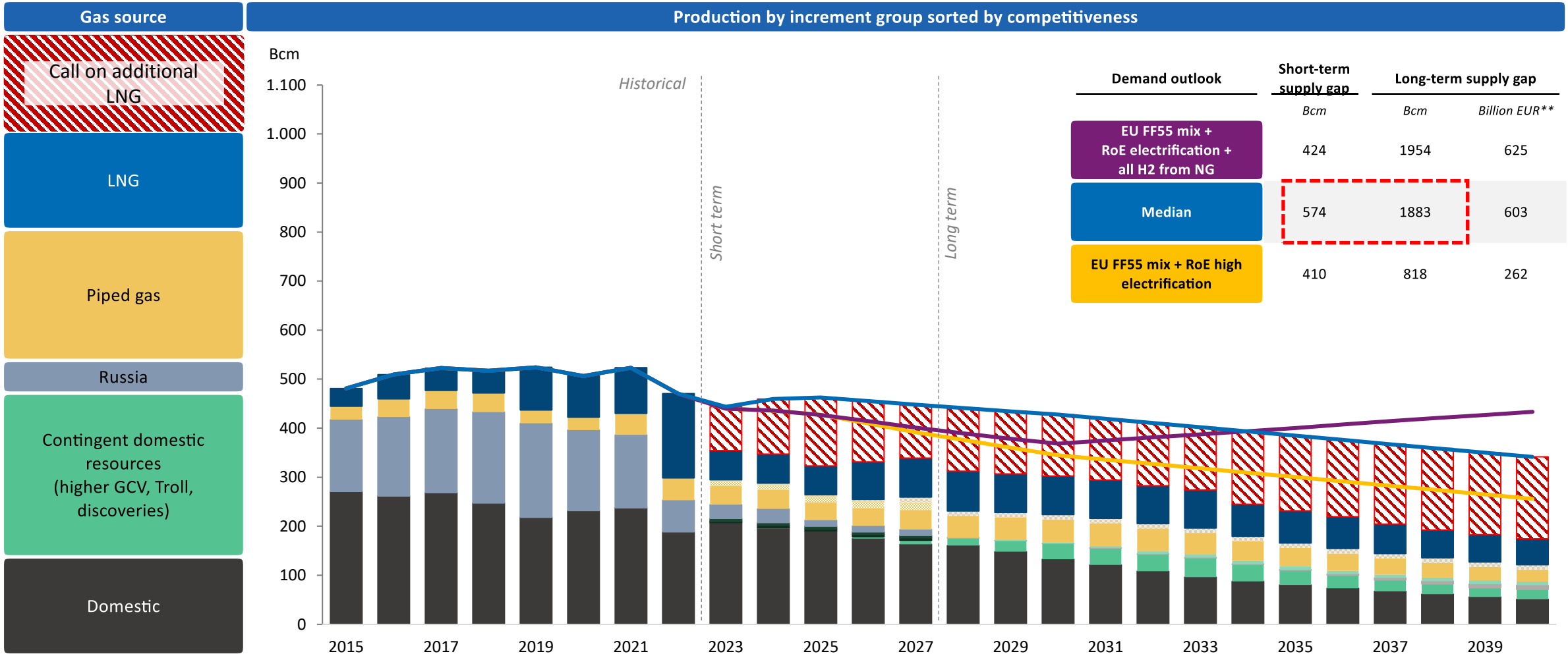


Scenarios used to contextualize Europe's supply options

European demand outlook by scenario

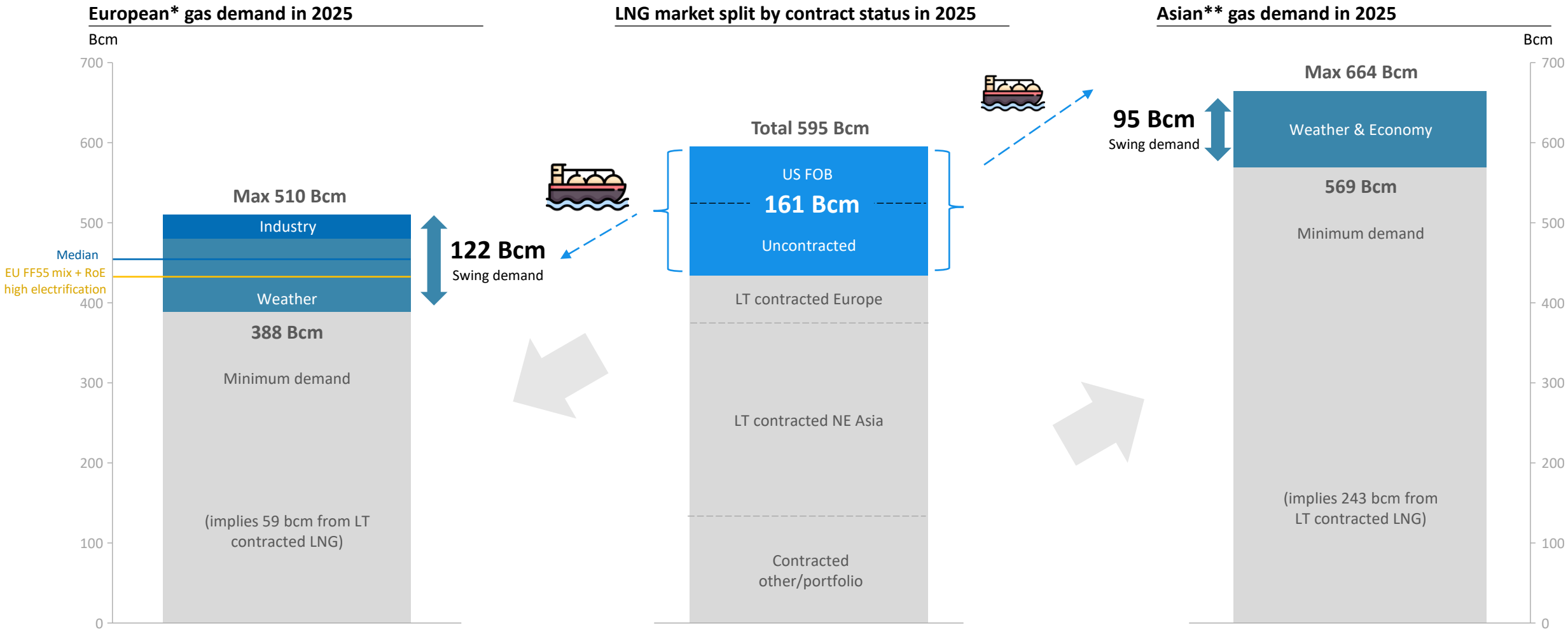


Insufficient domestic, piped gas and contracted LNG suggest Europe needs 2,300 Bcm of new (LNG) supplies through 2040



Note: Contracted LNG volumes as of end of October 2023; *Base increment group includes storage. **Based on 10 USD/Mmbtu, 0.9 EUR/USD and 35.7 trillion btu per bcm
Source: Rystad Energy research and analysis, GasMarketCube, European Commission, UK BEIS

Europe and Asia compete for LNG supplies with Europe at record high share in LNG market



Note: Contracted LNG volumes as of July 2023; *Includes selected European countries for the study; ** Variation driven by Japan, China and South Korea
Source: Rystad Energy research and analysis; Rystad Energy GasMarketCube

Policy recommendations

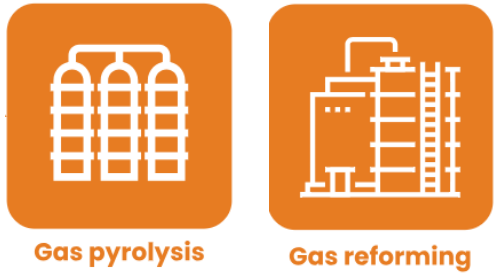
- **Recognize value of diversely/sufficiently supplied resilient gas system to reduce market volatility exposures:**
  - Avoid political signals / legislative barriers / market interventions that could discourage long-term supply contract
  - Recognize important role of natural gas in supplying Europe with affordable, reliable, and non-intermittent / balancing fuel in power mix
  - Support development of domestic resources with lower cost, lower GHG footprint, results in higher autonomy, economic activity, fiscal revenues : **all domestic gas can be produced while still meeting net-zero objective !**
  - Recognize security of supply value of ample LNG regas capacities; avoid premature infrastructure decommissioning
- **Recognize value of realistic demand forecasts**
  - Essential role of low-carbon H2 in energy transition ➔ Importance of forthcoming DA on methodology
- **Recognize value of stable, reliable framework** for significant investments to supply Europe's energy needs
  - Pragmatic policy making with long-term, technology open approach can reach net-zero objective at lower cost to society
  - Genuine impact assessment of market interventions

