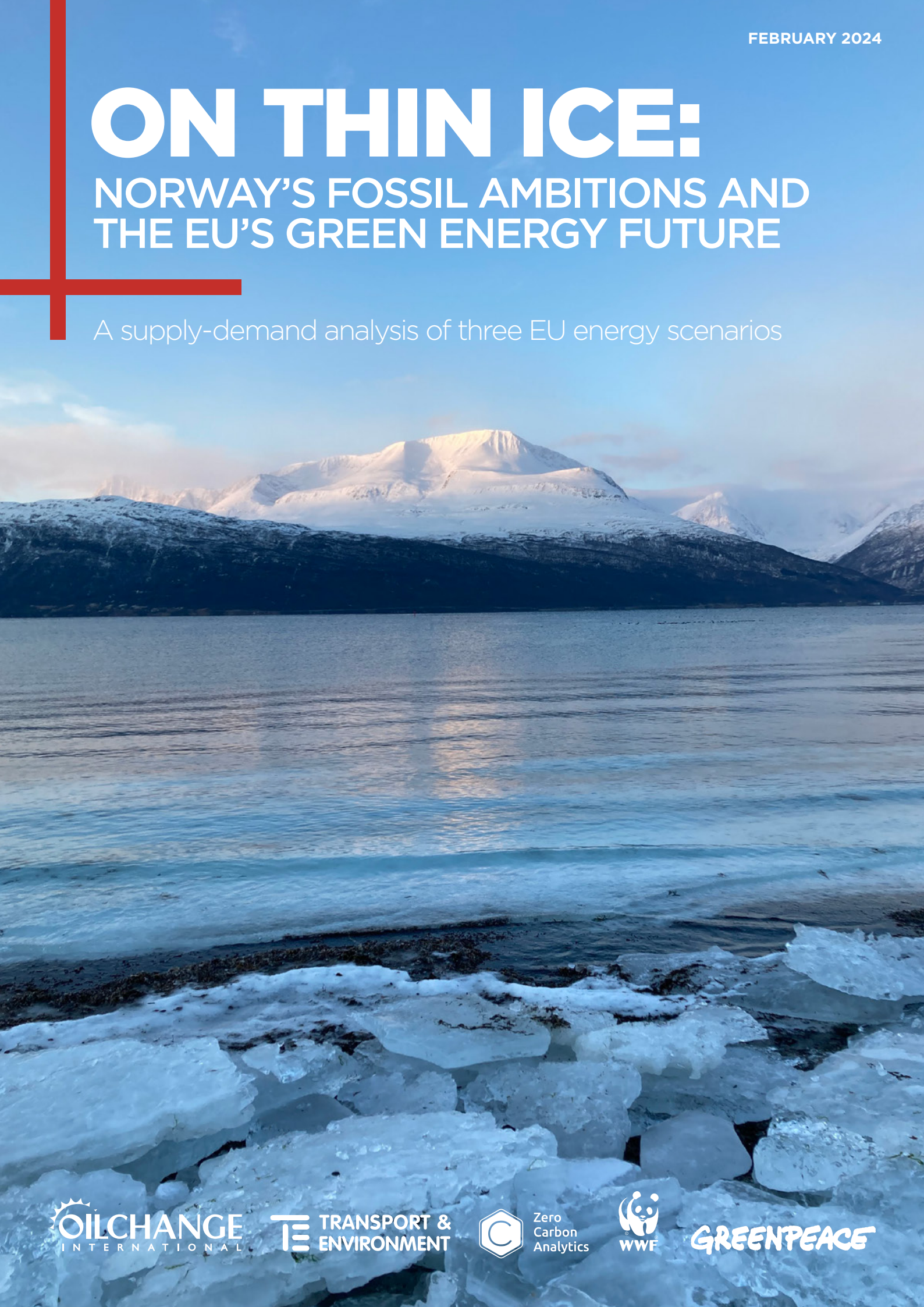
FEBRUARY 2024

ON THIN ICE:

NORWAY'S FOSSIL AMBITIONS AND THE EU'S GREEN ENERGY FUTURE

A supply-demand analysis of three EU energy scenarios



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ENERGY DILEMMAS FROM BARENTS TO BRUSSELS

This report provides a comprehensive analysis of the relationship between the European Union (EU) oil and fossil gas demand and oil and gas supply in future scenarios, with a focus on supplies from Norway. It looks at how declining demand caused by geopolitical events and an increasing need for sustainable energy will compare to projected production capacity.

Norway is essential in the European energy market, standing as the principal fossil gas supplier for the EU. However, the interests of Norway and the EU do not always coincide. In particular, the EU has expressed concerns about the further expansion of oil and fossil gas activity in Arctic areas. Norway, on the other hand, has distributed 141 exploration licences in the Arctic Barents Sea since 2010. The EU has also initiated policies that will decrease the demand for fossil fuels in the short and long term, while Norway has introduced policies to increase the supply of oil and gas.

In the wake of Russia's invasion of Ukraine in 2022, the EU took concerted action to change the trajectory of the European energy system and completely phase out the use of Russian fossil gas by 2027. The European Commission's REPowerEU strategy underscores a radical shift toward energy efficiency and renewable energy, though there's a noticeable void in measures to cut down oil consumption. This policy trajectory is pivotal, with a huge potential impact on Norwegian oil and gas activities.

The Norwegian government has consistently claimed that it needs to expand its oil and fossil gas production in order to meet demand from the EU, particularly as it phases out the use of Russian fossil fuels.

In the Arctic region, exploration in the Barents Sea has shown underwhelming results combined with high costs and vast environmental and economic risks. Still, Norway has granted numerous exploration licences since 2010; in a joint statement from the European Commission and the Norwegian Government in June 2022, the European Commission expressed support for Norway's continued oil and fossil gas exploration, even beyond 2030. However, production from Arctic explorations might only commence in the late 2030s, aligning with the period during which the EU aims to drastically cut down fossil fuel usage.

Any expansion of oil and fossil gas production would put the world's climate goals at risk. The Intergovernmental Panel on Climate Change has found that emissions from existing and planned fossil fuel infrastructure would already push the world past 1.5 degrees Celsius (°C) of warming. The IEA's scenario analysis suggests that there is no room for new long-lead time upstream oil and gas projects if the world is to achieve global net zero emissions by 2050. Building on peer-reviewed research, Oil Change International analysis shows the majority of fossil fuel reserves within active fields and mines must now stay in the ground to hold global temperature rise to 1.5°C.

Despite the significant role of Norwegian fossil gas in meeting the EU's energy demand in the short term, recent EU energy and climate regulations policies, such as the EU Climate Law, put the future of Norway's oil and gas production at a crossroads.

METHODOLOGY

Our analysis aims to assess the extent to which any new oil and gas supply is needed to meet future demand in a range of scenarios. For this, we used data on oil and fossil gas production from existing and new fields, forecasts of overall supply to the EU, and data on gas to be supplied to European buyers under long-term contracts from the consultancy Rystad Energy.[1] Our analysis includes a complete phase out of imports of Russian pipeline gas and LNG by 2027.

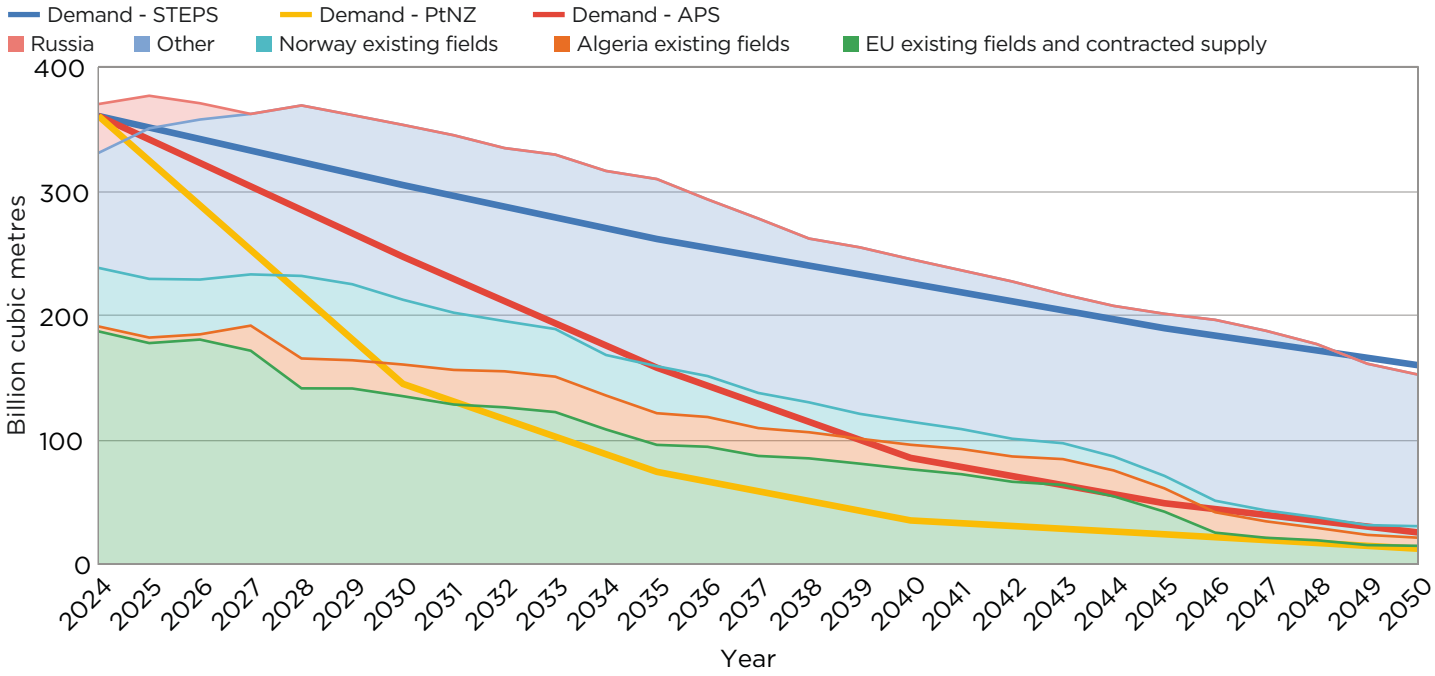
This supply data was compared against three scenarios: the IEA Stated Policies Scenario (STEPS) based on current policies, the IEA Announced Pledges Scenario (APS) which assumes long-term climate targets will be met, and DNV's Pathway to Net Zero Scenario (PtNZ).

AN OVERSUPPLY OF FOSSIL GAS IN THE MAKING

Our analysis finds that:

- Under all scenarios, the EU's fossil gas demand has entered a consistent long-term structural decline, driven by governmental policies, energy economics and climate commitments.
- Of the EU's main pipeline supplier countries, Norway and Algeria have capacity to export gas at levels above those committed in current contracts from gas projects currently in operation.
- **If the EU meets its long term climate targets, gas supply from currently producing projects in the EU, Norway and Algeria and existing contracts are set to exceed demand by 2035.** After this point, these producer countries would need to enter a managed decline of existing production or European buyers could not take gas under their agreed contracts.
- **In the net zero aligned scenario, EU domestic production from existing projects and already contracted gas exceeds demand by the 2030s** - rising to nearly double gas demand by 2040. In this scenario the EU could end all Norwegian gas imports in 2035 when its current gas contracts end.

Figure ES-1[2]: EU gas supply and demand 2024-2050



Source: Zero Carbon Analytics analysis - Data from DNV, IEA & Rystad Energy.

- In these scenarios, any expansion of gas production would be surplus to demand. Signing new long-term gas supply contracts comes with significant risks of oversupply.
- In the long-term, pipeline and LNG imports beyond what has already been contracted are only needed in a scenario where the EU fails to meet its climate goals and does not introduce any further climate policies.

