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REPORT SEPTEMBER 2024

GAS TRANSITION: WHAT'S NEXT?

A FRAMEWORK FOR A MANAGED EU GAS TRANSITION

RAPHAEL HANOTEAUX, RHEANNA JOHNSTON, SIMON SKILLINGS

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About E3G

E3G is an independent climate change think tank with a global outlook. We work on the frontier of the climate landscape, tackling the barriers and advancing the solutions to a safe climate. Our goal is to translate climate politics, economics and policies into action.

E3G builds broad-based coalitions to deliver a safe climate, working closely with like-minded partners in government, politics, civil society, science, the media, public interest foundations and elsewhere to leverage change.

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SUMMARY

The EU energy system's transition away from fossil gas was set in motion by the European Green Deal's climate targets. The energy crisis of the last two years has firmly shifted the outlook on fossil gas: a clear downwards trajectory in the medium to long term. However, the current EU policy framework is insufficient to ensure a smooth and managed transition. Effective planning of the whole energy system is therefore critical and must be built on solid projections of future demand.

Fossil gas use has reduced significantly in Europe in recent years, and this trend is being accelerated – due to the recent energy crisis and the explosion of clean technologies. Fossil gas currently still plays a key role in meeting the energy needs of the power sector, households and industry but the imperatives of energy security, economic competitiveness and climate ambition have set the EU on the path away from fossil gas. Alternatives already exist, principally using efficient, smart electric solutions.

The EU and its member states must consider how to deploy and build demand for these solutions in a predictable way, and ensure the right mechanisms are in place to efficiently plan energy system infrastructure needs. This requires a holistic understanding of the changes underway in our energy systems:

> **Planning and governance: Planning the whole energy system will be crucial to realising the opportunities and managing the challenges of transitioning away from fossil gas**. Current planning processes were designed for a system that changes slowly and enables only limited interaction between energy carriers. The EU and member states should consider what changes will be necessary to ensure plans and expert policy advice are produced without risk of bias through commercial self-interest.

> **Energy security**: As power sector decarbonisation advances, and fossil gas is increasingly replaced with electricity generation from renewable energy sources, the security of supply agenda must shift from a focus on immediate access to fossil fuels, to the need to efficiently store and flexibly use large volumes of renewable electricity. The role of fossil gas as a viable "transition

fuel" away from coal in power has been debunked by volatile prices, security of supply concerns and significant methane emissions. As electrification ramps up and volumes of renewable capacity increase, new regulations, markets, and operational practices will be needed to deploy the technologies that will replace the storage and other services currently provided by fossil gas generators.

> **Households**: Current policies have focused on encouraging early adoption of alternatives to fossil gas space heating – mainly heat pumps and heat networks. A new policy framework is required to increase access to, and drive mass adoption of, these alternatives while managing the decrease of gas use in distribution networks. This must maintain public consent by managing the cost and social implications with particular focus on protecting those households who will find it difficult to make the change.

> **Industry**: Fossil gas demand in industry has remained stagnant, reflecting the disconnect between short-term commercial drivers and the long-term benefits of decarbonisation. New policies and funding are needed to bridge this gap: to support upfront investment in new technologies, effectively plan for changes to energy needs and geographies, and secure long-term access to cheap renewable energy supplies.

> **Workers and regions**: The fossil gas industry provides many jobs, and these are already being affected by the energy transition. Similarly, different regions of the EU face different levels of exposure to fossil gas demand as well as challenges transitioning towards a clean economy. However, many new jobs and economic opportunities are being created as the clean energy transition advances. Effective planning of the transition will allow workers and regions to prepare for the future and allow them to reap the benefits.

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The EU needs a comprehensive framework for a managed gas transition

The critical next step lies in effectively managing this transition. Failure to do so could result in higher bills for businesses, industry and consumers, reduced investor certainty and wasted public funds. A comprehensive framework to address these challenges and ensure a successful fossil gas transition should implement several key recommendations:

> **Review energy system planning processes and governance** to deliver a forward-looking approach in line with an electrified and decarbonised future. Integrate planning across different energy vectors and energy sectors, while ensuring independent, transparent processes.