2. Role of low-carbon H2 in the future energy system

The potential of low-carbon H2 to reach climate neutrality

- **Reaching climate neutrality by 2050** requires the right regulatory framework for scaling up technologies to reach deeper GHG emission cuts.

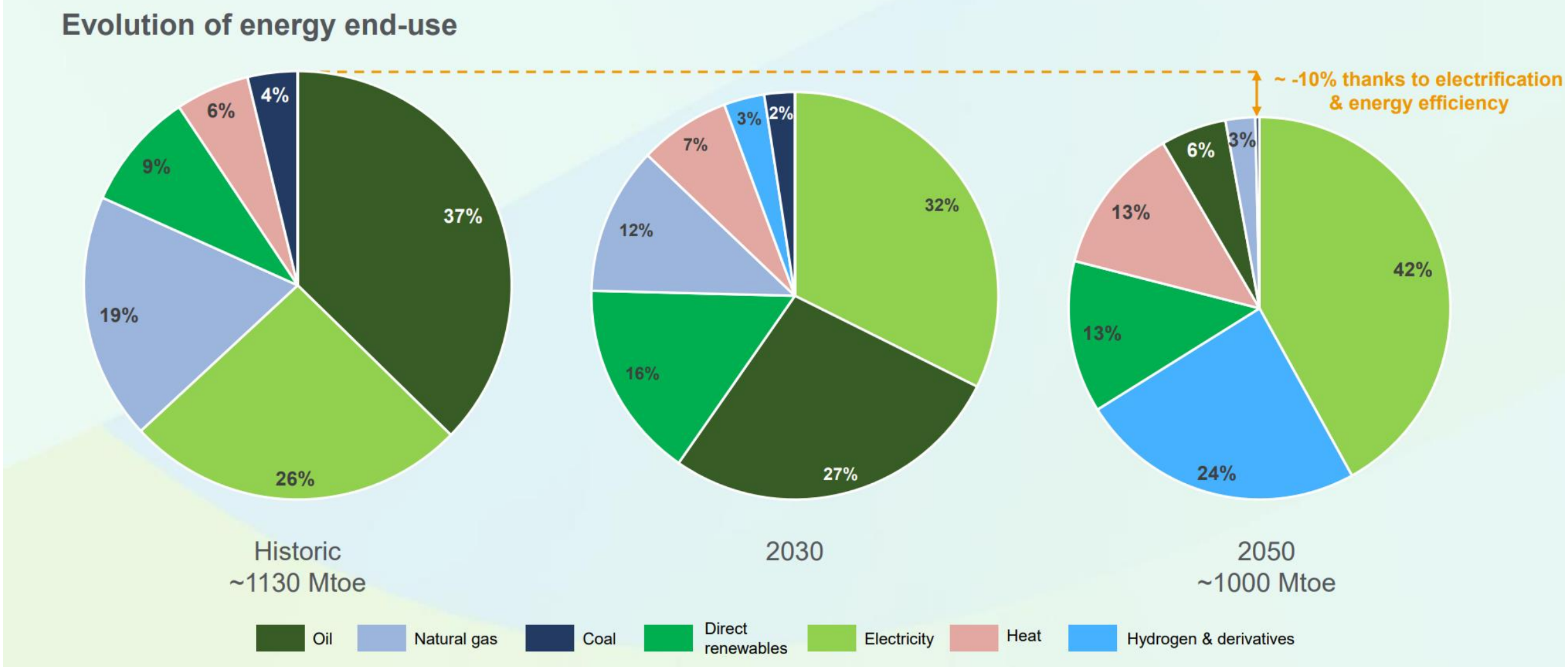
- H2 could effectively facilitate the decarbonization of the gas system and connected sectors → **H2 from natural gas with CCS** and pyrolysis has the potential to develop a commercial market for clean/low-carbon H2.