BLUE HYDROGEN IS NOT COMPETITIVE

The oil and fossil gas industry and the Norwegian government have pushed for using gas in conjunction with carbon capture and storage (CCS) to produce blue hydrogen as a way of meeting Europe's need to decarbonise its energy-intensive industries. This report finds that hydrogen from renewable electricity will be cheaper than hydrogen from gas, and therefore more competitive, within the next five years. Moreover, gas-based blue hydrogen may still cause significant pollution, and is incompatible with full decarbonisation. While the oil and gas industry is similarly promoting CCS as a way of prolonging gas demand, the scenarios used in this assessment already assume optimistic targets for the deployment of CCS – targets that the industry is far off track from meeting. Therefore, even if optimistic levels of CCS deployment are realised, European demand will decline at rates that eliminate any need for new oil and gas supply.

The expansion of liquid natural gas import capacity, with a 78 percent increase expected by 2030 from 2021 levels, poses a risk to European and global climate goals, as it could lock in higher levels of fossil fuel use.

THE DIMINISHING ROLE OF OIL

The EU has reduced oil imports from Russia, diversifying its supply chain. Although there was a short-term increase post-Covid, oil demand in the EU is expected to decline long-term. With Norway's oil production projected to peak by 2025 and decline significantly thereafter, new oil production projects are deemed unnecessary to meet future EU demand. This indicates that Norway will not significantly increase its EU market share, and highlights the incompatibility of new oil projects with a climate-resilient future.

CONCLUSIONS & RECOMMENDATIONS: ARCTIC AMBITIONS ON THIN ICE

Policymakers in the EU, Norway and elsewhere are urged to take bold steps toward energy transition and alignment with climate goals. **For the EU**, this means resisting Norway's push for more Arctic oil and fossil gas exploration and focusing instead on sustainable energy solutions. Moreover, European countries should not be pursuing the expansion of gas production in other supplier countries around the world. European buyers should not sign new long-term gas suppliers, and the EU should put in place measures to assess the financial and climate risks of new long-term gas contracts. The EU must ensure its policies are sufficient to reduce gas demand in line with its long-term climate targets and a fair share of global emissions reductions.

For Norway, alignment with climate goals requires halting the exploration, licensing and development of new oil and fossil gas fields, devising a phase-out plan for the oil and gas industry.

Other gas producing and exporting countries should not expand their production and export capacity in order to meet future European demand. The US should extend the current pause to become a permanent block on new LNG export terminal approvals, as European demand for US gas will fall.

This alignment ensures a sustainable and safe future for both the EU and Norway, contributing significantly to global efforts to combat the climate crisis.

EUROPEAN OIL & GAS SUPPLY AND ENERGY SECURITY

The Russian invasion of Ukraine sent a shock wave through the EU energy market. Price levels skyrocketed, driving households into energy poverty, with many having to choose between "heating or eating".[3] Social and political uproar forced national governments and the EU to introduce unprecedented policy and regulatory measures, including: lowering the price of electricity, curbing windfall profits, diversifying supply, and introducing market interventions never seen before.[4] The EU's energy situation and its ensuing policies allowed it to adapt to the new constraints and circumstances that few had anticipated. As the Transport & Environment report *The New Oil Map* shows, EU policies and regulations on curbing fossil gas consumption led to a 15 percent decrease during the first half of 2023.[5] Imports of Russian oil also plummeted, but were offset by products refined from Russian oil in third-party countries, later sanctioned.[6]

Gas prices hit a record high of 345 euro/megawatt hour (MWh) in March 2022.[7] By October 2023, prices "normalised" down to about 35 euro/MWh, with storage levels above average, around 95 percent. These prices are still between two and three times higher than pre-invasion prices.

To mitigate the energy crisis, the European Commission presented its REPowerEU strategy in March 2022.[8] First, the European Commission laid out a plan for diversifying energy sources, reducing dependency on external suppliers and enhancing infrastructure resilience. Second, the strategy's unprecedented focus on energy efficiency and significantly increased production of renewable energy make it a comprehensive roadmap for transforming Europe's energy sector. By increasing the legally binding goals for energy efficiency and renewable energy production, the EU is sending clear signals to the market for the promotion of investments in wind, solar, hydropower, and bioenergy. Similarly, the many legislative initiatives embedded in the Fit for 55 package,[9] and the ensuing REPowerEU, clearly shows that the Commission wants to tighten the screw on both fossil gas consumption and reliance on fossil fuels from the demand side. However, similar policy and regulatory initiatives to curb oil consumption are absent.

In February, the European Commission recommended a 90% net greenhouse gas emissions reduction target by 2040 for the EU, as compared to the 1990 level.[10] A condition for reaching this target is a successful transition from fossil to renewable energy. The Commission estimates that the use of fossil fuels in the EU's energy consumption will be reduced by 80% by 2040, compared with 2021, if the bloc succeeds in reducing emissions by 90%. As a result, the dependence on imports of fossil fuels would be significantly reduced.

As the EU's demand for oil and fossil gas is used to justify the Norwegian expansion of petroleum activity, signals from the EU regarding Norwegian exploration and extraction, particularly in the Arctic, could have a large impact. Any such signal would build on the EU's own Arctic Strategy from 2021, which stated: *"The EU will [...] push for oil, coal and gas to remain in the ground, including in Arctic regions, building on partial moratoriums on hydrocarbons exploration in the Arctic."*[11]

NORWAY'S ROLE IN THE EUROPEAN ENERGY MARKET

Norway is currently the largest gas supplier to the EU, and the EU constitutes the main export market for Norwegian oil and fossil gas.[12] Both parties acknowledge this interdependent relationship, and since 2002 there have been formal dialogue arenas for the parties to strengthen their energy cooperation.[13] However, the interests of Norway and the EU have not always coincided. In particular, the EU has expressed concerns about further expansion of petroleum activity in Arctic areas.[14] Norway, on the other hand, has distributed 141 exploration licences in the Arctic Barents Sea since 2010.[15] The EU has also initiated policies that will decrease the demand for fossil fuels in the short and long term, while Norway has introduced policies to increase the supply of oil and gas.

After the invasion of Ukraine and the following energy crisis, there was a change in EU statements regarding the expansion of petroleum activities in Norway. In a joint statement from the EU and Norway in June 2022, the EU expressed support for Norway's continued oil and fossil gas exploration and the development of new fields on the Norwegian continental shelf beyond 2030.[16] Both the Norwegian government and the oil and gas industry have used the energy crisis in Europe to argue for the expansion of petroleum activities, including opening the northern region of the Barents Sea for oil and gas exploration.[17] While the results of exploration in these areas are uncertain, the potential production would probably not start before the late 2030s – when the EU should be well on its way to achieving net zero emission levels and should be drawing closer to phasing out fossil energy entirely, including gas.

While the energy markets are still volatile, the EU's energy security has been strengthened since the invasion of Ukraine in 2022. The Norwegian government still argues that Norway needs to expand its production of oil and fossil gas to secure long-term supply to the EU, but the government failed to convince the EU to include formulations in support of Norwegian expansion of petroleum activity in a green industry agreement that was established in 2023.[18] Because the EU demand for oil and gas is used to justify the Norwegian expansion of petroleum activity, further signals from the EU regarding Norwegian exploration and extraction, particularly in the Arctic, could have a large impact.

NORWEGIAN OIL AND GAS PRODUCTION – STATUS AND EXPANSION PLANS

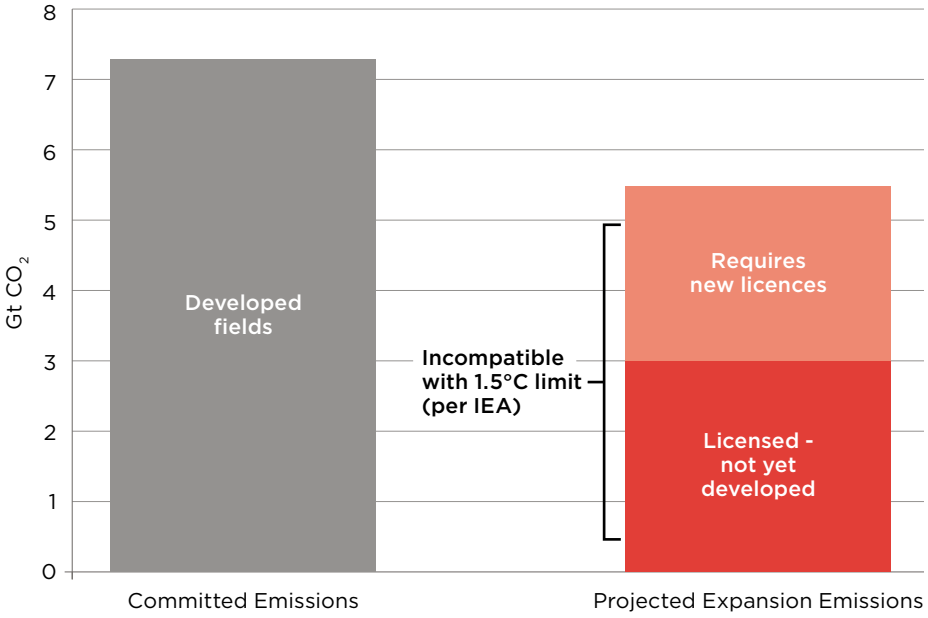
Norway has been producing oil and fossil gas since the early 1970s. The majority of oil and gas resources in the country have already been extracted, produced, and sold.[19] During the next couple of years, production levels will structurally decline,[20] regardless of climate policies or other political measures. However, the level of decline in a scenario that permits new licensing and field approval is very different from a scenario with no new field development. According to calculations by Oil Change International, new developments will result in increased emissions that are incompatible with limiting global warming to 1.5°C.

While the majority of emissions from oil and gas occur during combustion, the production emissions are also significant. Even if considerable efforts are made to reduce production emissions, the remaining emissions will challenge Norway's ability to reach climate neutrality by 2050. Due to this, an expert committee appointed by the Norwegian government has recommended pausing approval for any new oil and gas production until a strategy for the final stages of Norwegian petroleum activity has been developed.[22]

As Figure 2 shows, the production on the Norwegian continental shelf will reach a peak before 2030.

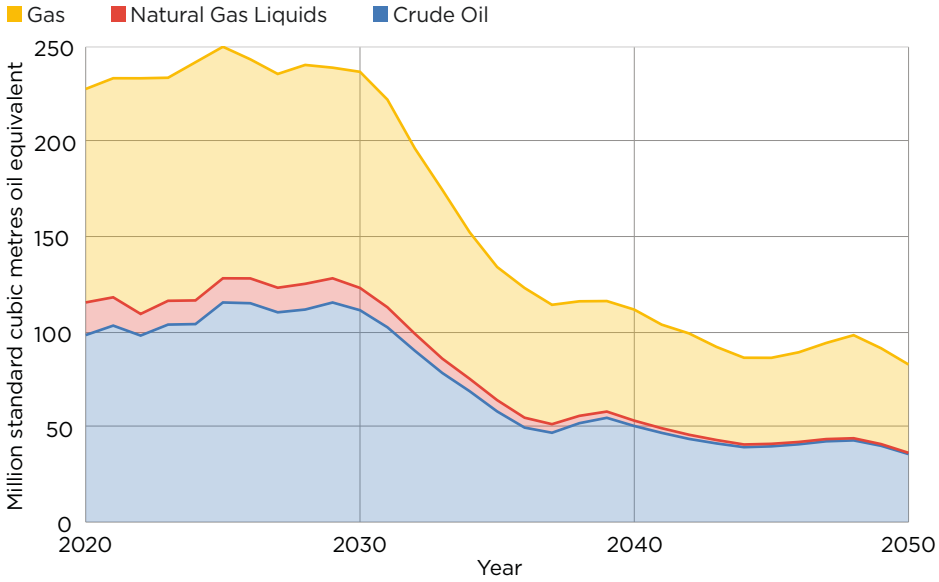
Norwegian petroleum activities happen in three major areas: the North Sea, the Norwegian Sea, and the Barents Sea. There are several differences between the three areas open for petroleum activity, both historically and in their production profiles. Production in both the North Sea and the Norwegian Sea has been active for

Figure 1: Projected cumulative future carbon dioxide (CO_2) emissions from Norwegian oil and gas resources, by stage of development.



