

Russian gas in the Netherlands: How to decrease dependency

Public Webinar

14 June 2022



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A U R  R A

Power markets



Renewables



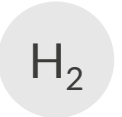
Storage



Electric vehicles



Hydrogen



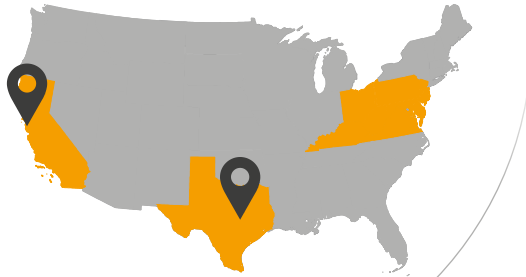
Carbon



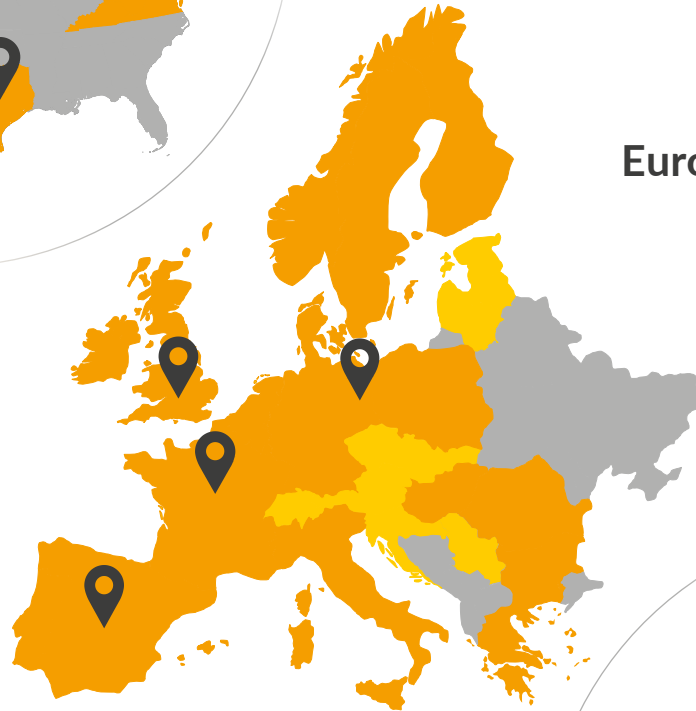
Natural gas



United States



Europe



Australia



 Regular detailed coverage  Analytics on demand



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market experts



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subscribing companies



100+
transactions supported in 2021

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Commissioned Projects

- Bespoke analysis, drawing upon our models and data
- Trusted advice for all major market participants proven in 600+ projects: transaction support, valuations, strategy & policy engagement



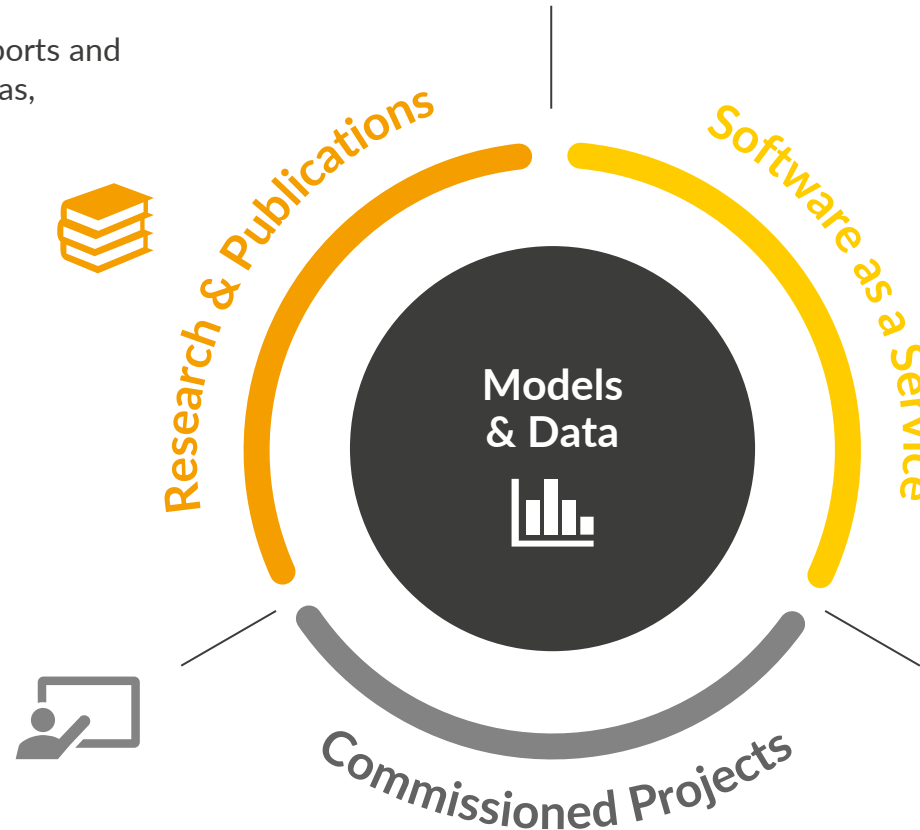
Software as a Service

- Out-of-the-box SaaS solutions, combining cutting-edge sophistication with unparalleled ease of use
- **Origin** provides cloud-based access to Aurora's market model, pre-populated with our data
- **Amun** automates asset-specific wind farm valuations for over 30 leading funds, developers and utilities



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The approach has succeeded – we are working with the industry's biggest players



"Aurora Energy Research is, I think, one of the smartest energy modelling companies around, and helped us on this Energy Outlook and continue to help us"

Spencer Dale, Chief Economist, BP



"Aurora's ability to forecast all the revenue streams relevant to UKPR's business model in a joined-up way sets them apart from their peers and has been very helpful to us in investment and business planning"

Tim Emrich, CEO, UKPR

ukpowerreserve

Power & utilities



Oil & gas



Energy consumers



Project developers



Financial sector & investors

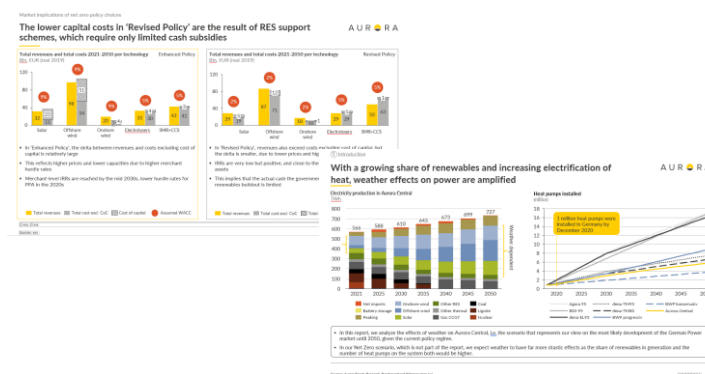


Policy & regulation



- **Policy outlook** detailing policy developments and their impacts
- **Yearly forecasts of wholesale market prices** till 2050 in three scenarios: central, high and low as well as an additional **Net Zero scenario until 2050**
- **Capacity development**, generation mix, capacity buildout, exports in four scenarios
- **Capture prices** of key technologies (onshore, offshore, solar) in three scenarios: central, high and low
- **Imbalance costs** for wind and Solar
- **NL Guarantee of Origin forecast** for wind and solar
- **Utilisation rates** of key thermal technologies along different efficiencies
- **EU-ETS carbon price forecasts**

- **In-depth thematic reports** on topical issues:
 - Outlook on SDE++ round
 - Business case for co-locating batteries
 - Risk of renewables build-out
- **Three multi-client roundtable discussions** per year in Amsterdam to discuss reports with actors across the Dutch power market (utilities, developer, investors, project finance, government, regulation)

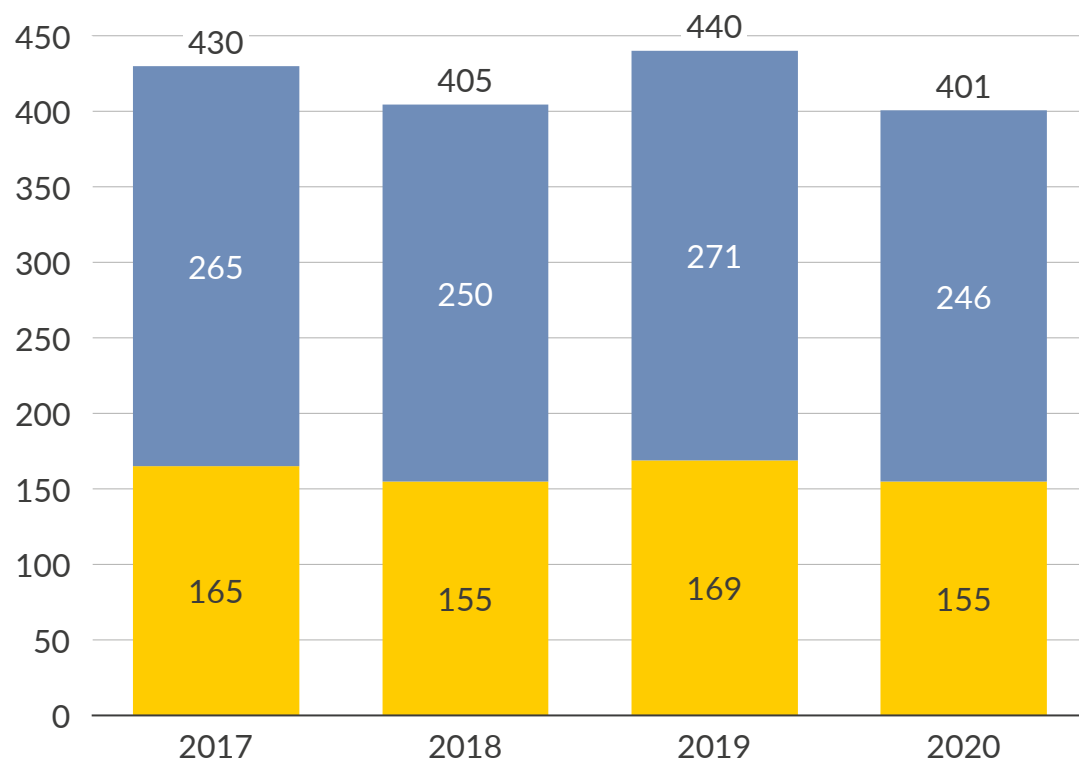


- I. Introduction
- II. Short term: the risk of Russian gas import halt
- III. Long term: development of gas supply
- IV. Long term: gas dependency of Dutch power system
- V. Long term: economic impact of gas supply

Currently the EU receives 40% of gas supply from Russia, though this is less for the Netherlands