- **Deploying low-carbon H2 at scale** and making use of the existing H2 infrastructure **can help create a European H2 market** → facilitates the cost-effective integration of renewable H2 into the grid.

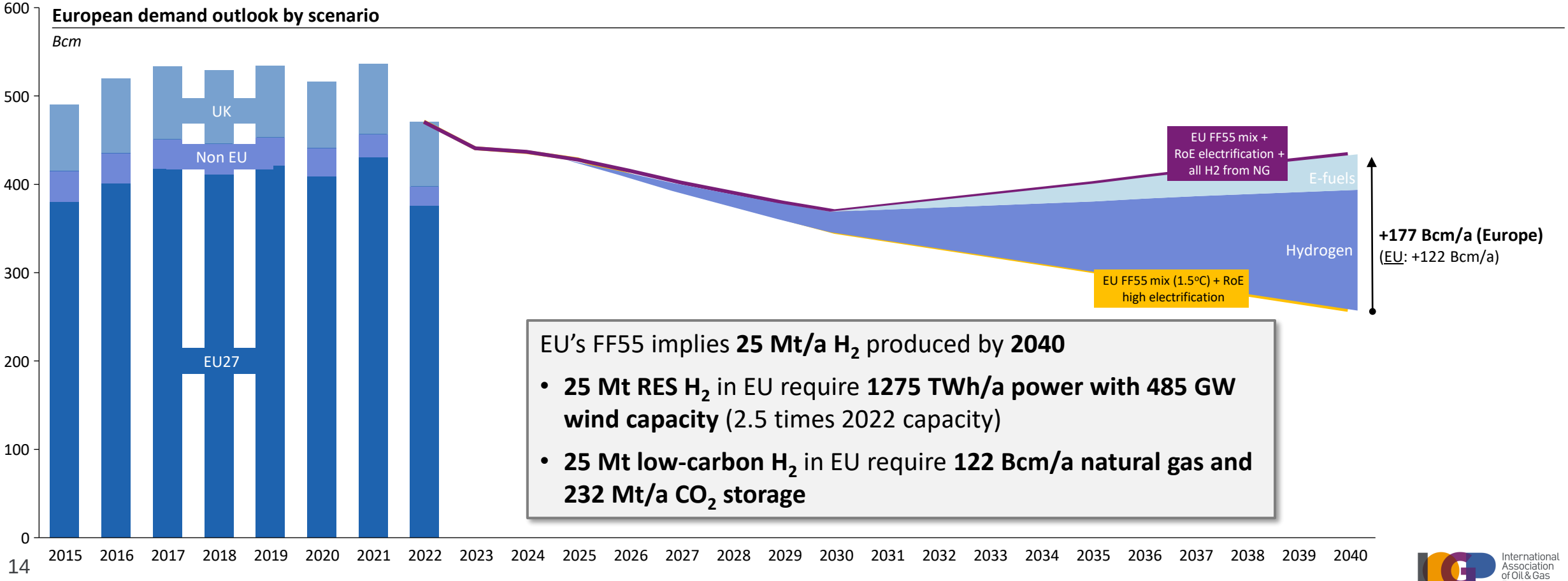
H2 long-term contribution in the energy mix

Hydrogen4EU
CHARTING PATHWAYS TO ENABLE NET ZERO



Role of low-carbon H2 through 2040 – In a nutshell

Scenario if all EU H2 & e-fuels (FF55 1.5°C scenario) produced with natural gas / CCS → Increases demand for natural gas by 122 Bcm/a in EU and for CO2 storage by 232 Mt/a



EU's FF55 implies **25 Mt/a H_2** produced by **2040**

- **25 Mt RES H_2** in EU require **1275 TWh/a power with 485 GW wind capacity** (2.5 times 2022 capacity)
- **25 Mt low-carbon H_2** in EU require **122 Bcm/a natural gas and 232 Mt/a CO_2 storage**