> **Adopt clear and well-defined projections** of future EU fossil gas demand reduction to provide clarity for planning and policy making.

> **Build a new approach to delivering energy security** which does not depend on fossil gas power generation. Update operational practises to manage systems with high renewable generation and review the procurement of flexibility and back-up services as part of the planned 2026 review of electricity market design.

> **Safeguard households from the rising costs** of lock-in to volatile fossil gas by developing a citizen-focused strategy that addresses the economic and social impacts to enable everyone to shift away from fossil gas in a managed and fair way.

> **Develop a strategy that enables industry to bridge the gap** between the short- and long-term economics of the clean energy transition: prioritise direct electrification in industry and enable access to affordable renewable electricity as well as upfront support for clean investments.

> **Create a strategy to transition direct and indirect gas industry workers** who are impacted by declining gas demand: plan across employment sectors to meet future needs; transparently communicate and plan together with workers and unions; and enable access to high quality clean energy jobs.

> **Address the regional differences** in exposure to gas demand and fiscal space across the EU, to leverage regional advantages in new clean economy opportunities and socio-economic development to build a competitive and cohesive European clean economy.

The above recommendations are summarised in Figure 1. Table 1, which follows on the next page, presents a checklist designed for policymakers to check whether they have thoroughly addressed the key issues for managing the gas transition for each theme discussed in this briefing.