Source: Oil Change International calculations using data from Rystad Energy UCube.[21]

Figure 2: Estimated production of oil, gas, and natural gas liquids[23] from the Norwegian shelf until 2050.



Source: Rystad Energy. Includes producing fields, fields under development, fields yet to be approved for development and from undiscovered resources.

five decades and three decades, respectively. Although there is still a substantial amount of oil and fossil gas extracted from the areas, production from the Norwegian Sea is declining, and production from the North Sea is expected to peak sometime between 2025 and 2031.[24] By contrast, the Barents Sea has a shorter production history. Although exploration has been continuous for more than 30 years, there are only two fields currently active, the older of which opened in 2007.[25] Total production from the Barents Sea is small compared to the two other areas, as shown in Figure 3. However, it is claimed that the majority of as-yet undiscovered petroleum will be found there.[26]

THE BARENTS SEA

The Barents Sea is the least mature area for petroleum production in Norway. It is also the area with the most controversies attached to its petroleum activity. This is due to potential environmental impacts, uncertainty regarding the quantity of petroleum, and the questionable profitability of the potential production.

Potential environmental impact

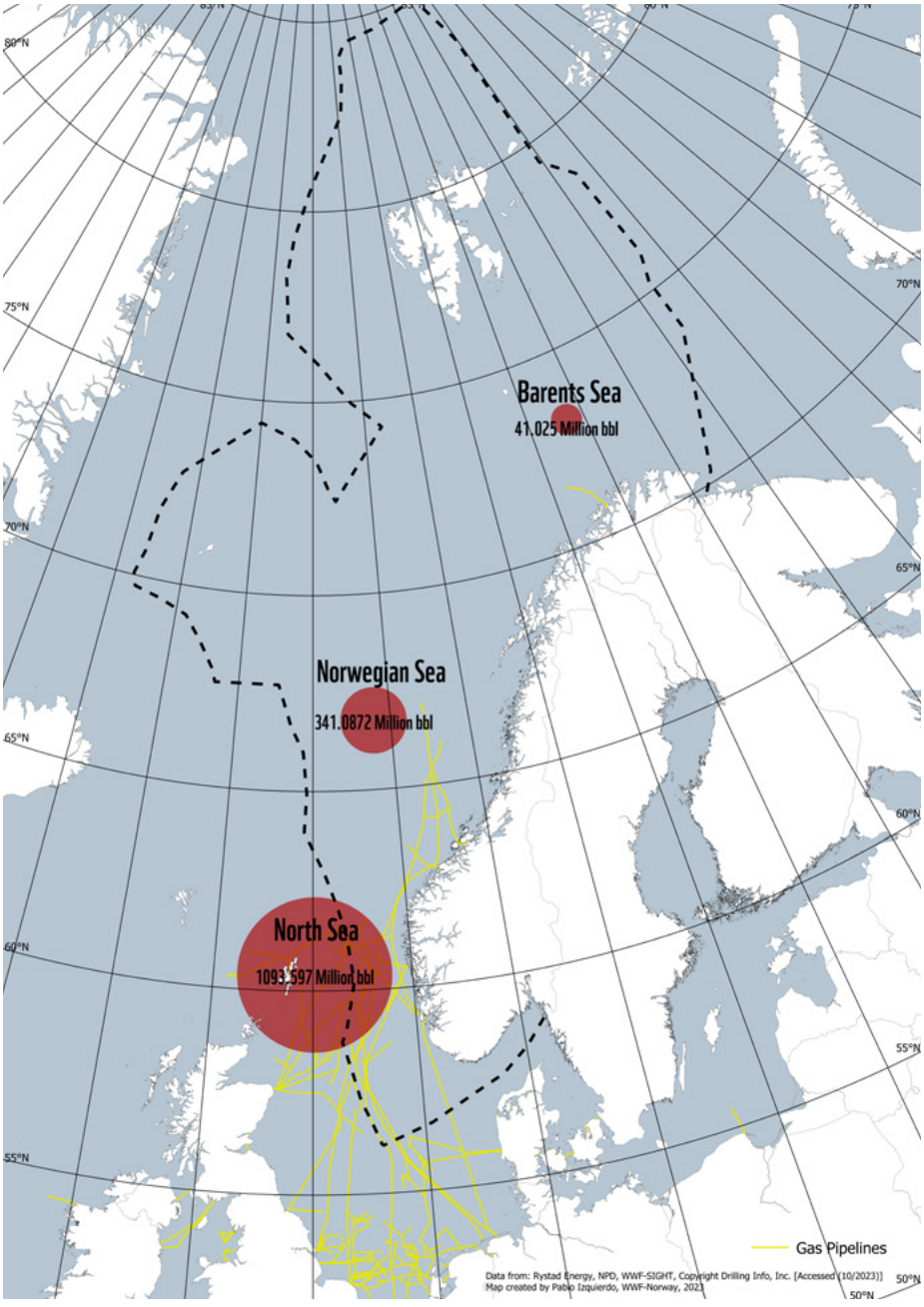
The Barents Sea is one of the world's most productive ocean areas, and is especially vulnerable to the many environmental risks associated with oil and fossil gas extraction, including spills and noise pollution.[27] It is an important nursery ground for several fish stocks, such as cod, herring, and capelin, and has a high level of biodiversity, from bird colonies and cold water coral reefs to a variety of marine mammals, such as whales and polar bears.[28] On multiple occasions, the Norwegian Environment Agency, a government body, has warned that petroleum activity could have a harmful impact on the vulnerable ecosystems in the Barents Sea.[29] According to the agency, these impacts are "impossible to eliminate," even if the government and oil companies take environmental precautions.

The effects of an oil spill in the Barents Sea would be dramatic. The lack of infrastructure and the remoteness of the oil fields mean that it could take days to respond to a spill.[30] The Norwegian Environment Agency has also questioned if existing oil spill technologies are suitable for the rough arctic conditions of the Barents Sea.[31] Under these limitations, an oil spill could ruin local environments for decades, effectively wiping out local populations of certain species.[32]

TOO LITTLE TOO LATE

As the majority of oil and fossil gas resources in the North Sea and in the Norwegian Sea have already been produced, the Norwegian Offshore Directorate,[33] the governmental agency that regulates oil and gas, claims that the future of Norwegian petroleum activity "is in the north" of the country. However, the oil and gas exploration in the Barents Sea has yielded disappointing results for the oil companies and the Norwegian state so far. Findings have been few, small, and often uneconomical. As a result, not all estimates of potential resources in the Barents Sea are as high as official Norwegian estimates.

Figure 3: Map of the Norwegian continental shelf, with production per sea areas and yellow lines showing gas pipelines.

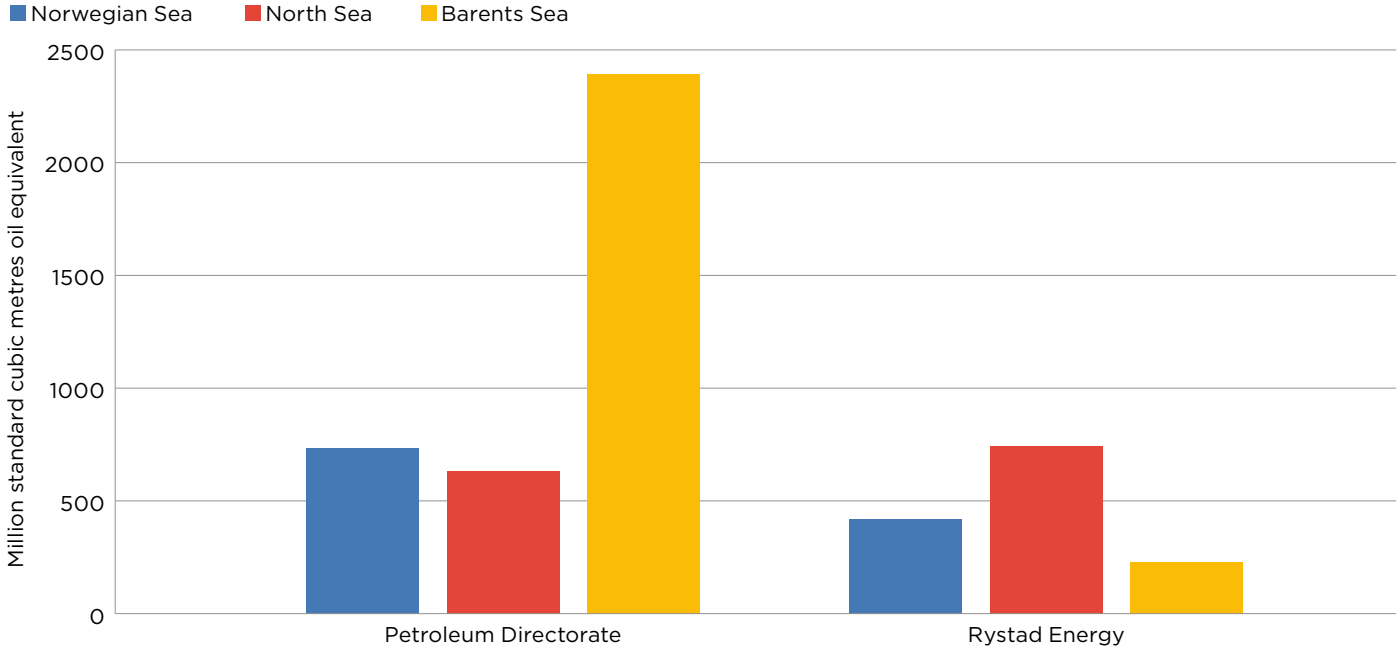


Source: Rystad Energy, the Norwegian Petroleum Directorate and WWF-Sight.

Figure 4 shows the difference in estimates by Rystad Energy and the Norwegian Offshore Directorate. These differences are in large part because the Norwegian government does not factor economic viability into its estimates.