Gross European gas imports¹

bcm



Share of Russian gas in European gross imports

38%

38%

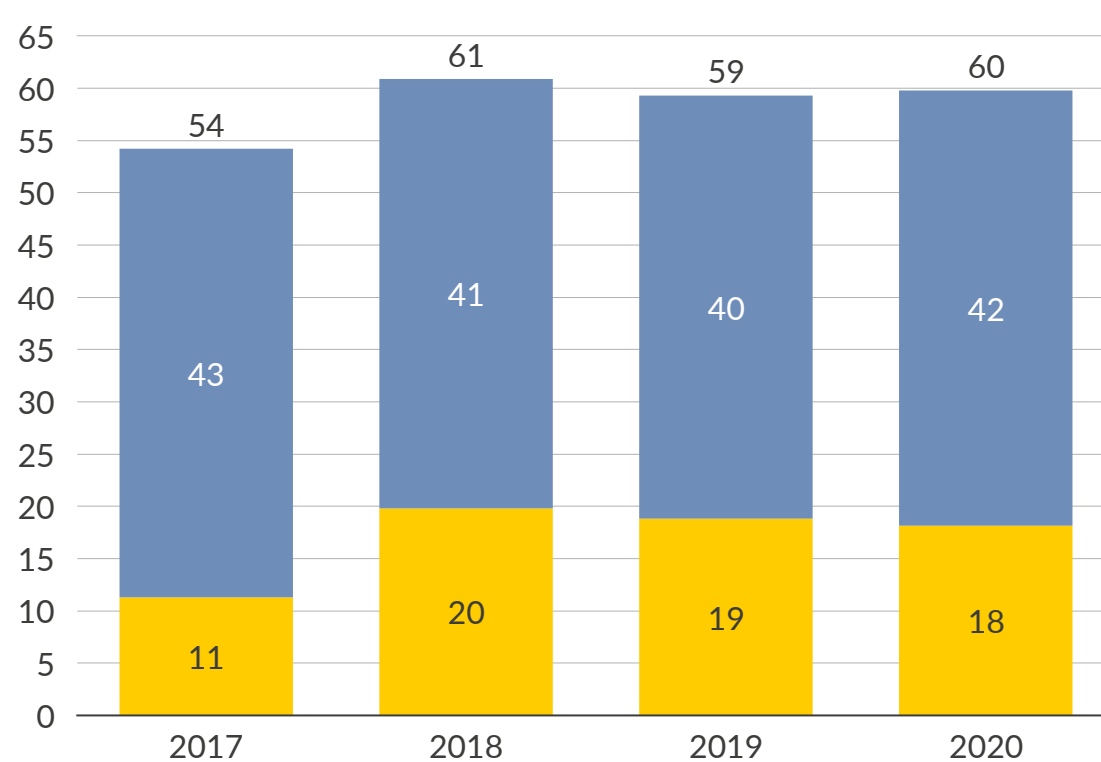
38%

39%

Other Russia

Gross Dutch gas imports¹

bcm



Share of Russian gas in Dutch gross imports¹

21%

33%

32%

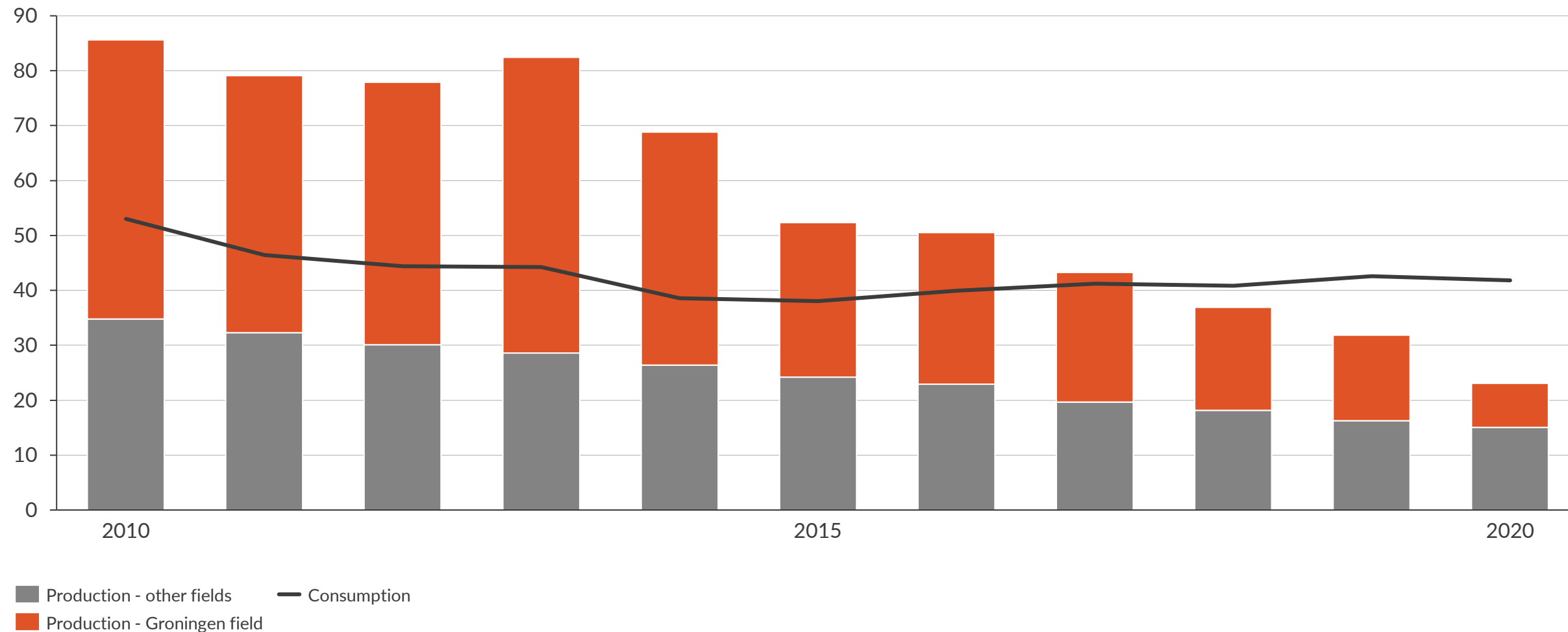
30%

1) Gross imports overestimates the imports of Russian gas to the Netherlands, since the Netherlands also exports some of the inflowing gas to other countries;

The Netherlands has become more dependent on imports of natural gas, as the Groningen field is phased out

Natural gas production & consumption in the Netherlands

bcm

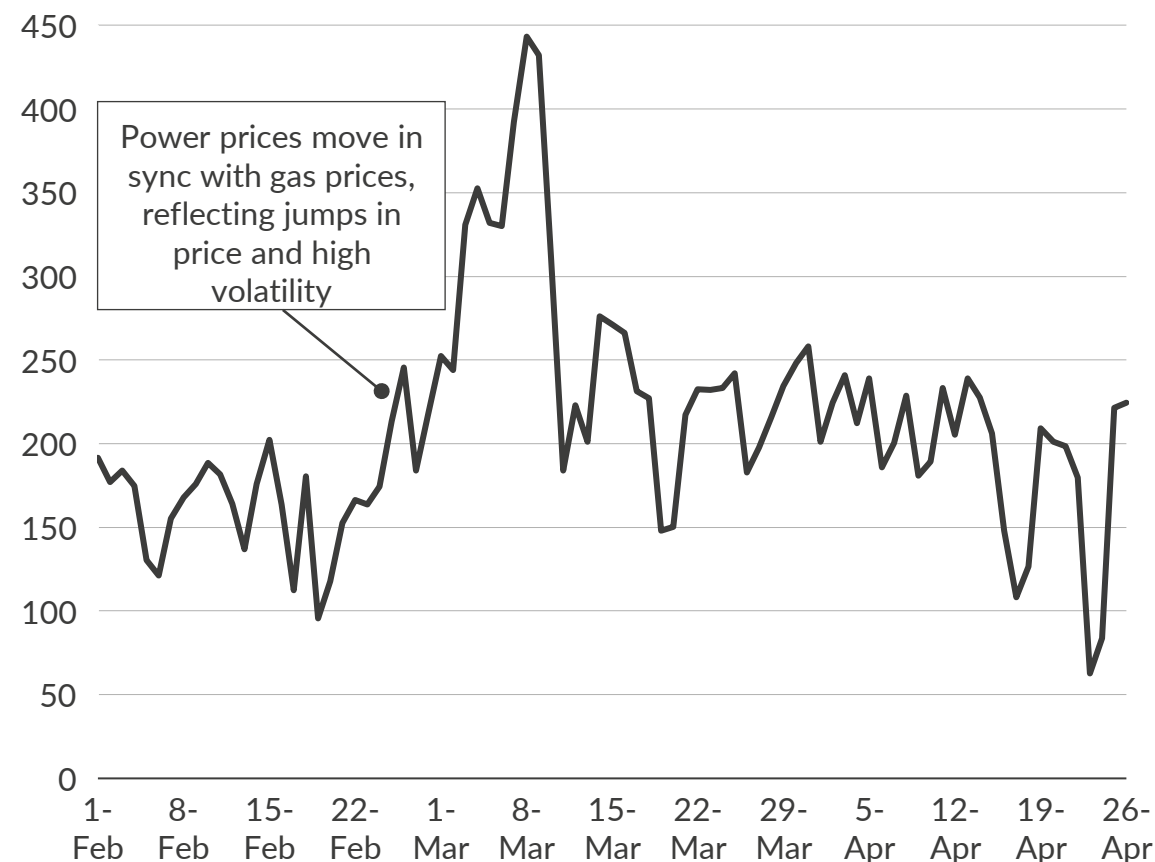


The recent price surge has laid bare the sensitivity to importing Russian gas for gas markets... and also for power markets

Dutch TTF forward prices^{1,2}
EUR/MWh (nominal)

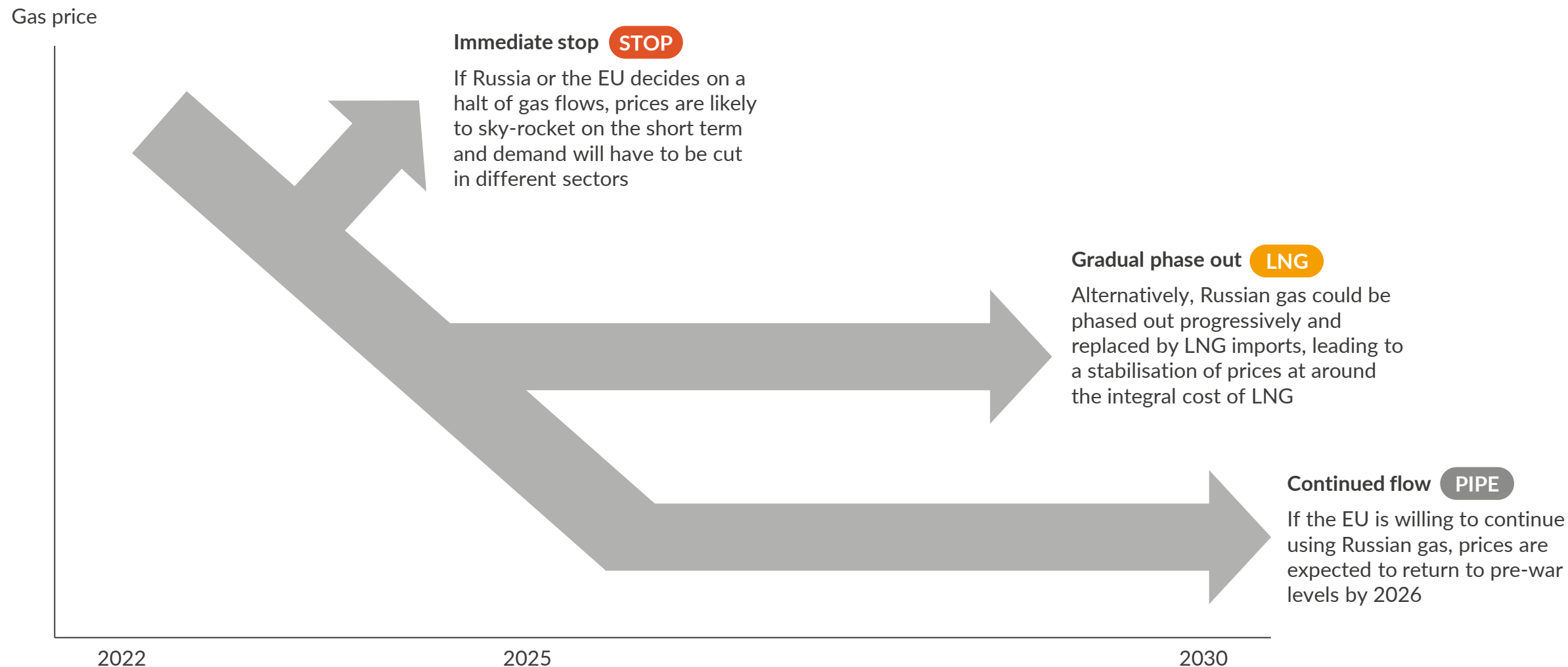


Netherlands day-ahead baseload power price
EUR/MWh (nominal)



1) ICE TTF futures. 2) Summer prices for delivery in April-September.

