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Sustainability & Climate

Natural gas demand outlook to 2050

Summary for Policymakers

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Summary for Policymakers

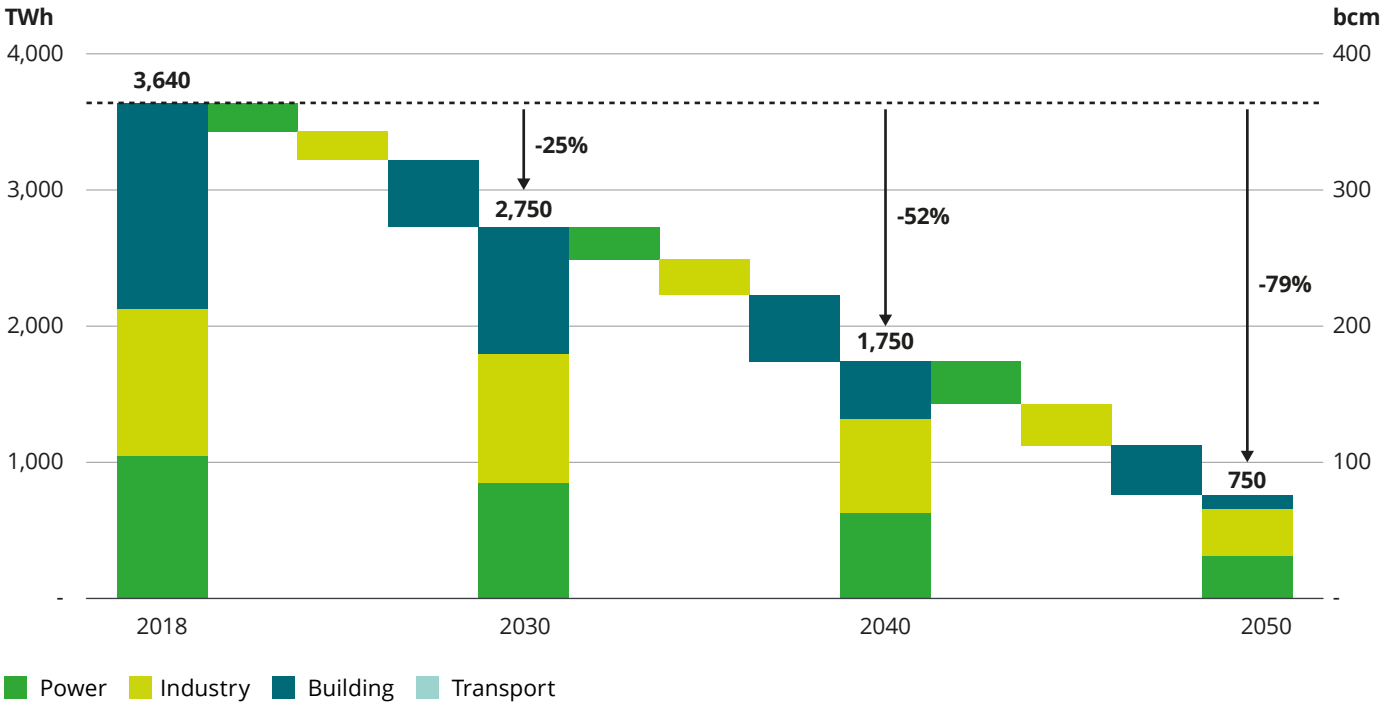
Natural gas constitutes a major component of the global energy system. This industry is facing fundamental challenges as part of the transition towards carbon neutrality. In 2020, natural gas accounted for about a quarter of the total primary energy supply at the global level, in the European Union (EU) and in Germany. Until recently, the supply mix of the EU was largely reliant on Russia, which supplied 45% of EU's imports and approx. 40% of its total gas consumption in 2021. However, reducing greenhouse gas emissions, including from natural gas, is now at the top of political agendas for many countries around the world, with both Germany and the EU aiming to achieve net zero by 2045 and 2050, respectively.