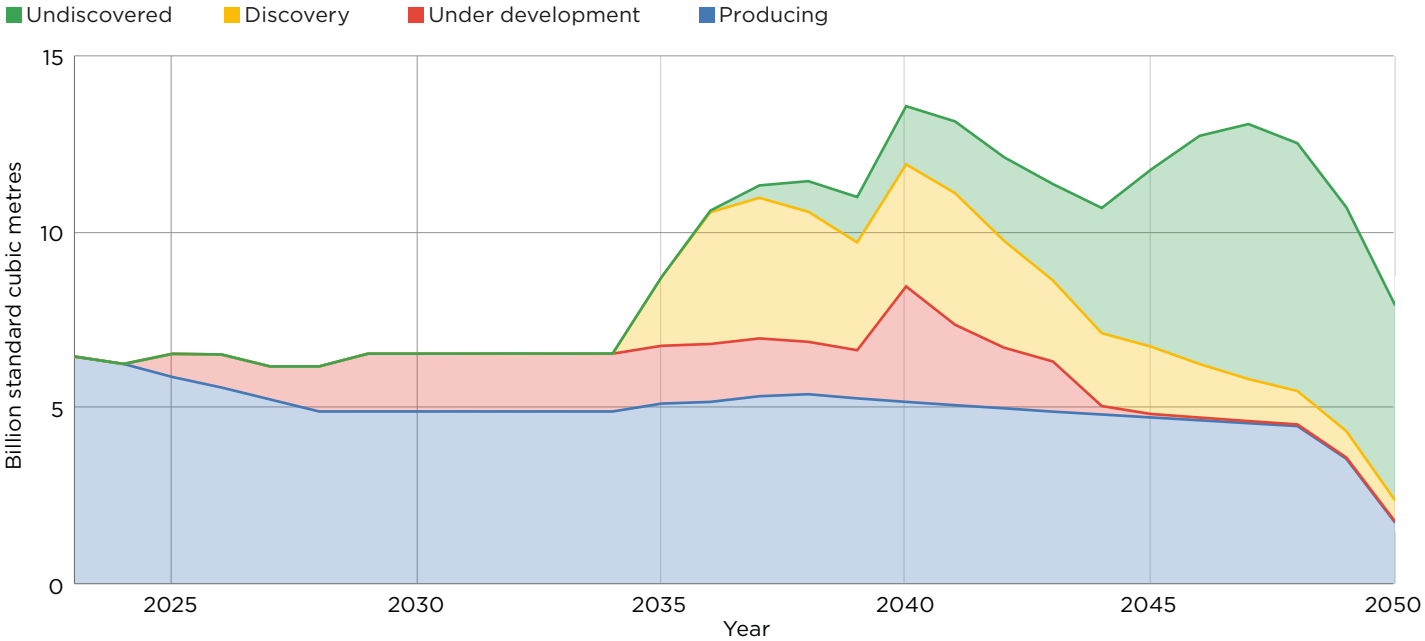
There are currently only two producing fields in the Barents Sea. In 2024, a third field is scheduled to start producing. On average, the time from discovery until first production is 17 years for these three fields in the Barents Sea.[34] Due to the lack of infrastructure, the harsh Arctic environment, and the long distance from shore, fields in the Barents Sea are both complicated and costly to develop. The long lead-time means that increased exploration and extraction in the Barents Sea cannot contribute to solving the current energy crisis in Europe. Figure 5 shows the projected gas production from the Barents Sea until 2050. Projections put the production start-date after 2030 for fields that are not currently producing or are still under development; the peak in production is not expected before 2040.

Figure 4: Estimates by the Norwegian Petroleum Directorate and Rystad Energy on undiscovered oil and gas resources



Source: Rystad Energy & Norwegian Petroleum Directorate.

Figure 5: Projected gas production in the Barents Sea until 2050



Notes: This includes both producing fields and fields under development, as well as assumed future production from fields yet to be approved for development and from as-yet undiscovered resources. Source: Rystad Energy.

GAS – THE EU'S RISK OF OVERSUPPLY

SUPPLY

The EUs fossil gas supply is rapidly changing, with a massive shift away from Russian gas to liquid natural gas (LNG) imports undertaken since Russia invaded Ukraine. At the end of 2021 Russia provided 41 percent of the EU's gas, but by late 2022 Russia was supplying just 12.9 percent.[35] During 2022, the EU's largest source of gas remained pipeline imports, which made up 44 percent of the bloc's supply. Russian gas via pipeline and LNG still accounted for 22 percent of the bloc's gas, roughly equal to LNG imports at 23 percent, with domestic production making up just 11 percent.[36]

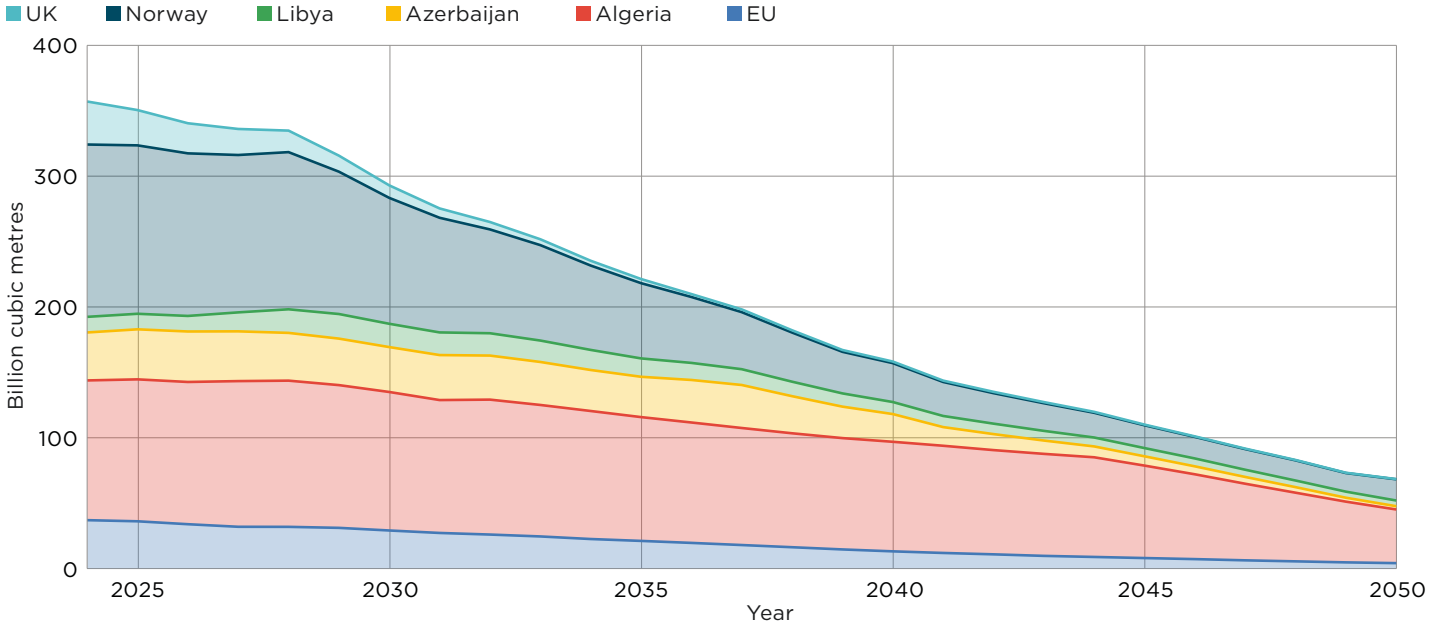
The EU's domestic producers and its main pipeline suppliers – Algeria, Azerbaijan, Libya, Norway, Russia and the UK – are tightly linked by the physical inflexibility of the pipelines that connect them. For example in 2023, 95 percent of Norway's gas exports are via pipelines to other European countries, with 73 percent of those exports going directly to the EU.[37] Many of the producing gas fields have few options aside from supplying through these pipelines to Europe, and with limited LNG import capacity Europe needs the gas those fields supply in order to meet demand.

However, according to Rystad Energy, the production from existing gas projects within the EU and from its regional suppliers, excluding Russia, is set to decline in the coming years.[38] This is due to a projected structural decline in productivity that all oil and gas projects experience. In total, supply from existing fields in these regional supplier countries is set to decline by 17 percent by 2030 and by 80 percent by 2050.[39]

The focus on existing projects is important as multiple studies have found that any new oil and fossil gas extraction projects are incompatible with limiting warming to 1.5°C.[40] Approving new oil and gas extraction projects has a lasting impact; due to the high upfront costs, continuing production for as long as possible is the most economical way of maximising returns on the original investment. New projects approved in the 2020s would still be producing oil and gas in the 2040s, locking in long-term oil and gas production, and thus also future carbon emissions.

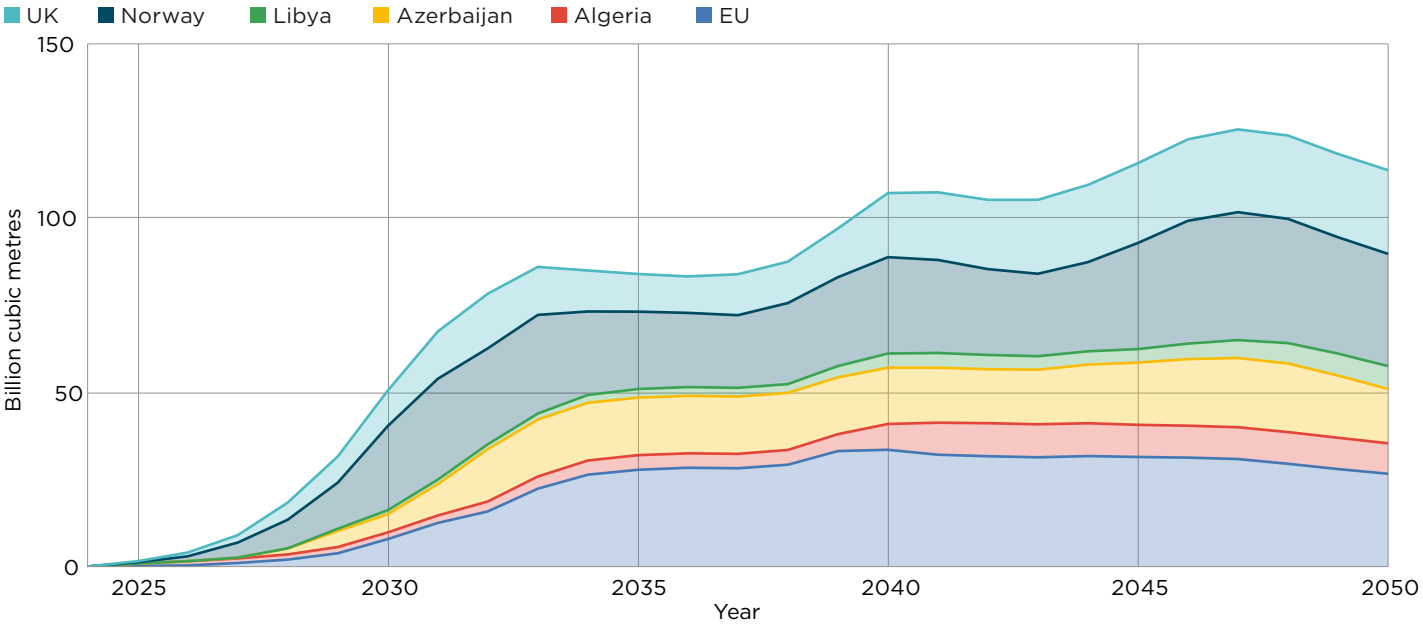
Despite these risks, new fossil gas projects are expected to be approved across many of the EU's domestic and pipeline supplier countries. Looking at EU and its regional suppliers – Algeria, Azerbaijan, Libya, Norway and the UK – new gas production from these countries would peak at 125 billion cubic metres (bcm) per year in 2047 and would in total produce 2,119 bcm of gas between now and 2050, according to Rystad Energy's projections.[41] Norway makes up by far the largest share of this; its projects are forecast to account for 29 percent of new gas from these countries between now and 2050.

Figure 6: Gas production from current projects - EU and regional suppliers 2024-2050



Source: Rystad Energy. Gas production from existing fields and those already in development.

Figure 7: Gas production from new projects - EU and regional suppliers 2024-2050



Source: Rystad Energy.

ANALYSIS OF EU'S LONG-TERM CONTRACTS

One of the key tools in securing Europe's gas supply is the use of long-term contracts. These contracts commit a buyer to purchasing gas from a specific supplier over a long duration, often as long as 20 years. Individual contracts are confidential, but usually include a set price for the gas supplied - often linked to an agreed benchmark - and an agreed volume of gas the buyer commits to take.[42] These commitments are often known as 'take or pay', where the buyer must take the agreed volume of gas or pay a fee if they do not. These agreements are often critical in financing for new LNG export terminals as they guarantee a market for the gas and are usually agreed between the exporter and an importing company. Sometimes contracts are made between a buyer and what are known as 'portfolio' companies, which are usually LNG traders - such as Shell - who commit to sourcing and supplying the agreed volume of gas.