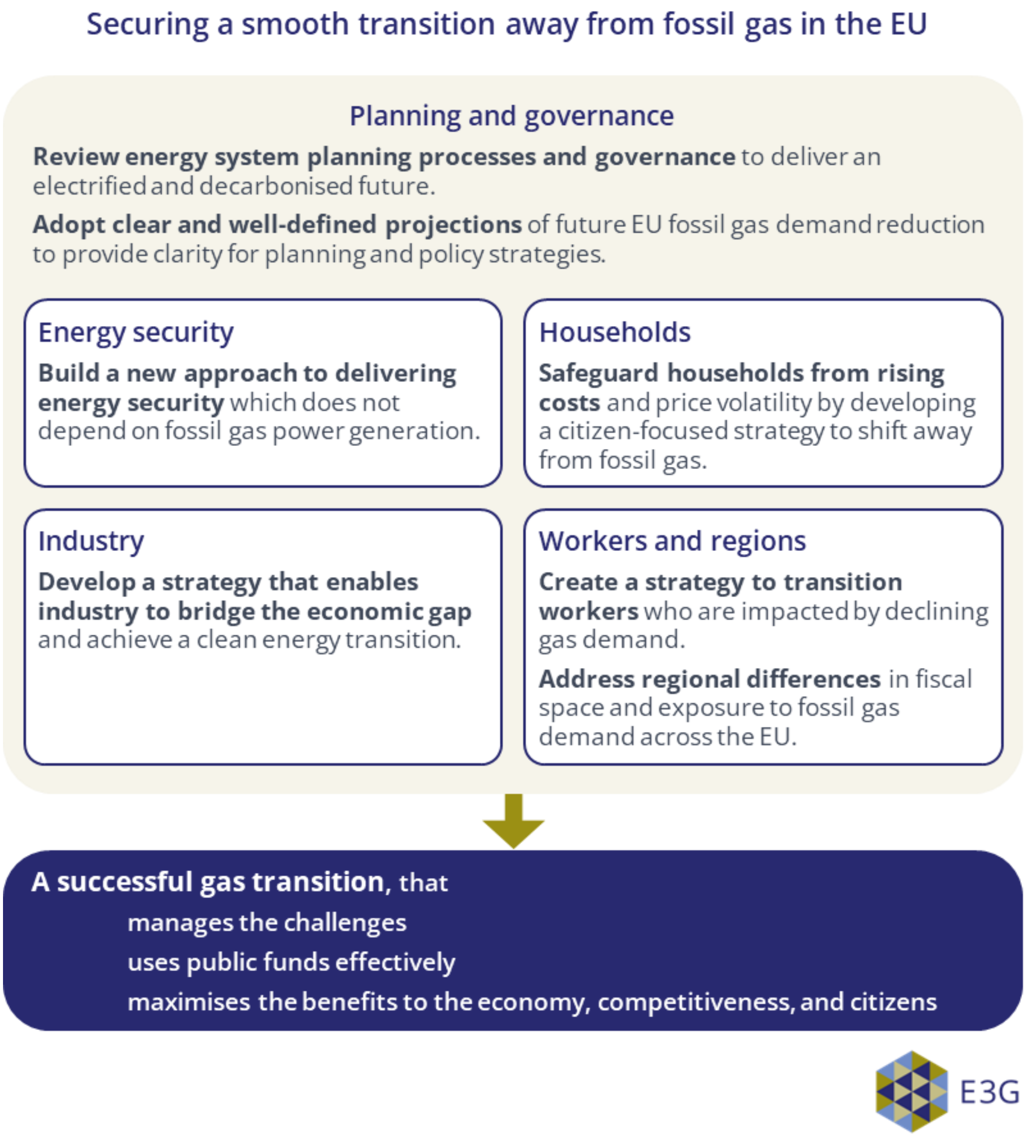

Figure 1: Managing a successful transition away from fossil gas in the EU will be a complex process, but offers benefits to the economy and society. Success depends on good planning and governance across the key areas of maintaining energy security, supporting the transition in households and industry, and ensuring a just transition for workers and across EU regions.

Table 1: Checklist for managing a successful gas transition

Theme	Policy checklist
Planning and governance	> Is the whole system planning capability in place to ensure the appropriate mix of investment in network infrastructure, demand side flexibility and zero emissions long duration storage? > Are the correct institutions in place to deliver the new planning functions required by the transition to net zero? Including for: • Whole system planning. • Expert independent advice to policymakers. • Ongoing market reform. • New system operational practices at transmission and distribution levels. > Are the institutions involved in these issues: • Sufficiently expert across all technologies? • Transparent: can decisions be traced and is the process clear and transparent for third parties? • Capable of ensuring and actively encouraging meaningful stakeholder involvement?
Energy security	> Are capacity markets aligned with new reliability requirements and with the most ambitious net-zero pathway for power generation? > Are TSOs and NRAs mandated to assess new system reliability requirements? > Are market prices granular enough to incentivise that all resources contribute to security of supply and efficient use of grids? > Are public participation and transparency embedded into every new priority project?
Households	> Has enough consideration been given to reducing household electricity costs, including taxes, levies, and profits? > Is data available on the energy transition's impact on households, including social factors like energy poverty and job effects? > Are renovation and energy efficiency programmes affordable, accessible and attractive? > Are vulnerable groups affected by gas demand cuts identified and supported? Is there a plan to keep energy affordable for low-income households during the transition? > Are the upcoming changes and their impacts effectively communicated to the public, and is public input being considered?

Theme	Policy checklist
Industry	> Is there a strategy to align the short-term economic impact of the transition for industry with the long-term benefits of reducing fossil gas demand? > Are there strategies to turn changes in energy geography into opportunities for new regions and industries while managing the effects on existing ones? > Are industry stakeholders meaningfully and transparently involved in planning processes for both electricity and gas network planning? > Are industrial policy frameworks tailored to the specific needs of different industries?
Ensuring a just transition for gas workers	> Is the future for the fossil gas sector being clearly communicated to workers? > Are there programs in place to support workers in receiving training to transition away from jobs in the gas sector? > Are workers and unions proactively involved in decision-making within companies and in the wider planning of the energy transition? > Are new clean energy jobs made attractive with good working conditions, quality pay, and inclusive internal cultures?
Avoiding a two-speed Europe	> Do actions taken at the EU level, particularly regarding funding, consider the resource gap between Northwestern Europe and Central and Eastern Europe (CEE) for managing the gas transition? > Is the decarbonisation of power and industry in CEE tailored to the competitive advantages of the region? > Is decentralised and resilient energy infrastructure prioritised to ensure CEE's energy security? > Is regional cooperation leveraged to enable competitive value chains and socio-economic development?

CHAPTER 1
THE ROLE OF FOSSIL GAS IN THE EU

Reducing fossil gas: A climate and health imperative for the EU

Methane emissions from fossil gas operations have an outsize climate impact
The continent of Europe's fossil gas operations are responsible for 16% of global energy-related CO_2-equivalent emissions.[1] Reducing fossil gas demand and transitioning the EU's economy away from fossil gas is pivotal for achieving the EU's climate ambitions.