Sparked by the Russian attack on Ukraine and the subsequent geopolitical upheaval, global energy markets have undergone a significant shift, particularly in Europe and Asia. Russia wielded its natural gas exports as an economic weapon against Europe, further accelerating the long-term phase-down of natural gas in the EU in the context of the energy transition. An unprecedented energy price hike triggered an inflationary shock, inciting economic turmoil and market tightness in countries particularly reliant on Russian gas, like Germany. Against this backdrop, the EU launched in May 2022 the REPowerEU plan, a wide-ranging policy response to save energy, to secure and diversify supplies (including by increasing the shipments of Liquefied Natural Gas, hereafter LNG), and to accelerate the clean energy transition.

These geopolitical tensions, together with serious security of supply concerns, raise numerous questions about the future of natural gas. The question of whether, when, and how Russian natural gas supplies could return to global markets adds to the uncertainty. Some governments have started to consider the option of (re)engaging public support for new natural gas projects, despite previous commitments to end international public financing of unabated fossil fuel projects made at COP26 in 2021. A clear vision of the outlook for natural gas demand is the basis for a robust assessment of supply needs and the potential implications for new gas exploration and production projects.

Leveraging a data-driven and model-based quantitative analysis, the study shows a significant decrease in future natural gas demand in the EU and Germany in the period to 2050. We rely on a scenario-based approach, in which EU member states deliver on their climate commitments. We do not impose phase-down constraints for natural gas, but adopt instead consensus assumptions on core drivers of demand. Compared with 2018 levels (taken as the reference year), the reduction in projected demand amounts to more than a quarter by 2030 in both the EU and Germany. By 2040, the reduction is in the range of one-half in the EU (see Figure SPM-1) to two-thirds in Germany (see Figure SPM-2). By 2050, natural gas consumption represents only about 4% of total primary energy demand in the EU and about 1% in Germany. The phase-out is faster in Germany, which is leveraging greater economic prosperity into higher climate ambition, with a binding target of reaching net-zero emissions by 2045, underpinning a fair and just energy transition in the EU.

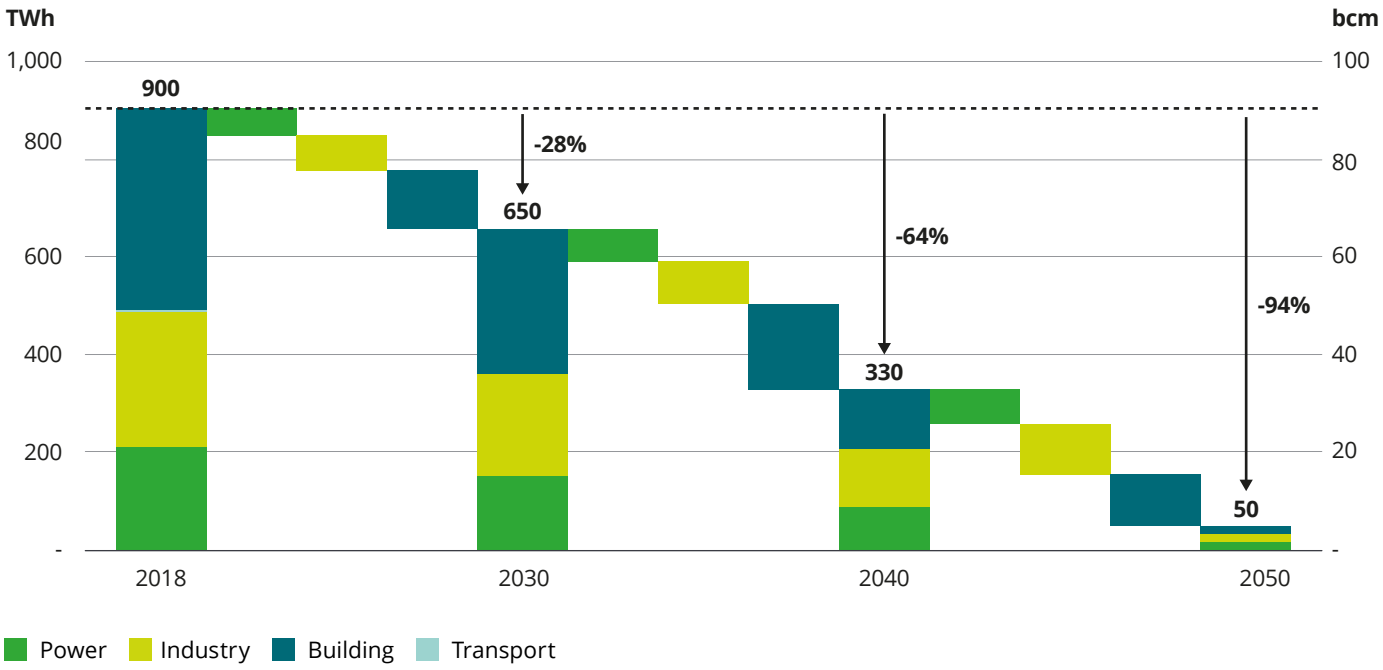
Fig. SPM-1 – Breakdown of natural gas consumption in the EU, 2018–2050