Data from Rystad Energy shows that the EU has contracted 150 bcm of gas supply in 2024, just over 40 percent of the bloc's forecast demand. The volume of gas that EU buyers have secured through contracts declines over time, as buyers want to have more certainty over near-term supply than in the far future. This decline also follows a similar trajectory to the overall decline in demand expected in the coming decades, yet it's notable that buyers in the EU have already committed to significant volumes of gas in the 2040s - very close to the region's target date for 'climate neutrality'.

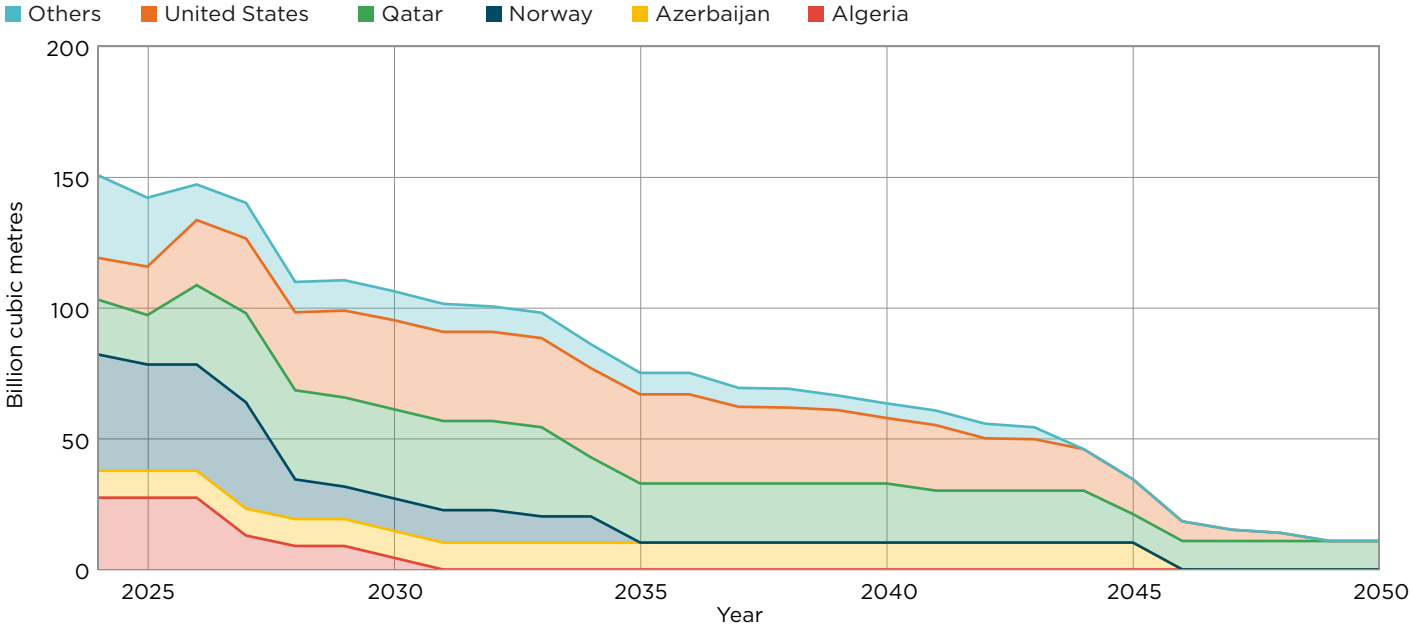
GAS EXPANSION THREATENS CLIMATE GOALS

Rystad Energy forecasts that 37 percent of new production between now and 2050 will come as a result of exploration for new fields that have not yet been discovered. A significant portion of that is expected to come from Norway, with 50 percent of Norway's new fossil gas supply up to 2050 set to come from as yet undiscovered oil and gas fields. Production from fields that are still being explored has a long lead time: output from such fields only becomes significant in the late 2030s and early 2040s, with output peaking in 2047, just three years before the world needs to have achieved net zero emissions in order to limit warming to 1.5°C.[43]

As part of the EU's efforts to phase out reliance on Russian gas, member states and the industry have also undertaken a massive expansion of LNG import capacity. According to gas industry data analysed by the Institute of Energy Economics and Financial Analysis, by 2030 the 27 member states' LNG import capacity is expected to have increased 78 percent from 2021 levels.[44] Much of this expansion has already happened, with LNG capacity having risen 40 percent between 2021 and 2023, and is expected to rise another 15 percent by 2024.

This expansion puts the world's climate goals at risk; the Intergovernmental Panel on Climate Change has found that emissions from existing and planned unabated fossil fuel infrastructure would push the world past 1.5°C of warming, unless infrastructure that requires fossil fuels is phased out early.[45] While the intergovernmental body was referring to fossil fuel-consuming infrastructure, such as power and industrial plants, peer-reviewed research shows this is also true for fossil fuel extraction – far too much is already developed.[46] Analysis by Oil Change International shows that the majority – 60 percent – of fossil fuel reserves within active extraction sites globally must stay in the ground to hold global temperature rise to 1.5°C.[47] Any expansion of fossil fuel infrastructure makes the 1.5°C limit harder to achieve, and will increase the costs of the energy transition as fossil fuel assets will have to be retired before the end of their normal lifetime.

Figure 8: Contracted gas supply to the EU 2024-2050



Source: Rystad Energy. Others = Angola, Congo, Egypt, Libya, Mozambique, Nigeria , Oman, Trinidad and Tobago & Portfolio.

DEMAND

In contrast to this push for new fossil gas supply, the EU's demand for gas has now entered a long-term structural decline. However, the scale and pace of that change is still to be determined by the policies governments put in place in the years to come.

In our analysis we assess three scenarios for the EU's future gas demand:

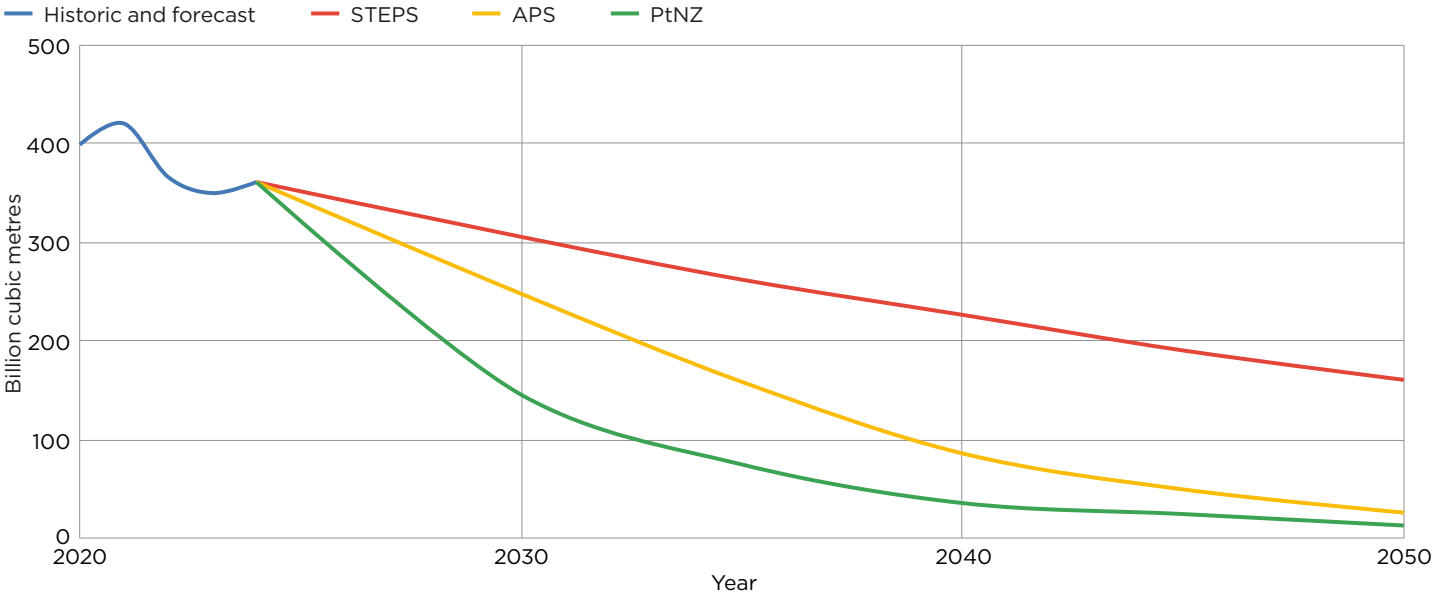
- The IEA Stated Policies Scenario (STEPS) is based on policies that were either already in place or were under development by governments as of October 2023, but this scenario does not assume that longer term climate targets will be met. This scenario would lead to a dangerous 2.4°C of warming by 2100, well in excess of the goals of the Paris Climate Agreement.[48] In this scenario, by 2030 EU fossil gas demand would have fallen by 17 percent from 2022 levels, and by 2050 would be 56 percent lower than 2022 levels.[49]

- The IEA Announced Pledges Scenario (APS) is based on countries meeting their announced targets and longer-term 2030 and 2050 target climate commitments, made as of October 2023, regardless of whether these have been codified in law. This, unlike Stated Policies Scenario, assumes that countries will continue to enact more ambitious climate and energy policies in order to meet their long-term climate pledges. This scenario still leads to a dangerous 1.7°C of warming by 2100.[50] In this scenario, EU demand falls 32 percent below 2022 levels by 2030, and by 2050 is predicted to be 93 percent lower than 2022 levels.[51] If the EU adopts the proposed target of reducing emissions by 90 percent by 2040, it is likely that gas demand would need to fall even further than is currently forecast in this APS scenario.[52]

- The DNV consultancy's Pathway to Net Zero (PtNZ) scenario, which achieves a global net zero energy system by 2050 with the aim of limiting warming to 1.5°C.[53] This scenario also incorporates a more equitable transition, scaling mitigation measures relative to the GDP of each region, so that wealthier regions decarbonise faster.[54] In this scenario, new oil and gas development in Europe (including Norway and the UK) is banned beginning in 2024, with the continent achieving net zero emissions by 2043.[55] With the EU delivering a fairer share of global efforts to limit warming to 1.5°C, gas demand drops 60 percent from 2022 levels by 2030, and is 97 percent lower by 2050.[56]