* Final energy output is converted on energy-equivalence basis, whilst natural gas feedstock requirements include the efficiency differences between technologies for each low-carbon gas
Source: Rystad Energy research and analysis, Rystad Energy GasMarketCube, European Commission, UK Department for Business, Energy & Industrial Strategy, IEA, Equinor, TotalEnergies

3. The role of Carbon Capture and Storage

Overview of existing and planned CO_2 storage projects in Europe

BULGARIA
1. ANRAV (IF)

CROATIA
1. Petrokemija Kutina*
2. Bio-Refinery Project*
3. CCGeo (IF)
4. **CO_2 EOR Project Croatia***

DENMARK
1. **Greensand***
2. Bifrost*
3. Stenlille demo CO_2-storage
4. Norne
5. Ruby

FRANCE
1. Pycasso*

GREECE
1. Prinos CCS

HUNGARY
1. MOL-Hungary CCS Project*

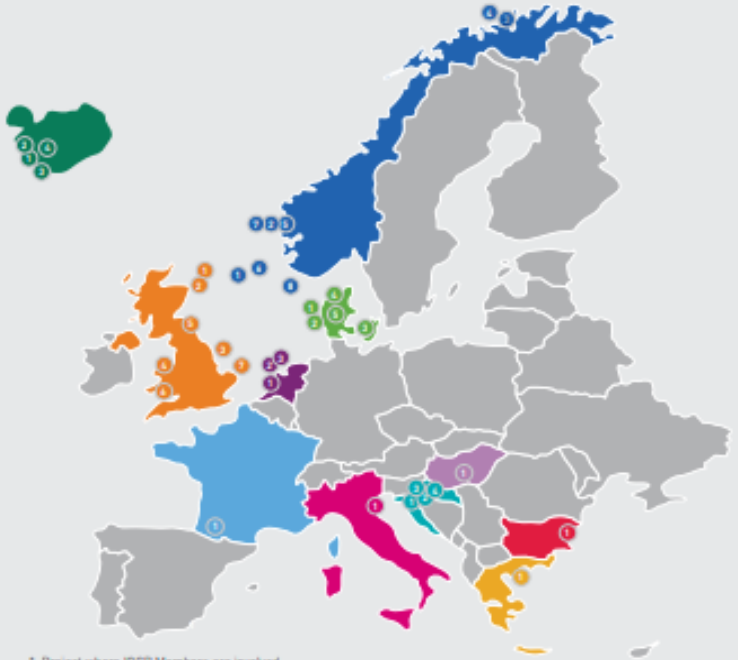
ICELAND
1. **Orca**
2. **Silverstone** (IF)
3. Coda Terminal (IF)
4. Mammoth

ITALY
1. Ravenna CCS*

THE NETHERLANDS
1. Porthos* (PCI)
2. Aramis* (PCI)
3. L10 CCS*

NORWAY
1. **Sleipner***
2. Longship (includes Northern Lights)* (PCI)
3. Barents Blue
4. **Snøhvit***
5. Smeaheia*
6. Trudvang*
7. Luna*
8. Havstjerne*

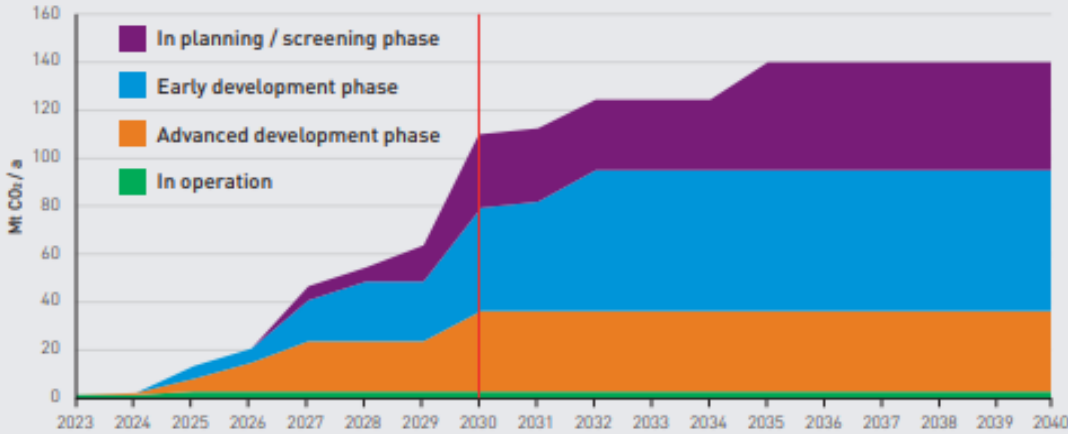
UK
1. Acorn*
2. Caledonia Clean Energy
3. Zero Carbon Humber*
4. HyNet*
5. Net Zero Teesside*
6. South Wales Industrial Cluster
7. Bacton Thames Net Zero initiative*