Fossil gas has in the past been touted as having lower greenhouse gas emissions compared to coal, for example. This is misleading. When compared to other fossil fuels, the greenhouse gas emissions of fossil gas's full life cycle – including extraction, transport and distribution, storage, and final use – are decisive.

The greenhouse gas impact from fossil gas is due in large part to the methane leakage from supply chains as methane is a much more potent greenhouse gas than CO_2: 34 times more powerful over a 100-year lifetime.[2] Even more significantly, over a 20-year period methane's warming potential is 86 times that of CO_2, meaning its short-term impacts on climate change mitigation efforts in the crucial decades towards 2050 are substantial.

Methane is responsible for 30% of the rise in global temperatures since the industrial revolution. The global energy sector (oil, coal, natural gas and bioenergy) accounted for 135 million tonnes of methane emissions in 2022, of which nearly 30% came from fossil gas operations.[3] Reducing methane emissions is therefore one of the most important levers to achieving global and EU commitments to limit global warming to 1.5 °C.[4]

[1] IEA, **Europe Natural Gas**, 2021 data

[2] Union of Concerned Scientists, 2014 (updated 2023), **Environmental Impacts of Natural Gas**

[3] IEA, 2023, **Global Methane Tracker 2023**

[4] Clean Air Taskforce, 2023, **EU oil and gas imports linked to avoidable health risks for 10m people**

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Air and water pollution from fossil gas use is harmful to health

Burning fossil gas releases harmful air pollutants as either primary or secondary pollution, including particulate matter (PM), nitrogen dioxide (NO_2), carbon monoxide (CO) and sulphur dioxide (SO_2).[5] Air pollution of this kind negatively impacts health already at very low levels. It can cause respiratory illness and cardiovascular disease, as well as asthma and impacts on cognitive functions – these impacts particularly worsen from childhood exposure.[6]

Although not as polluting as coal power, the direct impacts on health from air pollution generated by fossil gas power generation in the EU and UK include up to €8.7 billion in health costs in 2019 alone. This included over 15,000 cases of respiratory impacts and 2,800 premature deaths in the EU and UK.[7] Communities living near gas infrastructure are at a greater risk of additional health impacts while marginalised communities, vulnerable households, and children are disproportionately impacted by the health harms of fossil gas combustion.[8]

Moreover, extraction methods such as "fracking" (hydraulic fracturing) to extract liquid natural gas (LNG) can be particularly harmful as they contaminate local water quality and risk serious health impacts from "forever chemicals".[9] Even cooking at home with a gas stove increases exposure to NO_2, particulate matter, and known carcinogens such as benzene, consequently increasing the risk of and exacerbating respiratory illnesses.[10] The increasingly understood health risks posed by fossil gas therefore also underscore the benefits of rapidly transitioning to clean energy solutions.

[5] Union of Concerned Scientists, 2014 (updated 2023), **Environmental Impacts of Natural Gas**

[6] E3G, 2022, **The link between gas and health: a rapid review** and PSE, 2023, **Natural gas and human health: reheating an old debate**

[7] HEAL, 2022, **False fix: the hidden health impacts of Europe's fossil gas dependency**

[8] E3G, 2022, **THE LINK BETWEEN GAS AND HEALTH: A RAPID REVIEW**

[9] Friends of the Earth Europe & Food and Water Action Europe, 2022, **10 reasons why liquified fossil gas is the wrong choice for Europe**

[10] Scientific American, 2023, **The Health Risks of Gas Stoves Explained**

Fossil gas in the EU

The historical evolution of fossil gas in the EU

The EU's fossil gas demand has remained relatively steady for the last ten years, floating around 350 bcm of final energy demand annually (Figure 2).[11] The most significant drop (prior to 2022) was in 2014 when demand fell by 10% due to mild weather and slow economic recovery from the Eurozone debt crisis of the early 2010s.[12]