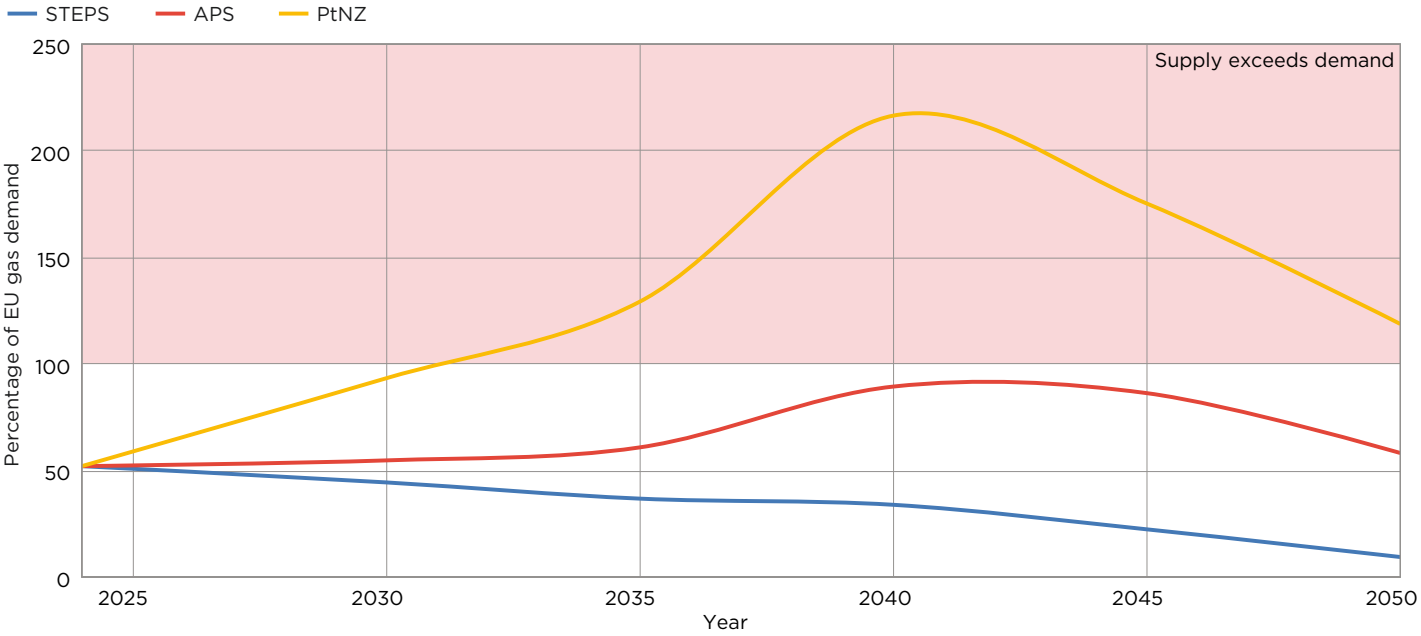
Figure 9 illustrated that even without implementing any further policy changes, European fossil gas demand has entered a period of decline, and that decline must be swiftly accelerated to align with the 1.5°C warming limit. To put these scenarios in context, the European Commission estimated that the full implementation of the 'Fit-for-55' package of energy policies would reduce the EU's gas demand by 30 percent by 2030 – roughly similar to the level of decline in the Announced Pledges Scenario.[57] If the EU fully implements the REPowerEU package, this would reduce gas demand by 52 percent by 2030, according to estimates by the European climate think tank E3G.[58] While significant, this still falls short of a fair share of global efforts to limit warming to 1.5°C, taking into account the EU's ability to finance the transition. To deliver that fair share more ambitious policies needed to phase out the use of gas to supply power, homes, and industry. These scenarios also demonstrate the scale of that challenge – PtNZ, which DNV describes as "challenging" but "feasible", would require urgent and rapid reductions in gas demand in the 2020s.

Figure 9: EU gas demand 2020-2050



Source: Zero Carbon Analytics analysis using data from DNV, IEA & Rystad Energy.

Figure 10: EU contracted supply & domestic production 2024-2050



Source: Zero Carbon Analytics analysis - Data from DNV, IEA, Rystad Energy. Forecast domestic production from existing projects and those already under development.

THE EU DOES NOT NEED NEW SUPPLY TO MEET DEMAND

Given these trends, our analysis sought to identify to what extent, if any, new fossil gas production from supplier countries is needed to meet future demand.

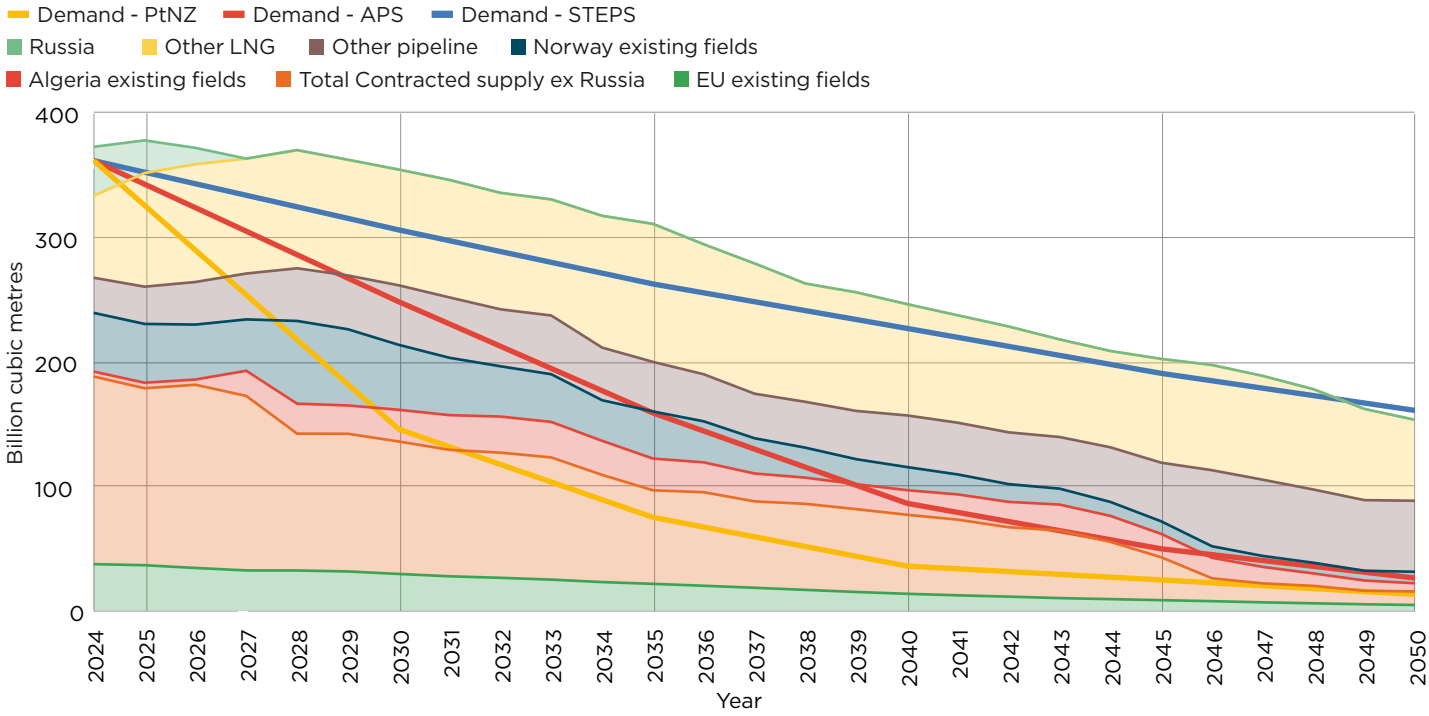
For this analysis, we combined data from Rystad Energy and gas demand data from the three scenarios introduced above. We have assumed that Europe will phase out imports of Russian gas by 2027, in line with the EU's target date for ending reliance on Russian fossil fuels.[59]

DOMESTIC PRODUCTION AND EXISTING CONTRACTS

The EU's most secure sources of gas are domestic production from existing fields and already contracted supply. Combined, they are forecast to account for just over 50 percent of the EU's supply in 2024. We would expect these sources of EU gas to decline over time, both as the volume of contracted gas reduces further into the future and due to the structural decline in output from the EU's current gas fields. This is what is seen in the current policies (STEPS 2.4°C) scenario, with domestic production from existing fields and already contracted supply declining to 33 percent by 2040 and 9 percent by 2050.

In the announced pledges (APS 1.7°C) scenario, these sources retain a consistent share of EU demand over the next decade, rising to

Figure 11: EU gas demand and supply 2024-2050



Zero Carbon Analytics analysis - Data from DNV, IEA, Rystad Energy Other supply is based on Rystad's base case scenario for supply to the EU. Russian imports estimated, based on a linear phaseout by 2027

account for nearly 90 percent of demand by 2040. In the Path to Net Zero scenario, domestic production from existing fields and contracted supply would meet all demand by the early 2030s, meaning that the EU would have phased out all LNG and pipeline imports beyond what has already been contracted. After that point, the EU would need to phase out domestic gas production and face the likely prospect of paying to not receive gas under the take or pay clauses of current contracts. By 2040, gas supply from domestic production and existing contracts alone would count for more than double the region's total gas demand.

From this analysis it is clear that if buyers in the EU continue to sign long term supply contracts there is a significant risk of the EU being committed to purchasing gas in excess of what is required.

EU SUPPLY AND DEMAND ANALYSIS

The second stage of our analysis sought to identify total supply and demand for the EU under the three scenarios. To do this we prioritised the sources of supply to the EU, starting with those that the EU is most likely to rely on or is committed to, and ending with those that it can phase out the quickest:

1. EU domestic production from existing fields
2. Already contracted supply
3. Existing fields in its pipeline supplier countries[60]
4. Other non-contracted pipeline supplies[61]
5. Other non-contracted LNG supplies
6. Russian gas, including pipeline and LNG imports[62]

In all three scenarios, reductions in demand mean that the EU is able to phase out Russian gas by the 2027 target date. Of the EU's pipeline supplier countries, we found that only Norway and Algeria have spare capacity from existing projects to export to the EU, above the levels committed to by existing supply contracts.

Our analysis shows that in scenarios aligned with the EU's climate pledges or the 1.5°C limit, gas supply from currently producing projects in the EU, Algeria and Norway and existing supply contracts are set to exceed demand. These existing projects would therefore either need to be retired early, or EU buyers would need to renege on their gas supply contracts.

In the announced pledges (APS 1.7°C) scenario, imports of LNG that haven't already been contracted decline rapidly and are phased out before 2030.[63] Any new gas supply contracts for delivery in the 2030s would be surplus to demand. By 2035, already contracted supply and production from existing fields in Algeria, Norway and the EU would be sufficient to meet all of the EU's demand. After this point, even some of that supply from existing fields in Norway and Algeria would no longer be needed as EU demand continues to fall. For producer countries like Norway, this would mean either delivering a managed early phase-out of gas production from currently producing fields, or investing in significant new LNG export capacity to take this gas to other markets beyond the EU. A phase-out would be in line with a global equitable transition away from fossil fuels, while expanding LNG capacity would add to an expected glut of LNG exports and put the world's climate goals at risk.

In the Path to Net Zero scenario, the EU could end imports of not-yet-contracted LNG by 2027. The following year, the EU could end all non-contracted pipeline imports apart from supply from existing fields in Norway and Algeria.[64] In

2035 the EU could end the import of Norwegian gas completely when its current supply contracts end.

Pipeline and LNG imports beyond what has already been contracted are only required in the long term in the current policies (STEPS 2.4°C) scenario, in which Europe is wildly off course from achieving its climate targets.

Our analysis has only analysed supply and demand volumes to the EU as a whole, and it does not account for country-level differences in demand and the geographic constraints of the EU's gas pipeline network. In addition, the preference order we have suggested is illustrative, and in reality a complex relationship between financial and geopolitical drivers would determine the exact order in which supply was reduced.

These findings are a stark demonstration of the financial and climate risks of expanding gas supply for the EU market. If new fossil gas extraction projects or LNG terminals move forward, they would lock in levels of gas use well above what is required for the EU to meet its climate goals and well above the EU's fair share in accordance with the targets of the Paris Climate Agreement. If, instead, the EU manages successfully to reduce gas demand in line with what is required, then the gas industry will face huge financial costs as these projects become stranded. Alternatively, supplier countries may instead seek to build new LNG terminals to reach new markets as EU demand declines. In this case, the EU's current rush to phase out Russian gas could be used to justify a huge expansion of gas supply that would ultimately be exported to markets outside of Europe, in turn locking those countries into a dangerous reliance on a fuel that must be phased out.