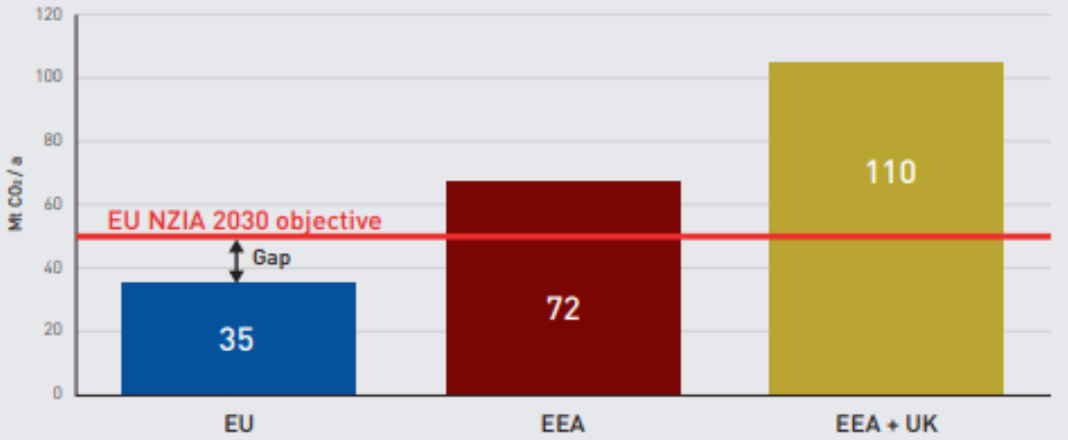
* Project where IOGP Members are involved
Projects listed in **bold** are in operation
(PCI) – Project of Common Interest
(IF) – Project supported by the EU Innovation Fund

EU	**17 projects** - 35 $MtCO_2/yr$ by 2030
Europe	**36 projects** - 110 $MtCO_2/yr$ by 2030