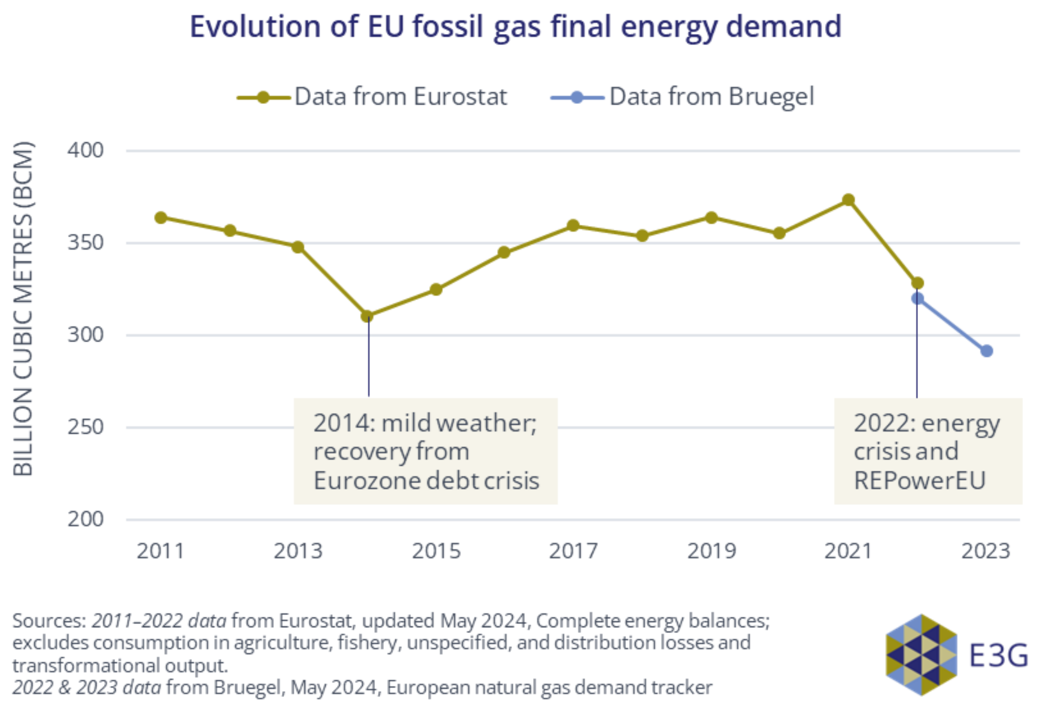

Figure 2: Fossil gas final energy demand in the EU floated around 350 bcm per year in the decade to 2021. However, there are signs of a more permanent reduction beginning in 2022.

[11] Final energy demand refers to the final use of fossil gas in the EU. In contrast, gross inland consumption is the total supply of gas consumed by the EU, including transformation losses as well as transmission and distribution losses. Gross inland consumption for the EU in 2019 was around 400 bcm (398.89 bcm) indicating a 50 bcm gap between gross inland consumption and final energy demand. Eurostat, updated May 2024, **Complete Energy Balances**.

[12] DG ENER, European Commission, 2014, **Quarterly Report on European Gas Markets**

The share of fossil gas in the energy mix has remained around 20% – in contrast to coal, whose share has slowly but steadily declined since 2010, and was surpassed by renewables around 2018.[13] The EU's dependence on external imports has remained similarly high: its fossil gas import dependency rate has been above 75% since 2015,[14] and was a staggering 90% in 2023.[15] The most significant portion of this gas has historically come from Russia via pipeline. Norway, the US and North Africa represent further significant exporters to the EU.[16]

Gas demand in the EU has historically been concentrated in three main sectors: households (heating and cooking), industry (as a fuel as well as a feedstock) and power generation (to produce electricity and heat). Households make up the largest share of gas demand (40%). Decarbonising the power sector will be a particularly important lever, as electrification will replace fossil gas demand in the households sector, as well as a large part of industry demand. Overall gas demand has already begun to decrease, particularly in the period between 2019 and 2023, but the proportion of demand between sectors has remained relatively equal.