Source: Deloitte analysis based on the DARE model. Reference year 2018 is based on data from Eurostat (2023a).

This outlook shows a decrease in natural gas demand in all sectors. Fallings costs of clean technologies, increasing carbon prices, and the extensive use of renewable energy sources in the power system make the transition away from fossil fuels increasingly viable. The building sector (residential, tertiary, and district heating) contributes the most to the decrease by 2030, leveraging abatement options such as thermal retrofits and heat pumps. By 2050, natural gas plays only a marginal role in buildings, mostly in district heating. Decarbonization efforts gain momentum in the power sector, with an almost full phase-out of coal from EU electricity generation by the end of this decade. Natural gas use significantly declines in industry from 2030 onwards, prompted by growing access to low carbon electricity, the dawn of the clean hydrogen market, and the deployment of biomass-based heat production.

Fig. SPM-2 – Breakdown of natural gas consumption in Germany, 2018–2050



Source: Deloitte analysis based on the DARE model. Reference year 2018 is based on data from Eurostat (2023a) and AG Energiebilanzen (2023a).

A benchmarking analysis of 15 recent energy outlooks confirms a consensus on declining demand for natural gas in Germany and the EU by mid-century. These studies cover scenarios with varying views on the future of energy systems, as well as the macroeconomic and climate policy contexts and technological assumptions. In Germany, all reviewed scenarios show a drastic decrease in natural gas demand from 2030 onwards. At the EU level, the reviewed scenarios with high climate ambition show a significant decrease in natural gas consumption by 2050. Our trajectories fall within the range of these studies.