The EU aims to lower dependency on Russian gas but faces risk of sudden import stop; uncertainty is reflected in 3 gas scenarios



I. Introduction

II. Short term: the risk of Russian gas import halt

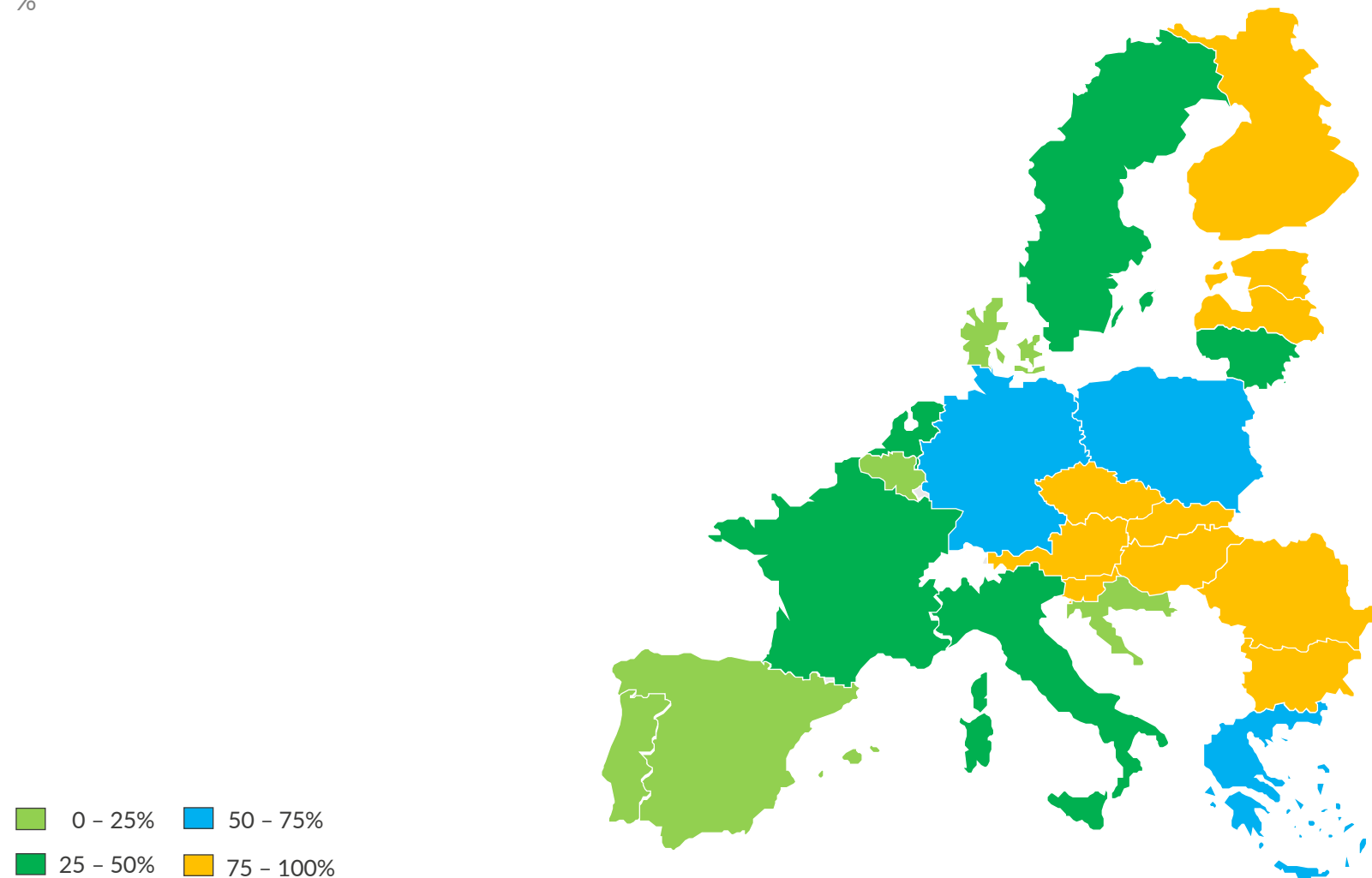
III. Long term: development of gas supply

IV. Long term: gas dependency of Dutch power system

V. Long term: economic impact of gas supply

For the Netherlands, the risk of gas shortages is limited, due to its LNG import capabilities, but Eastern Europe is especially vulnerable

Share of Russian gas in extra-EU imports¹ in January-June 2021
%

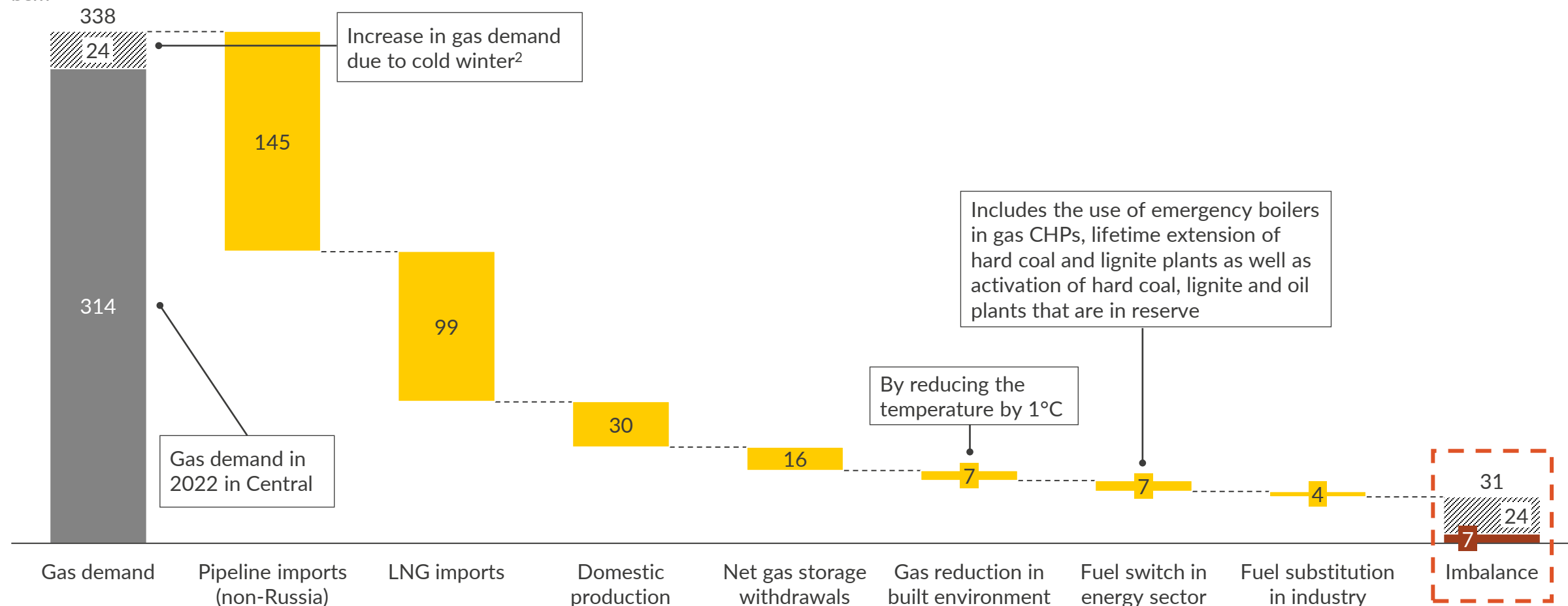


0 - 25% 50 - 75%
25 - 50% 75 - 100%

1) Pipeline + LNG flows. Share % of trade in value. Extra-EU trade flows (no intra-EU trading)

On a European level, a sudden halt of imports from Russia would lead to a short term gap, requiring demand cuts in industry

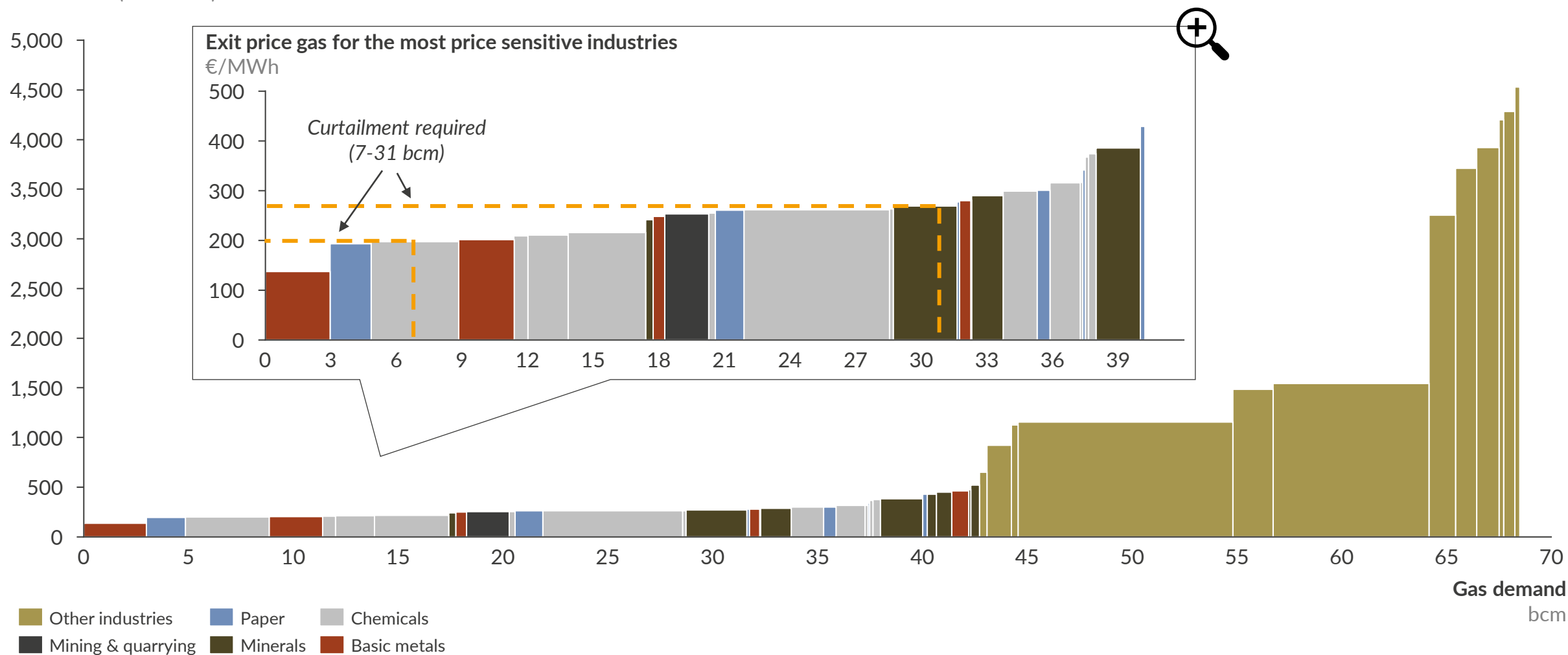
Gas demand and supply Apr-22 to Apr-23 - majority EU countries¹
bcm



1) Countries include 87% of the gas demand of all EU-27 countries 2) Based on the gas consumption in winter 2022 which was identified as an above-average cold winter (by comparing monthly degree day figures over the last 40 years)

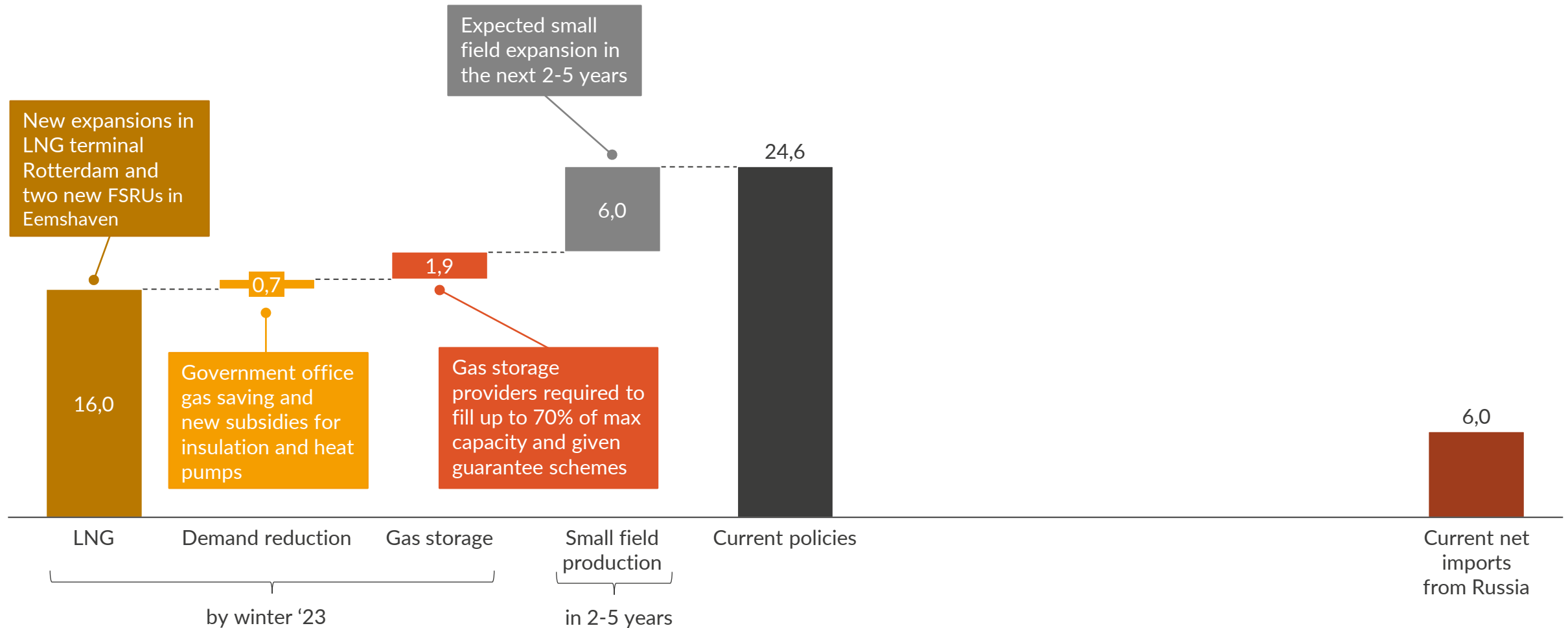
In order to incentivise sufficient demand reduction from industry, the gas price in 2022 needs to reach 200-270 EUR/MWh

Exit gas price for industry in EU-27
EUR/MWh (real 2021)