HYDROGEN PRODUCTION WILL NOT BE A SIGNIFICANT SOURCE OF DEMAND FOR NEW GAS

Hydrogen produces no CO_2 when used as a fuel and the EU has set ambitious targets for the use of this fuel. When made with renewable electricity and electrolysis - known as green hydrogen - and transported with limited leakage, it can have minimal emissions over its lifecycle.[65] However, hydrogen can still have a significant impact on the climate depending on how it is produced, stored, and transported. Currently, almost all hydrogen is produced using fossil fuels. When it is made from fossil gas with CCS, it is called blue hydrogen. All forms of hydrogen manufacturing are energy-intensive; therefore, using hydrogen to power something that could just as easily be powered directly with electricity is highly inefficient. Storing and transporting hydrogen is energy- and space-intensive – its energy per volume is low compared to methane – so long-distance trade in hydrogen is very inefficient.[66]

Blue hydrogen, in particular, is not compatible with decarbonisation. Using fossil gas to produce blue hydrogen can lead to higher emissions than using the raw gas product itself, depending on the level of leakage of the highly-warming gas methane throughout the supply chain.[67] Producing green hydrogen with zero emissions requires that all the electricity for production is sourced solely from renewable sources – rather than a grid that still includes fossil-fuelled generators. It also requires those renewable sources to be new and additional, so that the hydrogen production does not require resources that would otherwise be used to decarbonise the wider power grid.[68] In both cases, the storage and transportation of green hydrogen must be closely monitored to limit leakage risks: hydrogen leaked directly into the atmosphere can produce a warming effect almost 12 times stronger than CO_2.[69]

As part of the rationale for new gas production, the Norwegian government regularly cites the need to maintain high gas production in order to produce blue hydrogen that could then be exported to EU countries.[70] The REPowerEU strategy establishes a common goal of importing ten million tonnes of 'clean' hydrogen by 2030 – without specifying whether it should be green or blue, or setting science-based limits on its lifecycle emissions.[71] The German government has signed a cooperation agreement with Norway to look at the feasibility of hydrogen imports, and the German utility RWE is working with the Norwegian oil company Equinor on the potential to develop a hydrogen pipeline between the two countries.[72]

Norway remains bullish on the prospect of exporting blue hydrogen to the EU, with hydrogen industry groups seeing a significant role for blue hydrogen in the short term, growing faster over the next decade than green hydrogen.[73] However, in addition to being harmful to the climate, blue hydrogen is likely to be undercut by economics. Blue hydrogen is currently cheaper than green, but BloombergNEF predicts that green hydrogen will be cheaper than blue by 2028 because of falling costs.[74] In Germany by 2030, BloombergNEF forecasts that green hydrogen will be between 24 percent and 45 percent cheaper than blue hydrogen.[75] Given such a huge cost disadvantage, it is hard to see how Norwegian blue hydrogen could compete.

There also remain serious diplomatic obstacles to further collaboration between Germany and Norway on hydrogen exports. Germany has been clear it is only interested in blue hydrogen as a temporary step before transitioning to green, while Norway's petroleum minister has said the country has no plans to export green hydrogen.[76]

Pursuing new gas production in Norway for hydrogen exports yields no climate or financial benefit for the country. Doing so either risks locking consumer countries into an expensive and uncompetitive new energy source, or justifies an expansion in gas supply that will never produce hydrogen at scale and is instead exported to other markets around the world.

CARBON CAPTURE AND STORAGE

Alongside hydrogen production, CCS has also been promoted as a technology that would allow the continuation of oil and fossil gas production while meeting climate targets. However, CCS is unlikely to be able to sustain Europe's gas demand at a higher level while delivering on its climate targets. In the Announced Pledges Scenario, in which Europe meets its climate targets, the IEA estimates that sustaining Europe's gas demand would require 441 million tonnes of CO_2 to be captured through CCS worldwide by 2030.[77] Such a feat would require a nearly tenfold increase in current CCS capacity, almost 50 percent more than is expected if all planned CCS projects are built.[78] With six years to go until 2030, and CCS projects requiring between 5 to 10 years to be developed, according to the Global CCS Institute, it will be extremely difficult for CCS to reach the levels forecast for the Announced Pledges Scenario, let alone allow for a greater usage of gas within Europe.

OIL – DEMAND DECREASE IN ALL SCENARIOS

SUPPLY

RUSSIA'S INVASION OF UKRAINE HAS RESHUFFLED THE EU'S OIL SUPPLY CHAIN

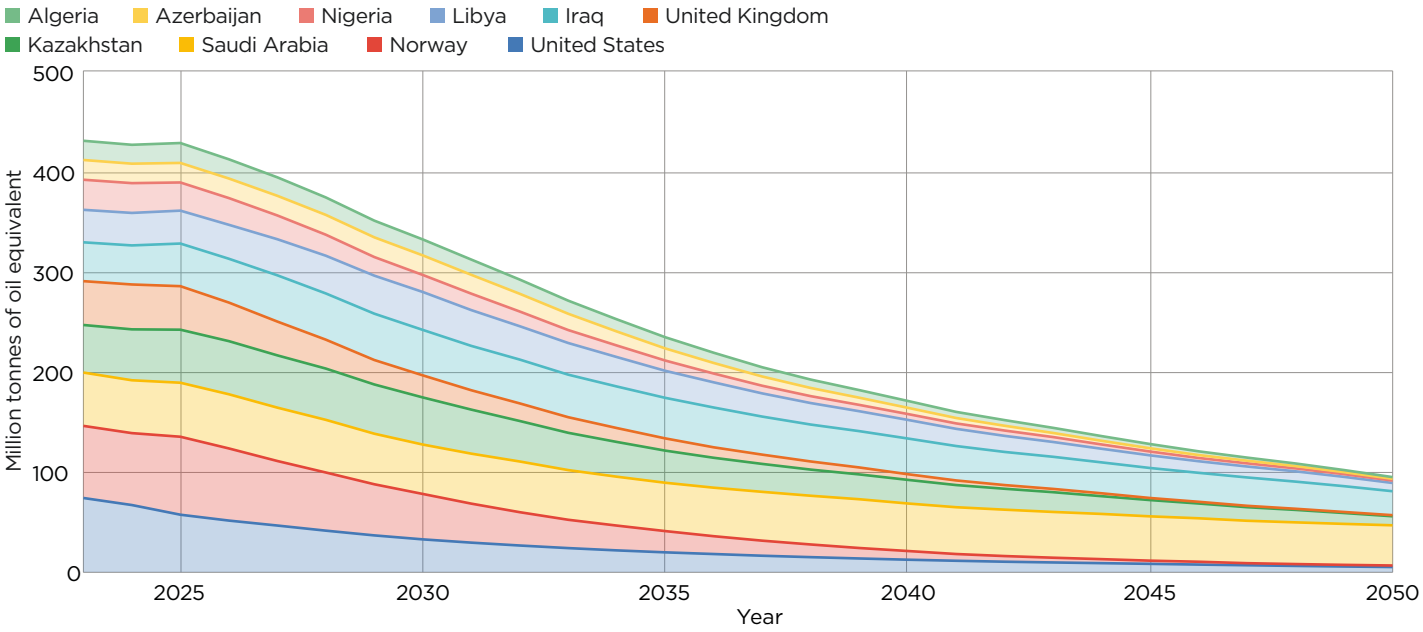
The EU used to import around one third of its oil products from Russia before the start of the war. Other main suppliers included the United States, Norway, Libya, Kazakhstan, and Iraq. As opposed to fossil gas, three-quarters of the oil coming into the EU is imported by shipments, mainly through ports located in the Netherlands, Germany, Italy, and Spain, rather than through pipelines.[79] Oil imports to East European countries are mostly via pipelines, notably through the Druzhba pipeline that connects Russia to the EU.

The EU's embargo measures against Russian oil have had an important impact on Russia's oil exports to the EU, which decreased from representing 31 percent of the bloc's oil imports in January 2022 to three percent in early 2023.[80] This decrease led to a strengthened market power of existing suppliers to the EU: the United States, Saudi Arabia, and Norway's oil exports increased to cover more than 34 percent of the EU's oil demand in early 2023, up from 23 percent before the war. Exports from Iraq, Brazil, and Angola to the EU also increased.

In order to assess trends in the EU's future oil supplies, we use production forecasts from Rystad Energy for the current top-10 largest oil suppliers to the EU. We started by analysing production forecasts from existing oil projects in those 10 countries,[81] while assuming the share of oil exports going to the EU remains constant over time.[82] Overall, oil production from existing fields will peak in 2024 and rapidly decline after that. However, the pace of decline differs among countries; for instance, oil supply from Saudi Arabia is expected to decrease by 25 percent between 2023 and 2050, but the share of the EU's oil supply produced in Saudi Arabia will increase, because its production is forecasted to decline more slowly than other countries' production.

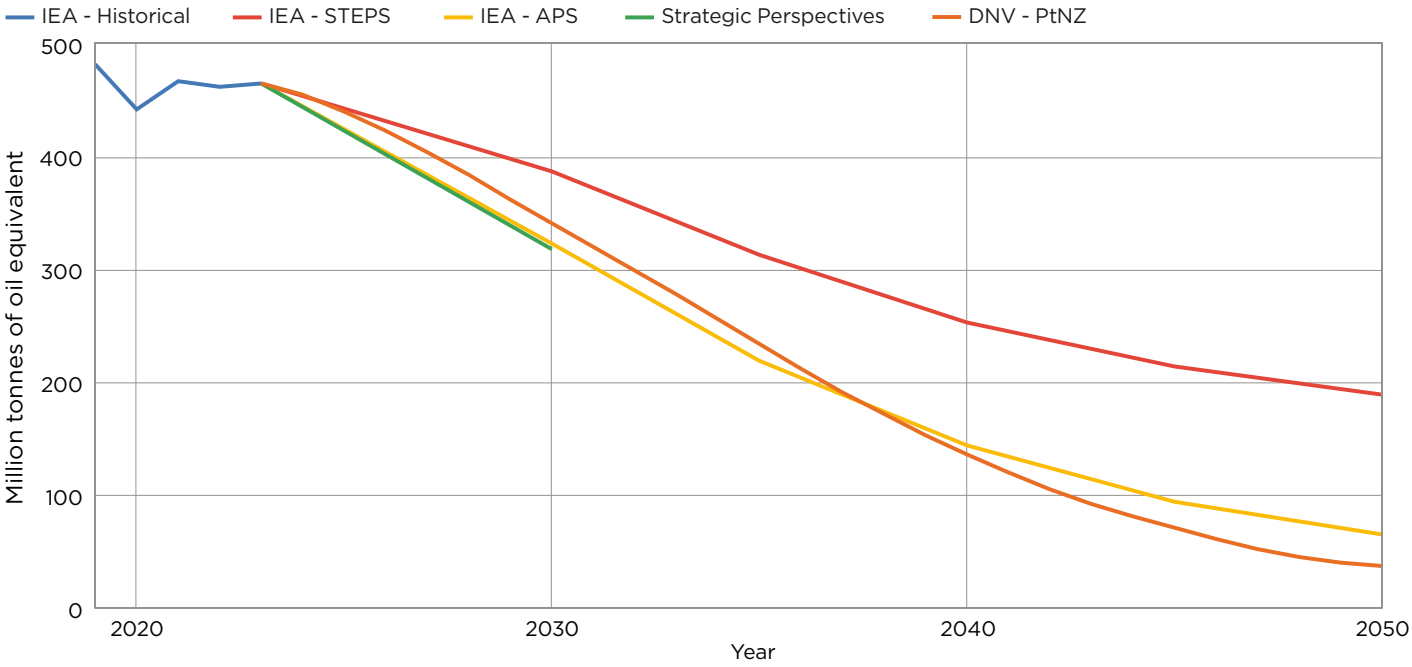
Production forecasts from new projects and comparison with demand trends are presented in the last section.