All EU countries use fossil gas, however the sector and level of consumption varies widely. Several countries are particularly big consumers of fossil gas – Germany, Italy and France made up over 50% of gas consumption, but with different distribution across sectors (Figure 3).[17] For example, in Germany the consumption is balanced between the three sectors, while in Italy power generation makes up the largest share of gas consumption.

According to ACER, the EU's gas network is made up of more than 200,000 km of transmission pipelines, and over 2 million km of distribution pipelines.[18] This vast infrastructure signifies a substantial financial and budgetary commitment, with significant investments in its development and maintenance. Not managing the transition of these assets could have wide-ranging economic impacts beyond the energy sector.

[13] Eurostat, 2024, **Energy Statistics – an Overview**. In 2022 coal was 11% of the EU's Gross Available Energy (GAE) declining from 16% in 2010. GAE of fossil gas was 21% in 2022; renewables and biofuels were 18%.

[14] European Commission, 2022, **EU Energy in Figures: Statistical Pocketbook**

[15] Eurostat, updated May 2024, **Natural Gas Supply Statistics**

[16] European Council, 2024, **Where does the EU's gas come from?**

[17] E3G, July 2022, **EU gas sector: data for decisionmakers**

[18] ACER, 2024, **Gas Factsheet**

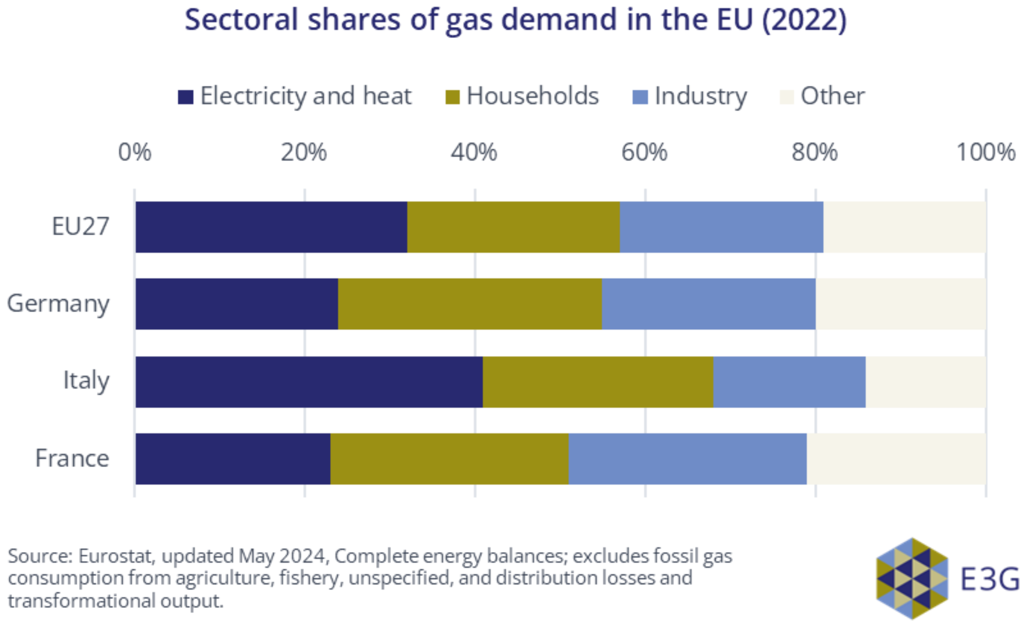

Figure 3: Distribution of fossil gas demand in the EU and major gas-consuming member states. Germany and France use proportionally less fossil gas for electricity and heat than the EU average. Italy, by contrast, uses more of its fossil gas in that sector – but has less demand from industry.

EU Green Deal and energy crisis: setting the gas transition in motion

The political and economic landscape of fossil gas in the EU has changed dramatically in recent years. Kicked off by the European Green Deal and the Fit for 55 package introduced in 2019, the EU's shift towards a climate neutral future ramped up in 2022 after the Russian invasion of Ukraine. In the context of the war and the ensuing energy crisis, the prices of gas skyrocketed while European and global supplies became unstable. The energy crisis set a sharp focus on the EU's dependence on gas imports. It became clear that the EU could no longer rely on fossil gas, in particular Russian pipeline gas, to deliver security of supply or affordable energy prices.