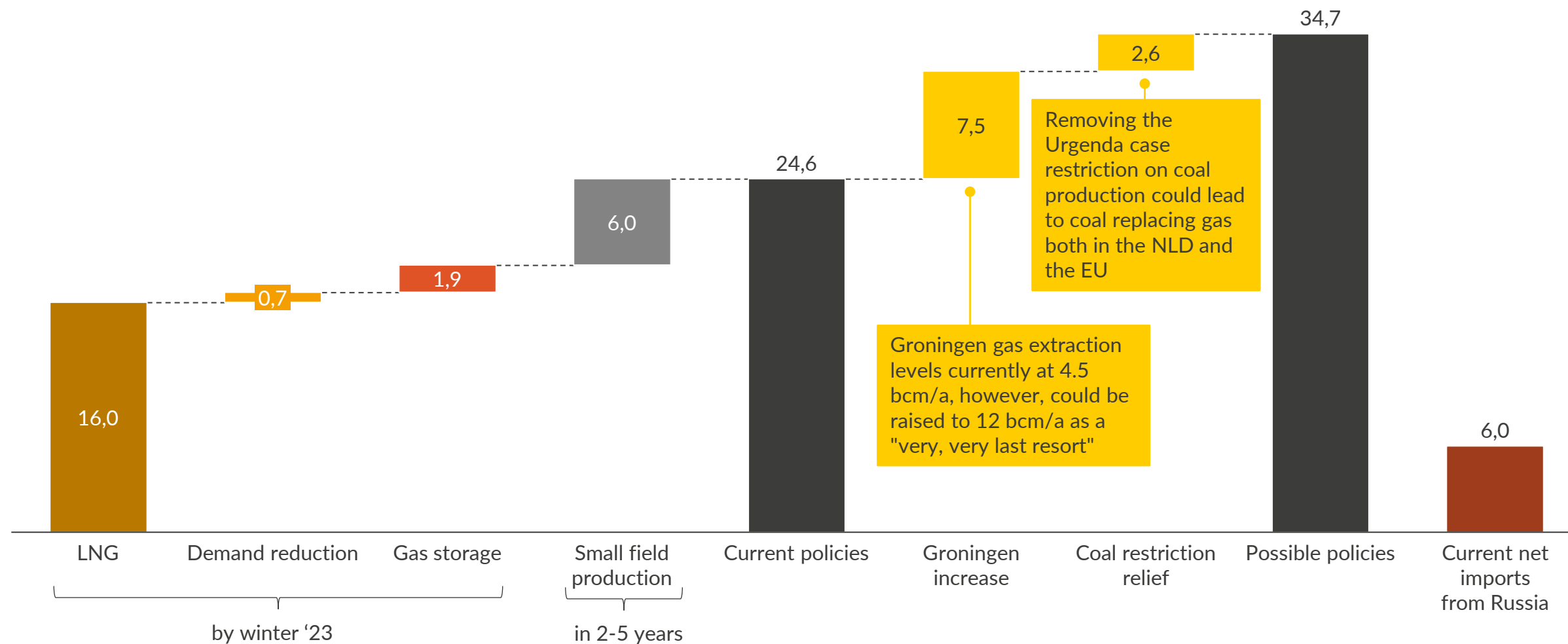
The Netherlands is taking its own measures to get rid of Russian gas imports by the end of the year

Gas impact
bcm/year



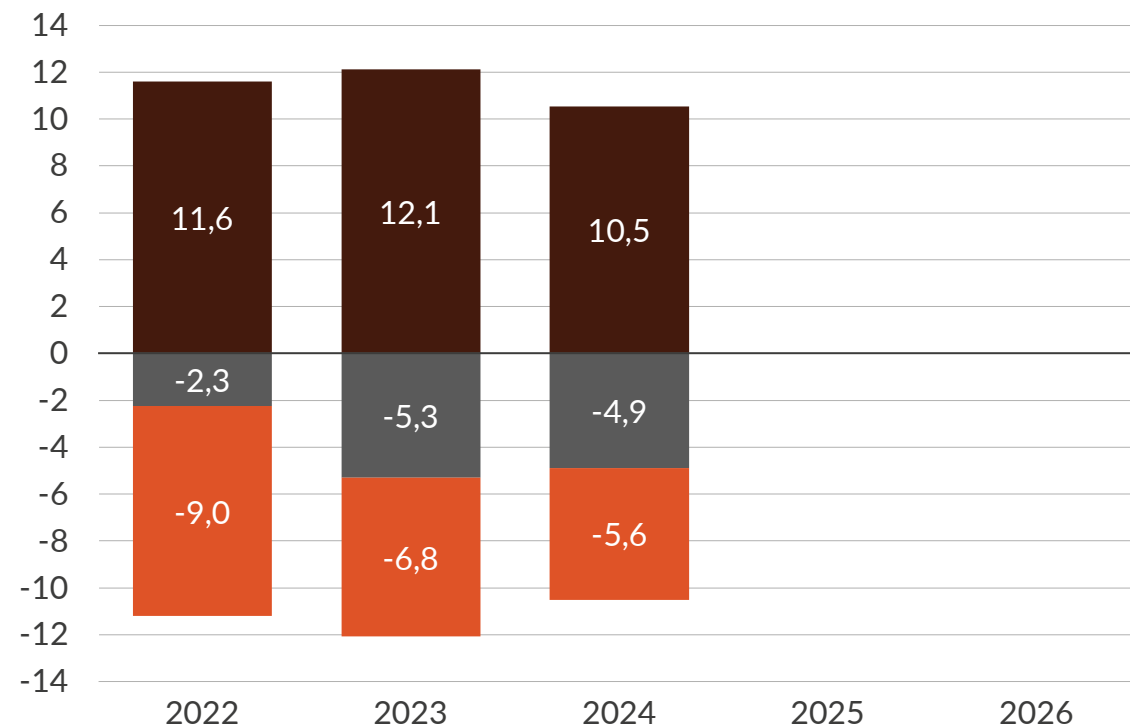
Additional measures could be taken on the short term to reduce gas imports by a further 10 bcm

Gas impact
bcm/year



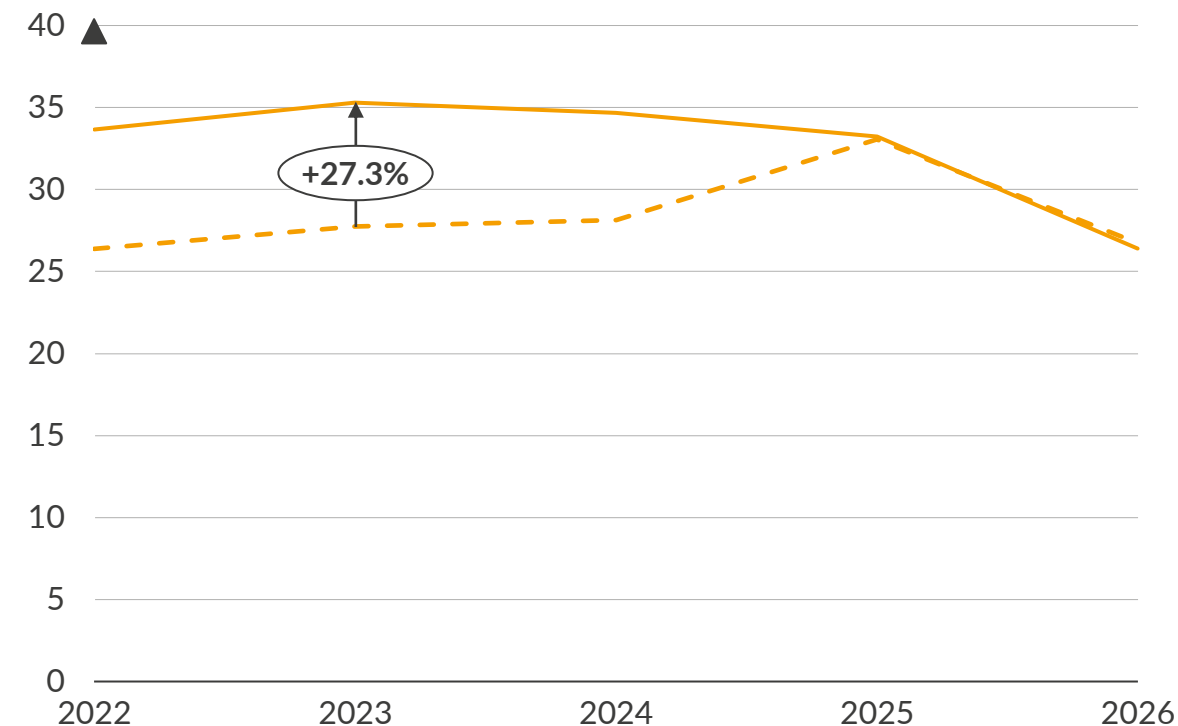
Coal plant run restriction relief reduces gas consumption with up to 2.6 bcm, but lead to higher domestic emissions, which would hurt the Urgenda target

Generation delta compared to Central¹
TWh



- Drop in domestic gas consumption of ~0.9 bcm/year
- Reduction of up to 1.7 bcm/year² of gas use in other countries

Emissions Dutch power sector¹
Mt CO₂e



- The Urgenda ruling set a target of 25% GHG reduction for NLD
- It does not specify the emission target for the power sector

■ Coal and cofiring ■ Gas CCGT ■ Net imports

— Coal restriction relief - - Central - Apr-22 ▲ Historical 1990

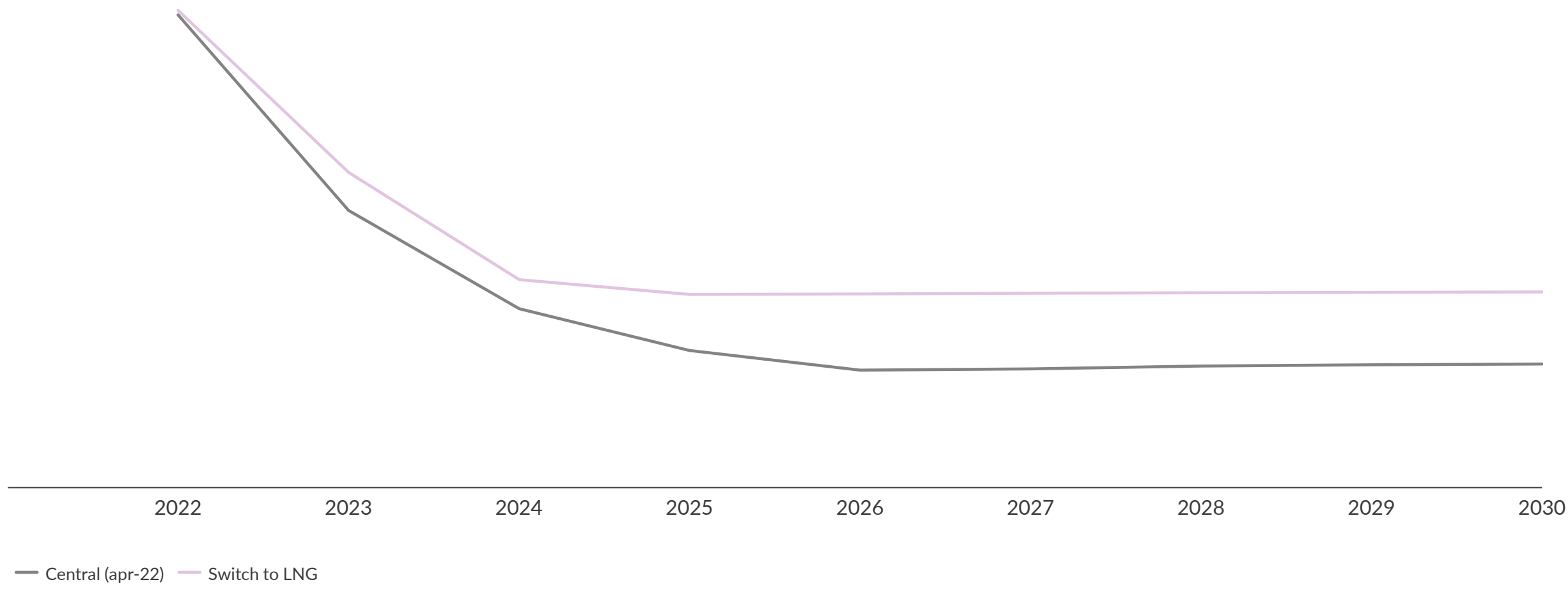
1) For 2022 we calculated the impact in case the restriction would have been lifted at the start of the year 2) assuming the gas plants replace imports with the European average fleet efficiency of ~45% (HHV)