Figure 12: Projected oil supply from existing projects. Top 10 EU suppliers



Source: Transport & Environment, based on historical data from Eurostat and forecast data from Rystad Energy.

Figure 13: EU oil demand 2019-2050



Source: Transport & Environment, based on data from the IEA WEO 2023, Strategic Perspectives and DNV.

DEMAND

The war in Ukraine had no significant impact on the post-covid recovery of oil consumption in the EU. While fossil gas demand dropped 15 percent between February 2022 and February 2023, EU consumption of oil increased by two percent, as no sobriety measures were implemented to reduce consumption in the short term.[83]

The EU's oil demand has also entered a long-term decline. The scale and pace of that change is assessed in four scenarios:[84]

- In the IEA's Stated Policies Scenario (STEPS 2.4°C), the EU's oil consumption would fall by **16 percent from 2022 levels** by 2030, and by 59 percent by 2050.[85]
- According to the consulting firm Strategic Perspectives' assessment of the EU Green Deal and RePowerEU policies, EU oil demand will fall by **34 percent by 2030 from 2019 levels.**[86]
- In the IEA Announced Pledges Scenario (APS 1.7°C), the EU's oil demand falls by **30 percent by 2030**, and by 86 percent by 2050 in comparison to 2022 levels.
- The DNV PtNZ scenario, which achieves a global net zero energy system by 2050 with the aim of limiting warming to 1.5°C, forecasts a **26 percent drop in oil demand by 2030** compared to 2021, yielding a 92 percent drop by 2050.

EU OIL DEMAND 2020-2050

The EU's oil demand decreases under all scenario projections. Likewise, recent policies adopted by the EU as part of the Green Deal are forecasted to accelerate the pace of decline. However, meeting our current climate targets requires more ambitious policies. The pace of change must accelerate at an even greater pace in the 2030s, which means the EU still has time to implement the right policies.

DOES THE EU NEED NEW SUPPLIES TO MEET DEMAND?

Our analysis seeks to identify to what extent, if any, new oil production from 10 supplier countries is needed to meet future demand. Our analysis indicates that new oil projects are not needed to meet the EU's future oil consumption needs, as long as announced pledges are met. If the EU came closer to following a net zero pathway, in 2050 the bloc would require 61 percent less oil than the forecasted production volumes coming from existing fields.

We have combined data from Rystad Energy on foreseen production coming from new oil projects in the top-10 largest supplier countries to the EU with data on oil demand from the three main scenarios presented above. For new supplies, as for production forecasts from current oil projects, we assumed that the share of oil exports from these countries to the EU would remain constant over the years.

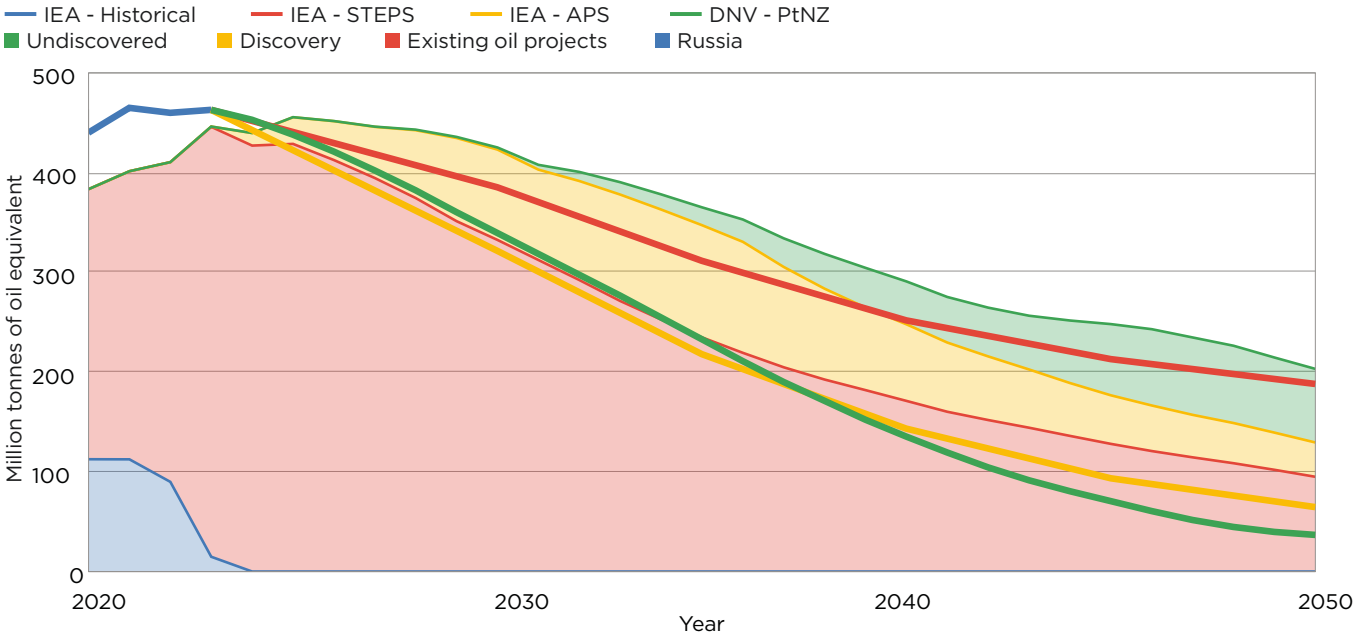
NORWEGIAN OIL PRODUCTION ON THE DECLINE IN ALL CASES

Following the invasion of Ukraine, Norway significantly increased its oil exports to the EU, directing more than 80 percent of its production to EU countries. Norway is currently planning for new oil fields, of which the majority will be developed in the North Sea (66 percent of Norwegian oil in 2050 will be from fields in the North Sea, according to Rystad Energy, while 11 percent will come from the Barents Sea).

However, production forecasts indicate that Norway's oil production will peak by 2025 and rapidly decline afterwards, as shown in Figure 15. In 2030, the country is expected to barely maintain its 2021 production level, even if new projects are approved.

Forecasts predict that production from existing fields will decline by 32 percent by 2030 and by 98

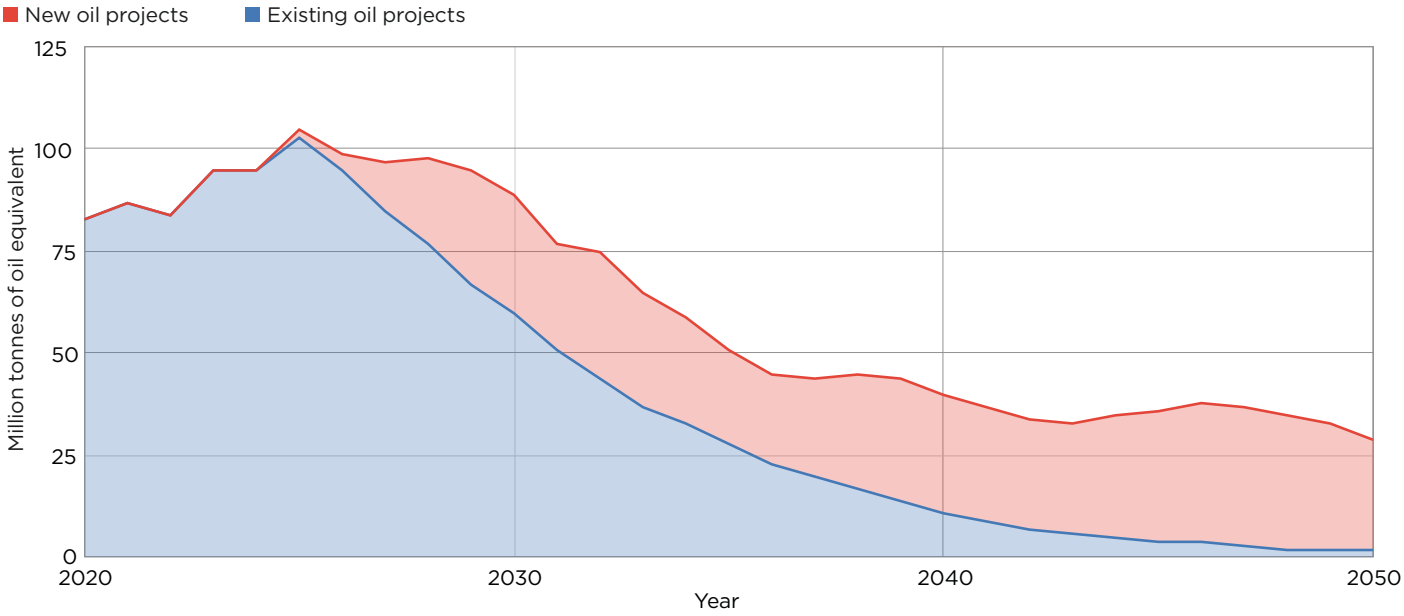
Figure 14: EU oil demand and supply 2020-2050. Top 10 suppliers to the EU



Source: Transport & Environment, based on data from IEA, Eurostat, DNV and Rystad Energy. 2020-2023 EU oil supply data from Eurostat. 2023-2050 oil supply estimated based on production forecasts from Rystad Energy, assuming a constant share of exports to the EU from its 10 biggest suppliers in 2023.

percent by 2050, compared to 2021 levels. As shown in Figure 15, the development of new fields will not compensate for the long-term decline in Norwegian production nor delay its forecast 2025 peak. Accounting for these potential new projects, Norway's oil production will still be 66 percent lower in 2050 than it was in 2021. Thus, it is clear that Norway won't significantly increase its share of the market for oil exports to the EU, even if it goes on with the development of new oil projects, which also remain incompatible with a climate-proof future.

Figure 15: Existing vs new oil projects' production in Norway



Source: Rystad Energy. Existing projects refer to producing fields and fields currently under development. New projects correspond to discoveries and undiscovered reserves.

CONCLUSIONS & RECOMMENDATIONS: ARCTIC AMBITIONS ON THIN ICE

Policymakers in the EU, Norway and other gas exporting countries are urged to take bold steps towards energy transition and alignment with climate goals.

The EU should resist Norway's push for more Arctic oil and fossil gas exploration and extraction, and focus instead on sustainable energy solutions. EU countries should also not be pursuing the expansion of gas production or exports in other supplier countries around the world. European buyers should not sign new long-term gas suppliers, and the EU should put in place measures to assess the financial and climate risks of new long-term gas contracts. The EU must ensure its policies are sufficient to reduce gas demand in line with its long-term climate targets and a fair share of global emissions reductions.

Norway should halt the exploration, licensing and development of new oil and fossil gas fields, devising a phase-out plan for the industry.

Other gas producing and exporting countries should not expand their production and export capacity in order to meet future European demand. The US should extend the current pause to become a permanent block on new LNG export terminal approvals,[87] as European demand for US gas will fall.

Aligning with climate goals ensures a sustainable and safe future for both the EU and Norway, contributing significantly to global efforts to combat climate change.

ENDNOTES

1 Rystad Energy's production forecasts are based on its assessment of more than 85,000 oil and gas fields and licences globally, including their recoverable reserves, reservoir characteristics, historical performance and drilling profile. Our analysis of the gas supply uses Rystad Energy's database that covers data on production forecasts, trade flows of gas and LNG, infrastructure, economics, and contracts from 1990 through 2050. The authors are responsible for the analysis in this report.

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20 A decline is structural if it is due to fundamental and long-term changes, as opposed to short-term changes, such as market shocks.

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