The EU responded by raising the ambition of key climate and energy legislation to reduce dependence on Russian pipeline gas as quickly as possible. This new set of measures, REPowerEU, significantly increased the EU's projected gas demand reduction by 2030 relative to 2019 – from 32% reduction foreseen by the Fit for 55 measures, to 52% reduction in REPowerEU.

The energy crisis, alongside the growing body of evidence on the climate impact of methane, fundamentally challenged the pre-war view of fossil gas as an affordable and convenient "transition fuel" on the road to the EU's decarbonisation. It became clear that reducing gas demand was the fastest and most cost-effective path to protect households and industry from the volatility of gas prices and the risk of exorbitant prices, as well as reduce reliance on Russian fossil fuels. The cost of net fossil fuel imports represented about 2.2% of GDP between 2010–2021 but nearly doubled to 4.1% during the energy crisis in 2022.[19] In their impact assessment of the 2040 climate target, the European Commission therefore concludes that reducing dependence on fossil fuels not only reduces energy system costs but will also better protect the block from future price shocks.[20]

The EU therefore significantly reduced reliance on Russian pipeline gas, from 150 bcm before the war began, to only 43 bcm in 2023.[21] Furthermore, it consistently achieved annual gas demand reductions, saving 12% in 2022 and a historic 20% of gas demand in 2023, compared to the 2019–2021 average.[22] Meanwhile, renewables have steadily grown to become the major source of new electricity generation, reaching a record 44% of electricity generation in 2023, while fossil gas generation simultaneously fell by a record 15%.[23]

While gas prices have decreased significantly as of February 2024, prices remain above pre-crisis levels and global gas markets are expected to remain tight at least until the 2026 arrival of new supplies.[24] The continued volatility of gas prices and the risks it poses for the EU's economic competitiveness and the energy security imperative, combined with the EU's continued ambition to become the first climate neutral continent, have therefore firmly set Europe's gas transition in motion.

[19] European Commission, 2024, **Commission Staff Working Document Impact Assessment Report Part 1**

[20] European Commission, 2024, **Commission Staff Working Document Impact Assessment Report Part 1**

[21] European Council, 2024, **Where does the EU's gas come from?**

[22] Bruegel, March 2024, **European Natural Gas Demand Tracker**

[23] Ember, 2024, **European Electricity Review 2024**

[24] The stability of gas prices from 2024 to 2026 is also likely to be impacted by the variability of gas demand in other regions, notably spikes in demand in Asia, which may further impact global prices. IEA, 2023, **After peak in mature markets, global gas demand is set for slower growth in coming years**

Current outlook and the EU framework

Fossil gas demand: A downwards trajectory

Member states are already planning for significant reductions in fossil gas demand, as evidenced by REPowerEU and updated National Energy and Climate Plans (NECPs). The latest draft NECPs submitted by the top three gas consuming countries project an average 34% reduction by 2030 compared to 2019 (Figure 4).[25] This is a significantly steeper projection in gas demand reduction than was made in the last round of NECPs from 2019.