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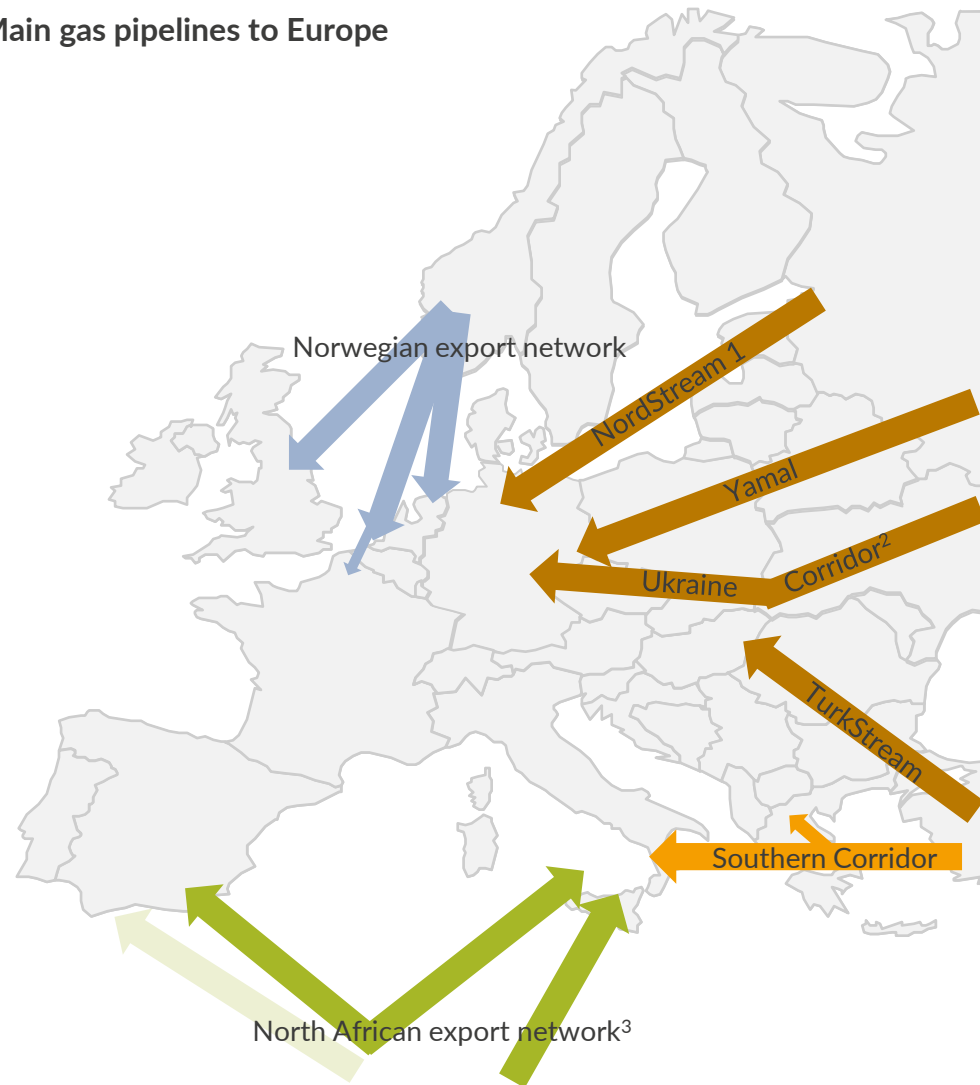
In Central, gas prices drop by 2025, whereas a complete phase out of Russian pipeline gas leads to higher long term prices

Gas price
EUR/MWh (real 2021)

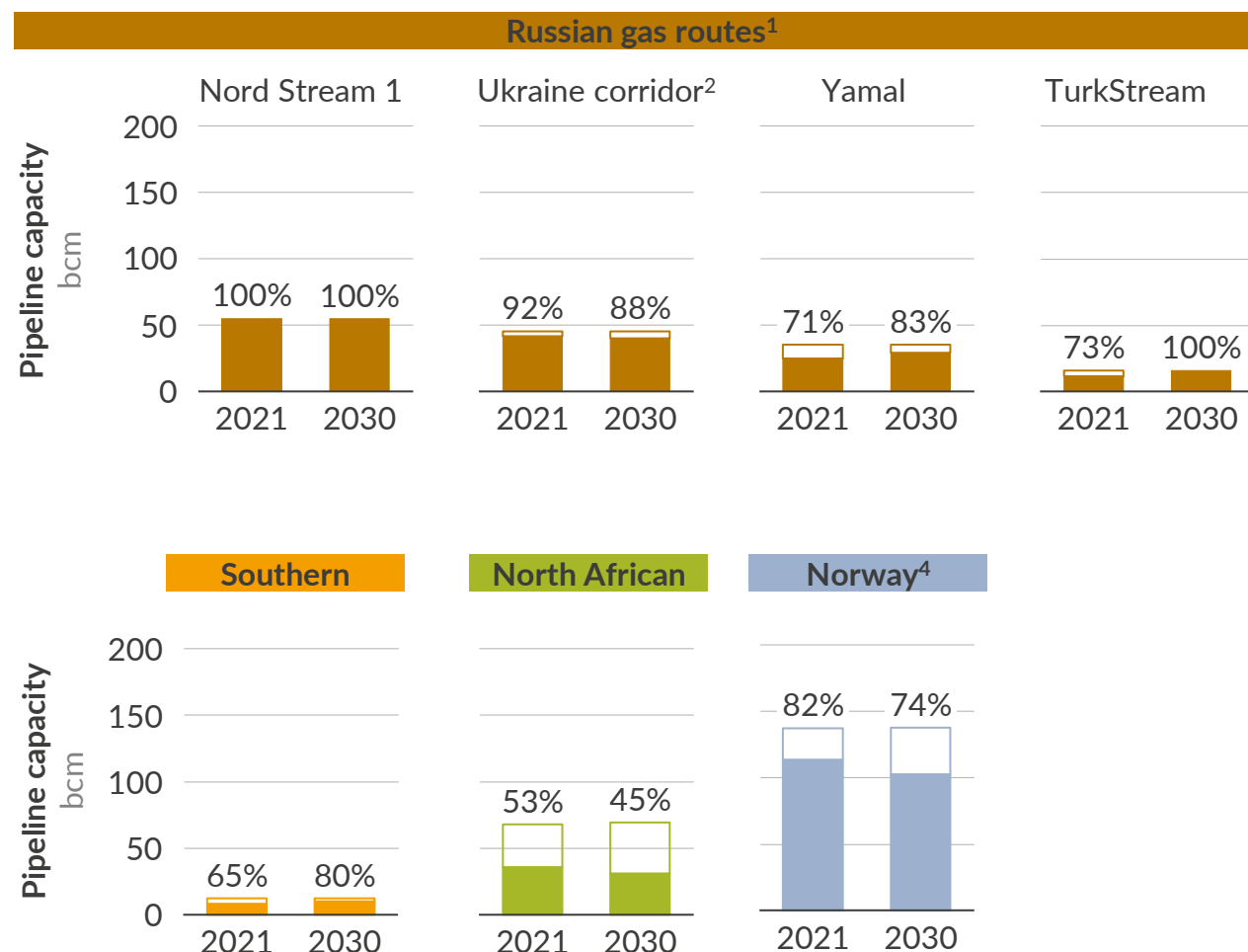


In our Central scenario, Europe continues to depend on Russian pipeline gas, reflected in high utilisation of pipelines

Main gas pipelines to Europe



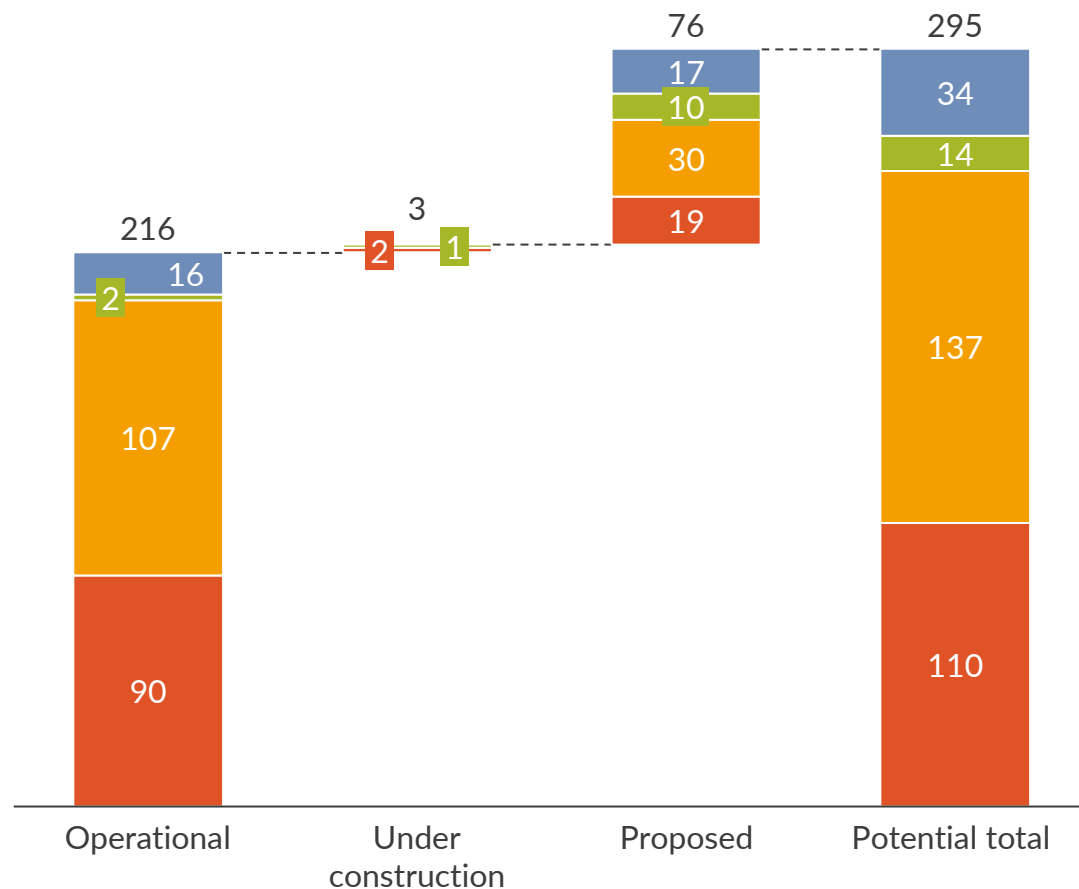
Pipeline load factors (Numbers on top of the bar chart)
%



1) We assume Nord Stream 2 to be indefinitely suspended as a result of sanctions on Russia following Ukraine invasion. 2) We assume the Ukraine corridor remains partially mothballed. 3) Flows along the Maghreb-Europe Gas (GME) Pipeline are suspended amid a diplomatic dispute between Algeria and Morocco over Western Sahara. 4) Norwegian pipeline capacity based on quickest single-day pipeline exports.

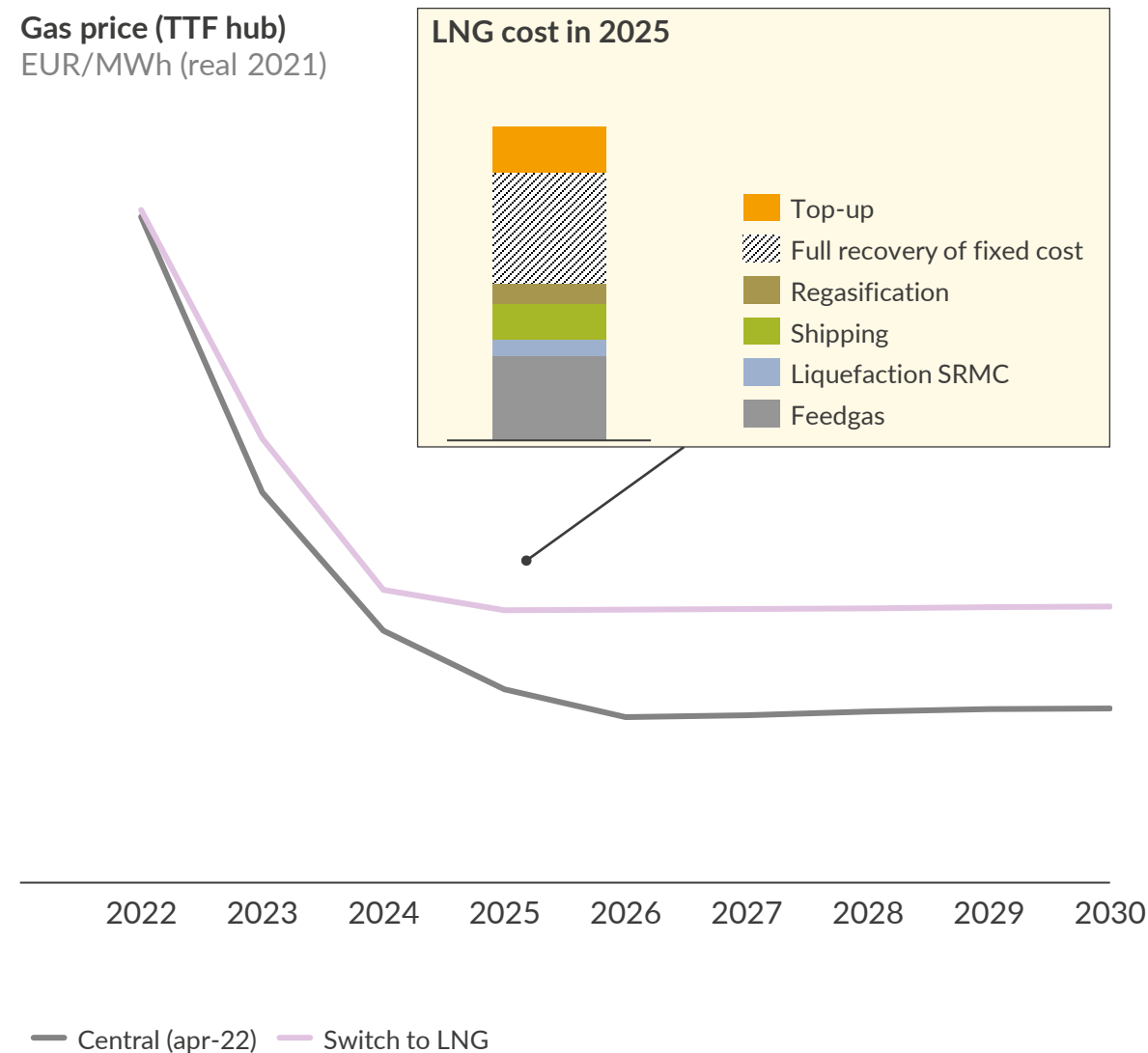
Under the switch to LNG scenario, the expansion of LNG terminals allow for a full phase out, but gas prices rise to cover the full cost of LNG