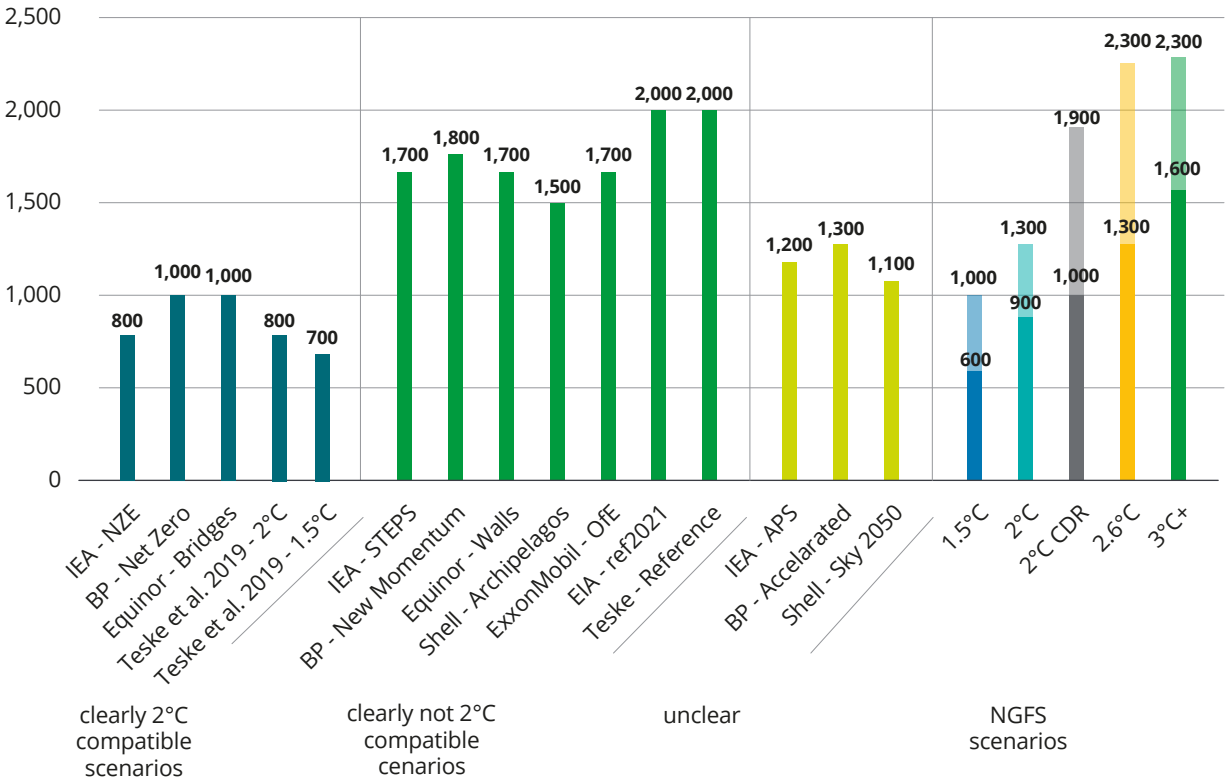
A review of more than 30 recent energy system projections on a global scale reveals that natural gas is also losing momentum in the global energy system on the pathway towards climate neutrality. In almost all scenarios compatible with keeping global warming below 2°C, the share of natural gas in the energy mix significantly decreases up to 2050 relative to 2020, with a demonstrable shift towards carbon-free energy carriers. This pattern is robust against a broad range of surveyed scenarios which rely on various assumptions about macroeconomic prospects, the availability and costs of new technologies, and the level of climate ambition.

Behind this trend of globally declining natural gas demand, different patterns emerge across regions. Pathways compatible with limiting global warming to 1.5°C show democratic industrialized countries reducing their natural gas consumption by 20% to 40% by 2030 compared with 2020 levels, followed by a strong phase-down by mid-century. By 2050, natural gas demand in these countries is between 7% and one-third of 2020 level. For the rest of the world, natural gas demand under these 1.5°C pathways broadly stabilizes at current levels before significantly decreasing from 2030 onwards, reaching a 40% to 50% drop in 2050 compared with today's demand.

The early and extensive deployment of carbon removal solutions to delay the phase-down of natural gas while meeting climate targets appears highly uncertain. Carbon Capture and Storage (CCS) solutions can certainly play an important role in achieving the energy transition in the long term (for instance, to reduce the environmental footprint of hard-to-abate activities, to supply carbon feedstock to the chemical industry, or to offset residual emissions). However, despite efforts over the past ten years, there is little reason to believe that a major political, economic, or technological breakthrough is imminent. Hence, CCS technologies do not seem sufficiently mature to be deployed within this decade on a scale that could enable the use of natural gas to be extended while complying with climate commitments.