Build-up of CO_2 storage injection capacity in Europe



Regional breakdown of CO_2 storage injection capacity by 2030



Key numbers

EU

17 CO_2 STORAGE PROJECTS

8 COUNTRIES WITH CO_2 STORAGE PROJECTS

35 MT CO_2/YEAR CO_2 storage injection capacity by 2030

Europe

36 CO_2 STORAGE PROJECTS

11 COUNTRIES WITH CO_2 STORAGE PROJECTS

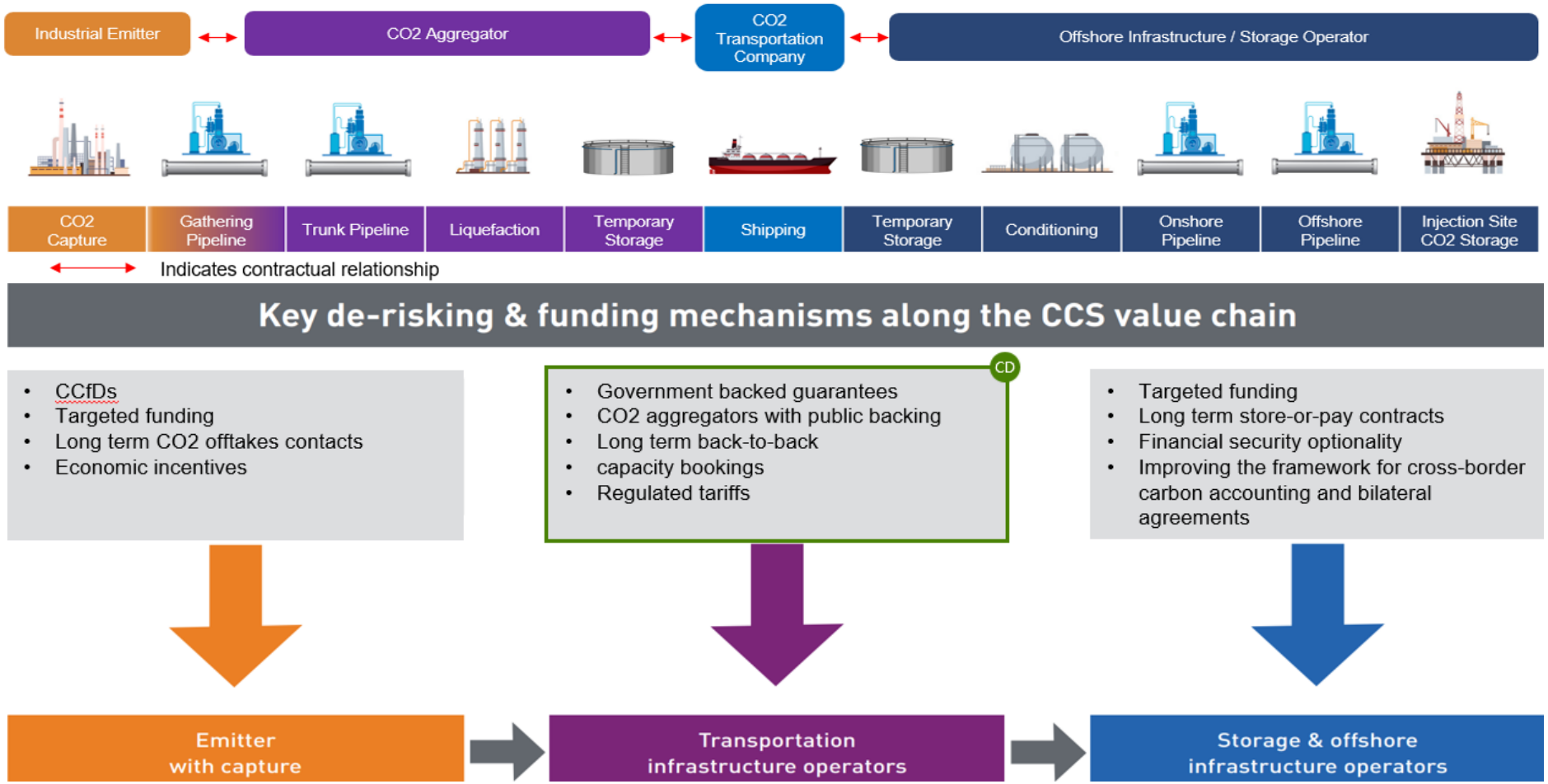
110 MT CO_2/YEAR CO_2 storage injection capacity by 2030

International Association of Oil & Gas Producers

CCS is a key enabler for a resilient energy system

- CCS is widely recognized as a key enabler of climate neutrality:
  - It is one of the only options to decarbonize energy intensive industries
  - When used with gas in power generation it reduces CO2 emissions by 90%
  - When used for producing hydrogen from natural gas it is one of the most cost-efficient in terms of €/CO2 abated
- CCS is back on the EU political agenda:
  - Net Zero Industry Act: establishes a 50MtCO2/y storage obligation for Oil& Gas entities by 2030
  - Industrial Carbon Management Strategy: sets actions needed to enable the development of the CCS value chain
- There is enough storage potential in Europe: about 500 GtCO2 to cover the CO2 demand from industry ranging from 0.3 to 1.4 Gt CO2 per year by 2050
  - Important role of bilateral agreements to unlock all storage potential
- But in Europe.. an enabling framework with economic incentives is still incomplete

Need for a sustainable business case for CCS projects



International Association of Oil & Gas Producers

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