LNG regasification terminal capacity in Europe
bcm/a



■ Eastern Europe ■ Northern Europe ■ Northwest Europe ■ Southern Europe






Gas price (TTF hub)
EUR/MWh (real 2021)



Agenda

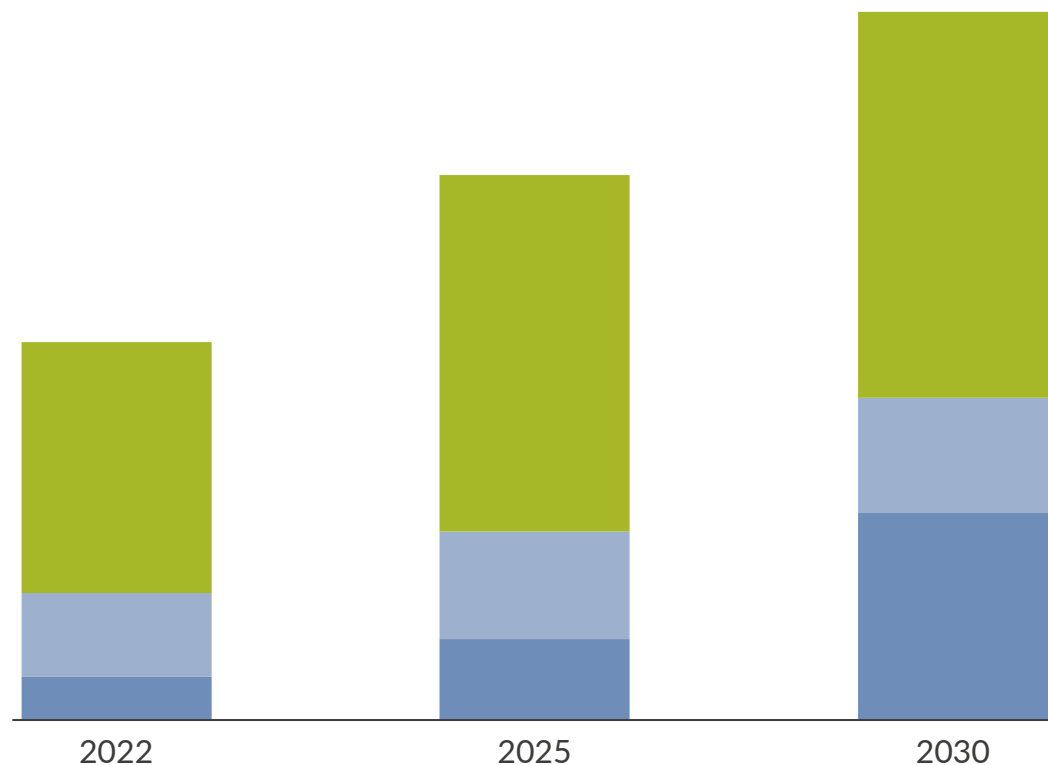
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To asses long term gas dependency in the Netherlands, we analysed different pathways of decarbonisation and gas supply scenarios

Central Decarbonization			Accelerated decarbonization
Gas demand reduction	 Renewables	XX GW by 2030	XX GW by 2030
	 Electrification of Heat	XX TWh_e by 2030	XX TWh_e by 2030
	 Electrolysers	XX TWh_e by 2030	XX TWh_e by 2030
Gas Supply	 Continued flow	Central Scenario	Net Zero Scenario
	 Switch to LNG	LNG Scenario	NZ LNG Scenario
			Not covered in today's session

Up to 2030, a strong build out of renewables takes place, with build out of solar and offshore wind well above average historical rates

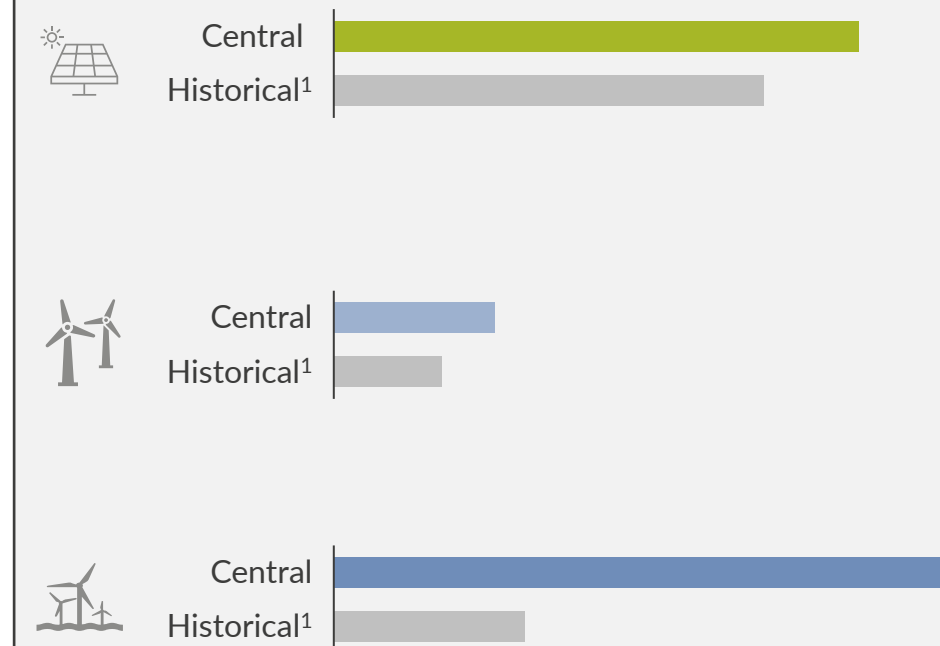
Installed intermittent RES capacity
GW



 Solar  Onshore wind  Offshore wind

1) Historical average annual gross buildout from 2010 to 2020.

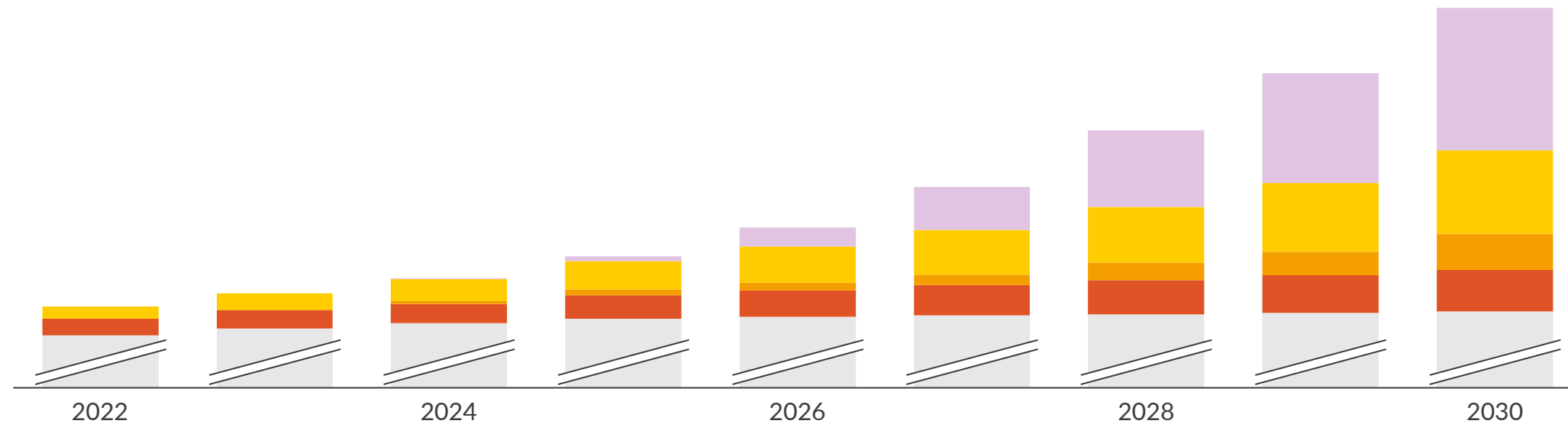
Required average annual buildout 2022-2030
GW/year



At the same time, a push for electrification driven by economics and government policy leads to a large growth in electricity demand

Electricity demand - Central

TWh



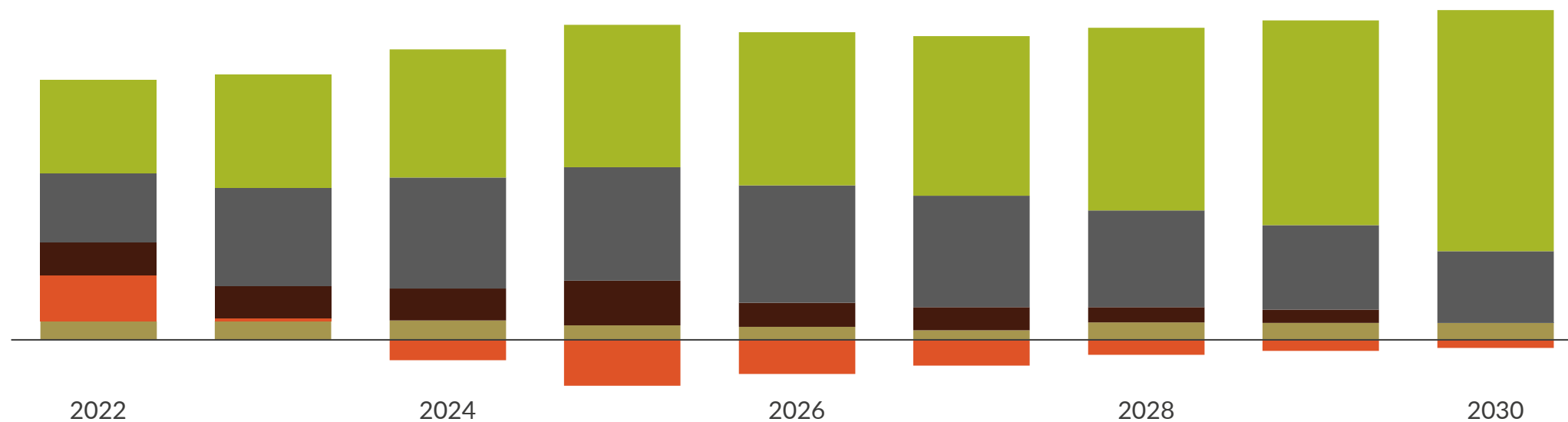
Base Heat pumps Power to heat EV Elektrolyzer

Higher gas prices in the LNG scenario lead to lower gas production and higher imports and coal production in the mid 2020s