Current proven natural gas reserves are sufficient to meet global projected demand in the mainstream scenarios that are consistent with the Paris Agreement. At the global level, current reserves (excluding new discoveries) are at least twice as high as cumulative global natural gas consumption by 2050 under trajectories consistent with keeping

Fig. SPM-3 – Cumulative primary energy supply from natural gas from various global scenarios, 2020–2050



Source: Oeko-Institut analysis based on Global-ScenSe-DB.

global warming under a 1.5°C pathway. **If all reserves were to be completely burned and the resulting CO_2 released into the atmosphere, this alone would most likely result in an increase in the global mean temperature of 1.5°C** or more above preindustrial levels. The analyses show that the global use of natural gas must be limited to less than 1,000,000TWh in the period 2020 to 2050 if the global average temperature increase is to be kept to well below 2°C (see Figure SPM-3). All exploration, production, export and import infrastructure projects should be aligned with this limit to avoid further climate impacts, lock-in effects, and stranded assets on a large scale.

The high geographic concentration of natural gas reserves in a few countries poses security of supply challenges for importers, including the EU. Except for Russia, Algeria, and Norway, none of the top 10 reserve and production countries is within significant pipeline reach of Germany and the EU. Due to supply constraints in Norway and North Africa (already connected via pipeline to the EU), in the short term, additional imports can thus only arise through the LNG route. The LNG market is dominated by three suppliers: the US, Qatar, and Australia (with global market shares of approx. 20% each). Despite political interest in improving the diversification of supply, concentration of the LNG market can hardly be reduced quickly in view of the location of reserves and the infrastructure constraints.

New investment decisions in new natural gas production projects located outside the EU and targeting the German and the EU market raise several risks.

- **Against the backdrop of declining global demand, there is a risk that new investments end up stranded.** As demonstrated by our detailed modelling of the European energy system, deep cuts in the consumption of natural gas are inevitable in the context of a speedy energy transition. The consensus established in the literature clearly indicates that, to meet climate targets, many consuming regions (including China) may have already reached peak consumption, or are likely to do so in the next 10 to 15 years, before they enter into a phase of significant demand reduction. With an operational life that typically spans several decades, new exploration and production projects barely comply with the Paris Agreement targets. As such, there is a major risk that such investments, especially if primarily aimed at exporting natural gas, end up stranded. This applies particularly to new or small-scale producing regions (especially in Africa), where the production and shipping infrastructure need to be created from scratch or greatly expanded. This, in turn, raises the broader question of how to foster growth opportunities in developing and emerging markets to ensure a fair global energy transition.

- **Beyond short-term investments to compensate for the loss of Russian gas, the contribution of new production and export projects to improve German and EU energy security and diversification appears limited.** Given the capacity constraints of existing infrastructure and high concentration of natural gas reserves, such projects would only marginally diversify supply at least in the short term. Furthermore, the sharp decline in demand envisaged by numerous outlooks is expected to reduce security of supply concerns and political pressure for diversification in the medium and long term.

- **Government support from EU countries would raise questions about consistency with climate and development goals.** It would blur the strong commitments made by EU countries to promote the global energy transition. It could also encourage beneficiary countries to embark on a development trajectory that would be either unsustainable or incompatible with curbing global emissions.

Notwithstanding these fundamental concerns, our analysis suggests two important implications for any potential policy support from EU countries for new natural gas production and export projects, and for major expansions of existing infrastructure:

- **Factor the risk of stranded assets into project design.** If new investments in natural gas are pursued, they could incorporate ex ante plans, with accountable roadmaps, on how major parts of the facilities can later be repurposed into assets that support a country's energy transition, for example towards clean hydrogen and its derivatives. The adoption of best available technologies should be another prerequisite.

- **Limit lock-in effects by promoting agile business models and high governance standards.** For instance, business models that mainly rely on long-term contracts commit projects to operating over a fixed time horizon, while destination clauses freeze exports to the same destinations. Both gas-producing and gas-buying countries have therefore an incentive to prolong the use of gas-based technologies, even if alternative cleaner and competitive solutions become readily available. To promote flexible business models, governments could refrain from supporting projects based solely on long-term contracts and/or that include destination clauses. Improving governance standards will also be key to ensuring the timely transformation of assets and business models on the road to carbon neutrality. Otherwise, long-term financial and climate risks may outweigh potential medium-term benefits.

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