A U R  R A
PIPE LNG

Generation - Central

TWh



Delta in generation - LNG

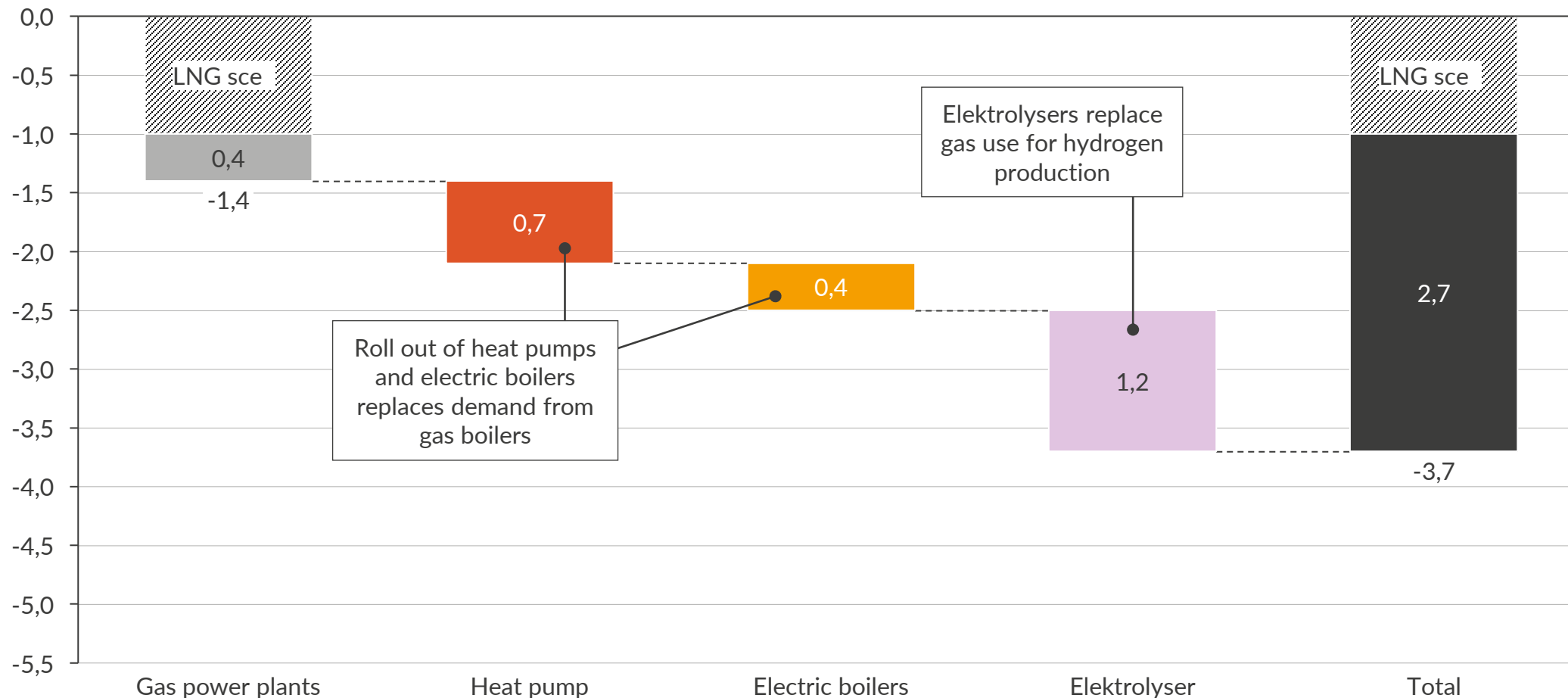
TWh



Renewables Gas Coal and cofiring Net imports Other

Gas consumption in the power sector drops with 0.4-1.4 bcm/year; electrification leads to a further 2.3 bcm reduction by 2030

Delta gas consumption 2030 vs 2022 - Central
bcm/year



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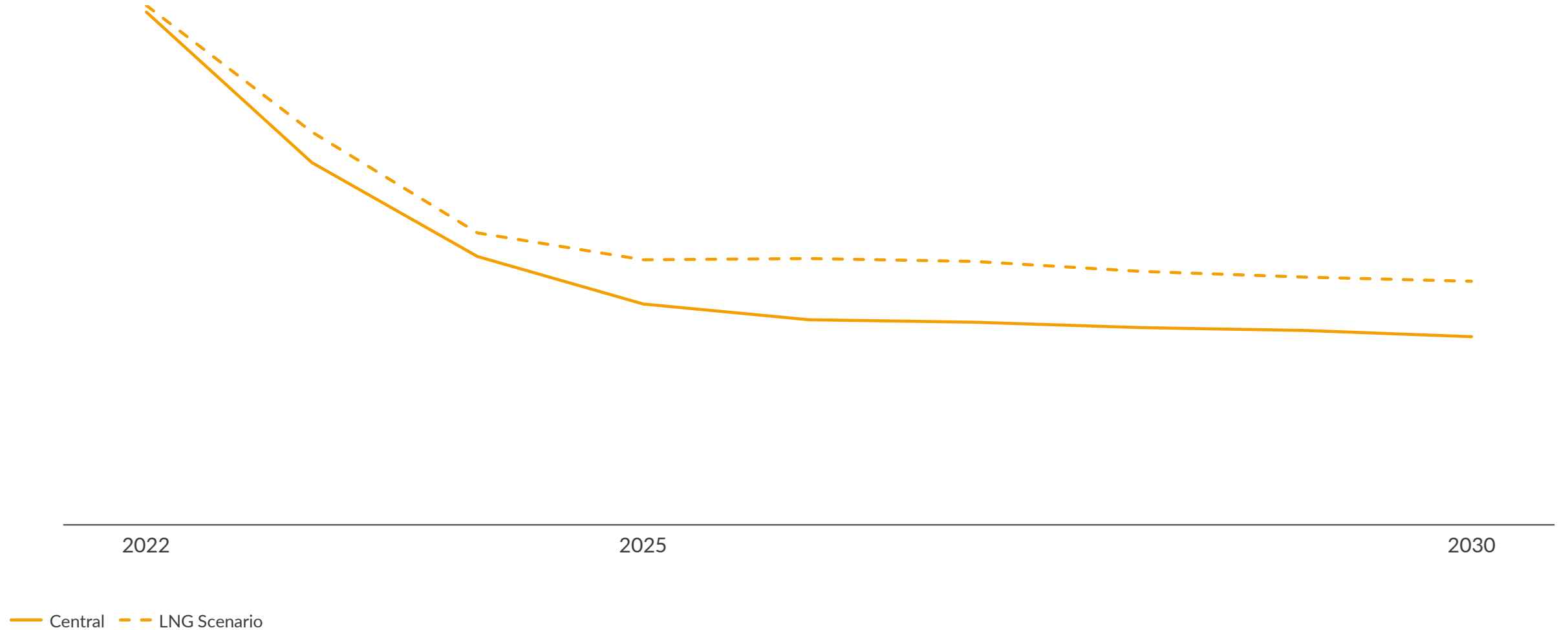
Baseload prices fall in the early 2020s, but a switch to fully LNG gas supply keeps them above 88 EUR/MWh

A U R  R A

PIPE

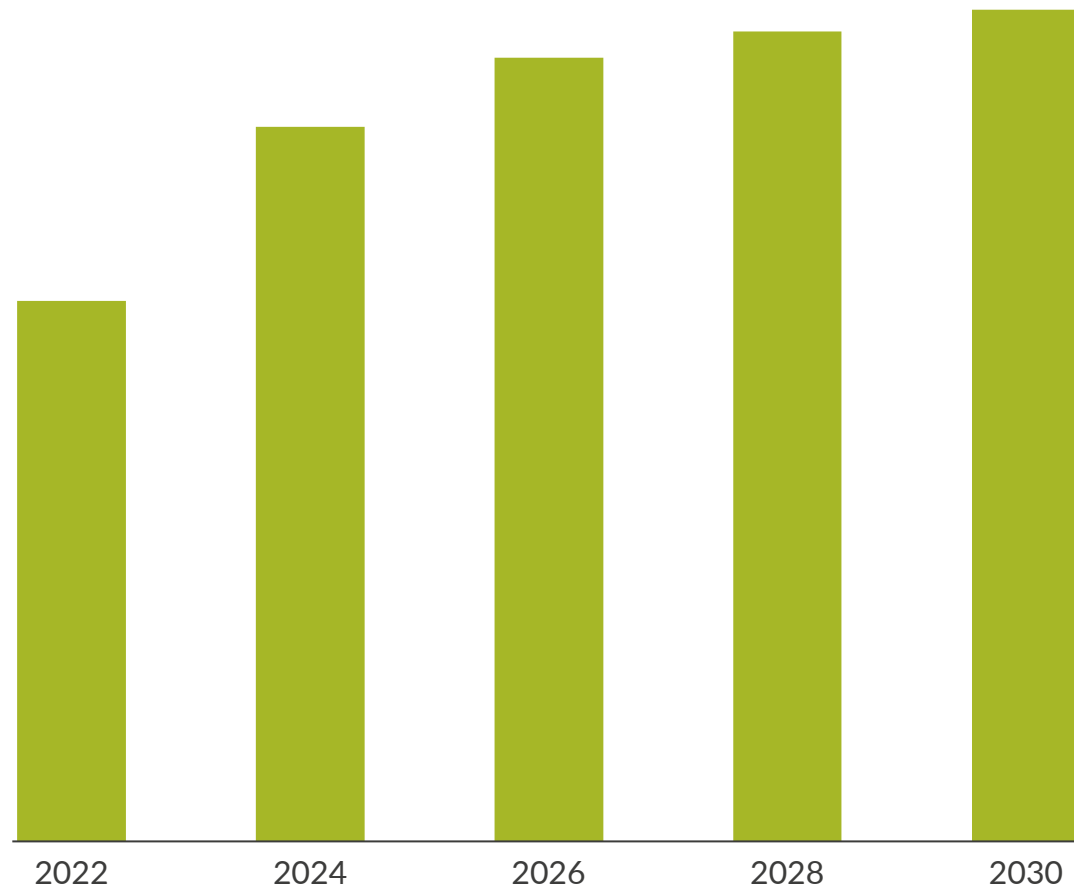
LNG

Baseload wholesale electricity price
EUR/MWh (real 2021)

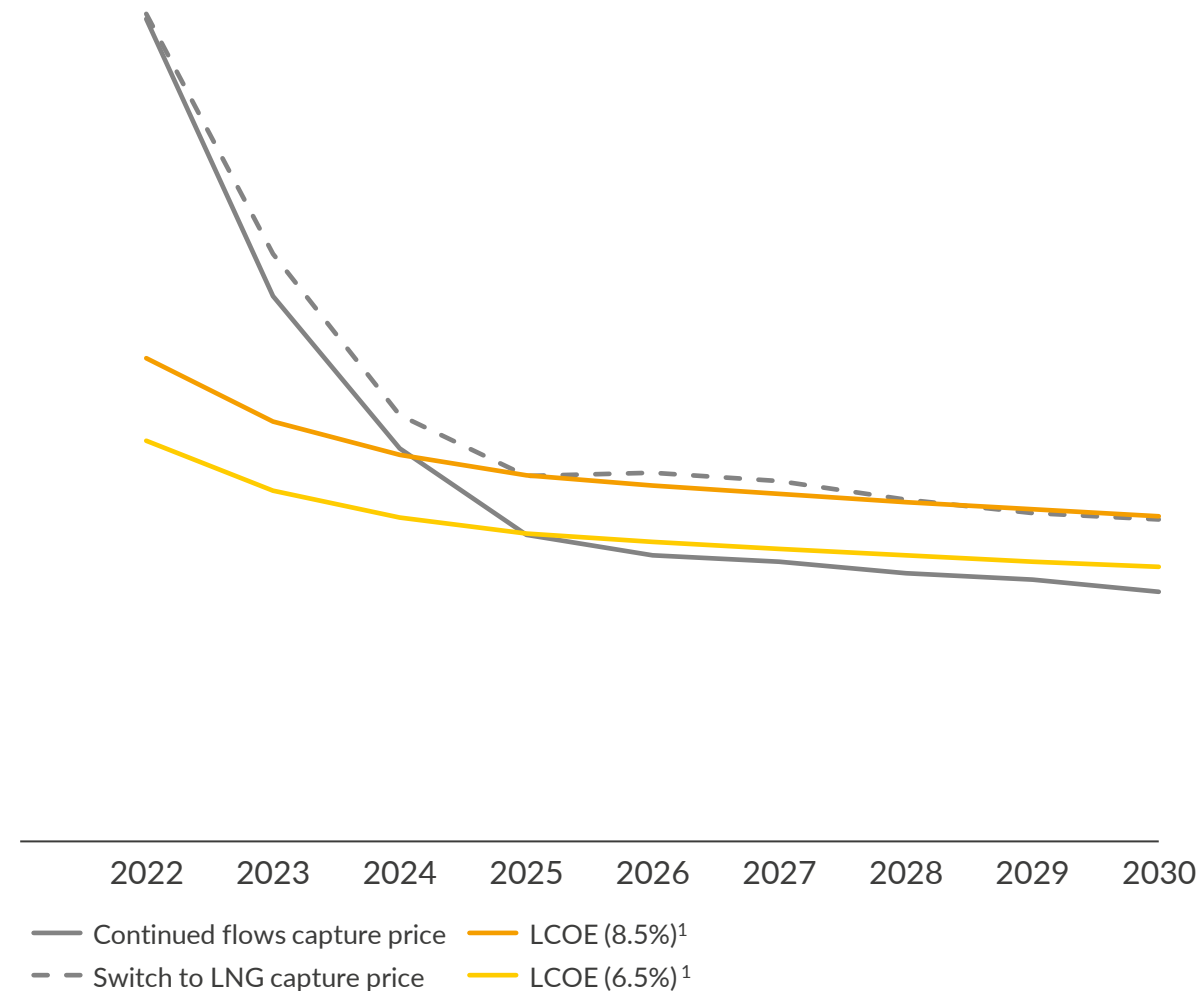


In Central and Net Zero, returns for merchant solar fall below 6.5%, but reach 8.5% and above with a switch to LNG

Installed solar capacity
GW



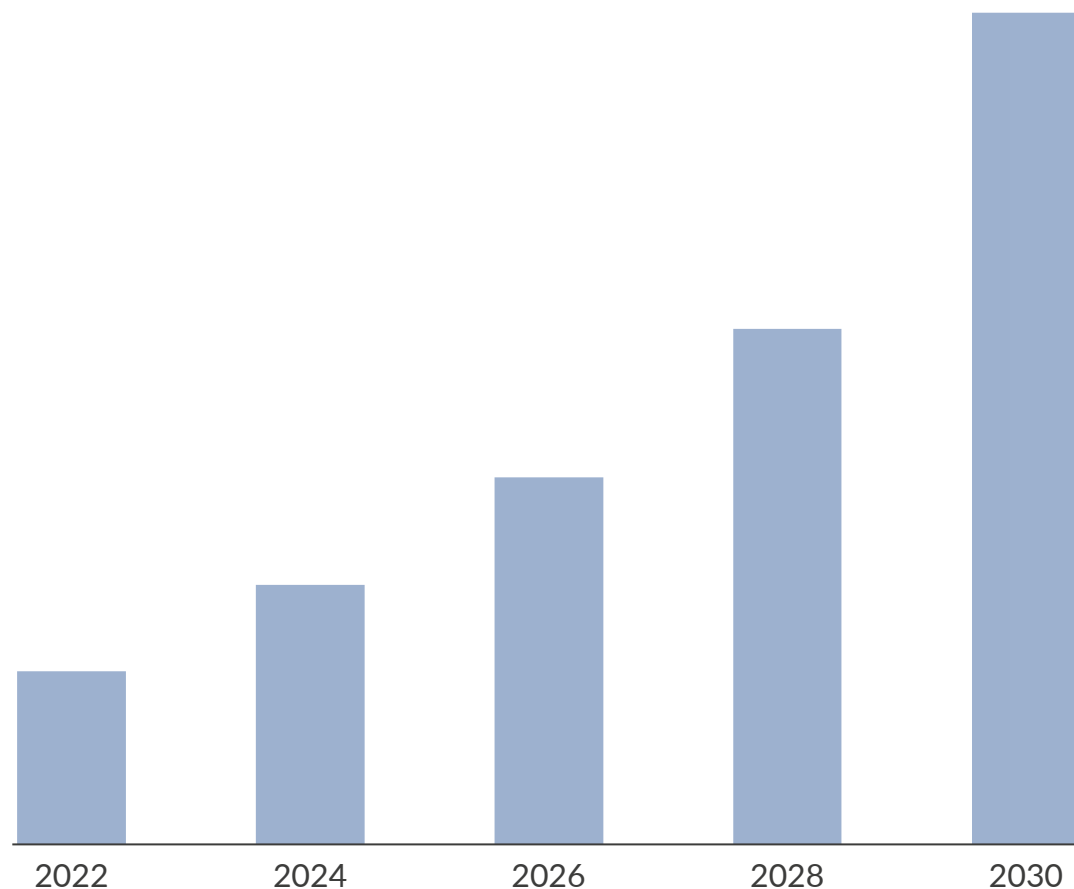
Solar capture prices and LCOE
EUR/MWh



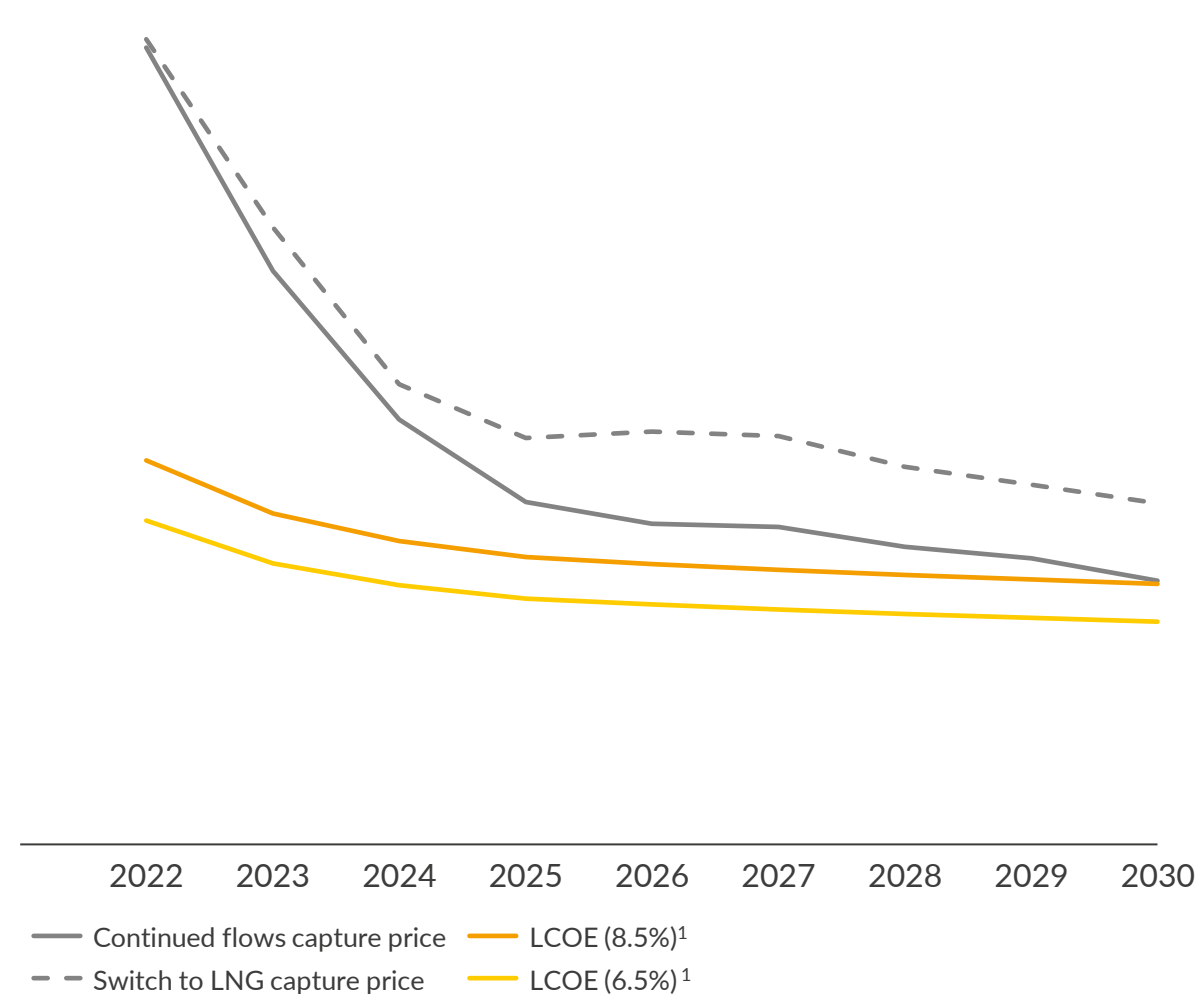
1) Merchant build out assumes WACC of 8.5%, whereas 6.5% is assumed for projects with a PPA

Offshore wind already builds out on merchant basis, higher gas prices would enable further expansion of capacity

Installed offshore wind capacity
GW



Offshore wind capture prices and LCOE
EUR/MWh



1) Merchant build out assumes WACC of 8.5%, whereas 6.5% is assumed for projects with a PPA

AMUN our leading software solution addressing the critical need for asset-specific wind valuation, helps our clients hastened wind build out

A U R O R A



Transactions



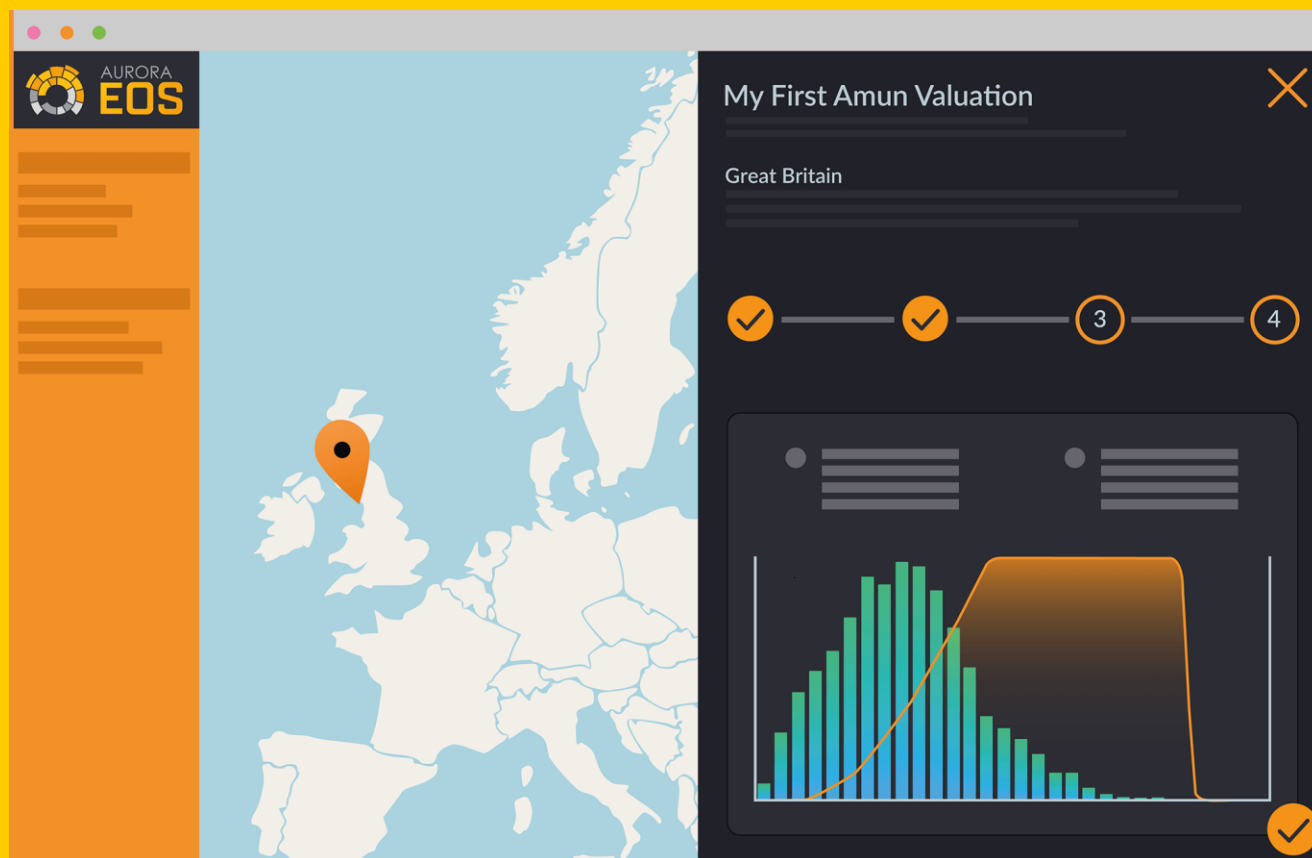
Site Selection



Portfolio Management



PPAs



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- 2 Asset-specific, bankable price and revenue forecasts in minutes
- 3 Unlimited access – making one-off consultancy fees history
- 4 Supporting the biggest wind transactions and valuing the largest portfolios
- 5 Backed by Aurora's data and models, and supported by our wind and market experts

Key take aways of this report

- An immediate halt of Russian gas import would create a European demand deficit, driving gas prices up to 200-270 EUR/MWh to incentivise sufficient industrial demand cuts.
 - Dutch implemented policies have a net effect of 19-25 bcm/year on Russian gas demand.
 - Additional measures could have up to 8-10 bcm/year effect, by ramping up Groningen gas field and ease coal plant restrictions.
- If Russian gas is not completely phased out, gas plant generation in 2030 is only slightly lower than current levels, leading to only 0.4 bcm/year reduction. The effect of renewable built out is evened out by increased electrification, less coal, and lower imports.
 - In case of a full phase out of Russian gas, gas usage would reduce with a further 1.0 bcm/year decrease, due to a gas to coal switch.
 - Indirectly electrification leads to a larger decrease in gas consumption, with 2.7 bcm/year impact by 2030.
- Towards 2025, gas prices will fall to close to historic levels if Russian gas continues flowing, whereas a full phase out (i.e. switch to LNG) would lead to structurally higher gas prices, which would push up power prices by 2030
 - In our Central scenario, post-subsidy build out of renewables is limited by the lower gas prices
 - Under the switch to LNG scenario, further build out of renewables on a merchant basis would be possible

Details and disclaimer

Publication

Russian gas in the Netherlands: How to decrease dependency

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