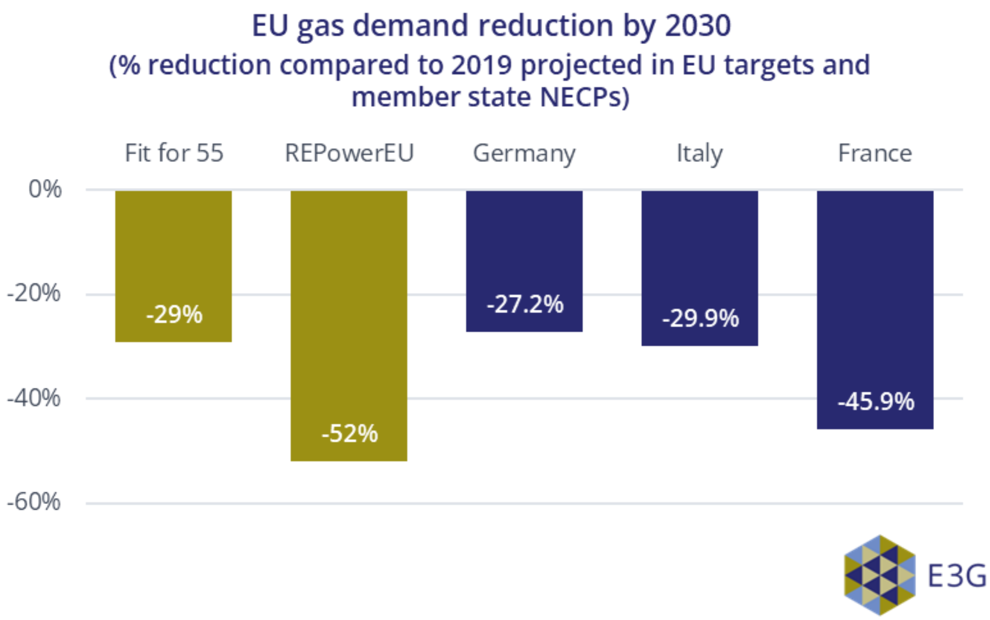

Figure 4: Draft NECPs of three major gas-consuming member states project gas reductions in line with Fit for 55, though not yet reaching the targets outlined in the REPowerEU initiative.

This trajectory aligns with the EU's expected impact of implementing the Fit for 55 package, though this still falls short of the expected trajectory of halving gas use by 2030 outlined in the REPowerEU initiative.

The 2040 impact assessment published in February 2024 by the European Commission also sets a clear downwards trajectory for fossil fuels, including gas. Fossil fuel consumption would be 74% lower in 2040 than in 2019, while the power grid would be mostly decarbonised via renewable energy (complemented

[25] E3G, March 2024, **Charting the course for EU gas sector transformation**

by some nuclear) generating well over 90% of electricity in 2040.[26] Moreover, as the economy increasingly electrifies, gas will be phased out not only from power generation but also from various other sectors as electrification ramps up. The 2040 impact assessment expects the share of electricity in final energy consumption to double from 25% to 50% by 2040. By 2050, the overall demand for gas molecules is expected to decline by more than two-thirds (between 71% and 74%) compared to 2019, even after taking into account alternative gases such as biomethane or hydrogen. This indicates that not only fossil gas demand, but also demand for all gases, will decline.

The impact of the Fit for 55 package, combined with the trajectories outlined in member states' NECPs and the EU's 2040 ambitions, clearly indicates that the EU's fossil gas demand is already decreasing and will continue to do so – sooner and faster than previously anticipated. This significant reduction in gas demand will present new challenges for the EU's energy system transition, particularly affecting gas grids, infrastructure and workers. It will also have broader economic impacts, both positive and negative, on public budgets, energy bills, and industry competitiveness.

However, the critical aspect lies in effectively managing this transition. Failure to do so could result in higher bills for businesses and consumers, reduced investor certainty, and wasted public funds. It is therefore imperative for the EU and its member states to take proactive steps to ensure a smooth and efficient fossil gas transition.

The EU's framework: a missed opportunity to manage the transition

Via the Fit for 55 and REPowerEU legislative updates, the EU has kicked off its trajectory to reduce gas demand. However, while these measures set out the first steps for reducing demand, they do not set up a framework to manage this transition (Figure 5). Details of key legislative files are provided from page 21.

The EU's Emission's Trading System (ETS), which covers large industry and energy installations (ETS 1), has been complemented by a second ETS covering the consumption of all remaining fossil fuels outside of agriculture, most notably in the transport and building sectors, but also including smaller industries (ETS 2). Together, these two emission trading systems set a significant signal to phase out fossil gas in heating and power generation, and importantly, change the

[26] In the EU's 2040 impact assessment, the share of fossil-fired generation is projected to decrease to 12% in 2030 and further down to 3% – 8% (depending on the scenario) in 2040. European Commission, 2024, **Commission Staff Working Document Impact Assessment Report Part 1** and **Part 3**

underlying energy economics by making fossil gas more expensive vis-à-vis clean energy. The ETS 1 cap, or annual emissions limit, is set to reach zero in 2039 – effectively setting a de-facto deadline for unabated fossil gas use in industry and power. Meanwhile, the buildings and transport sectors would effectively need to phase out fossil gas by 2044.

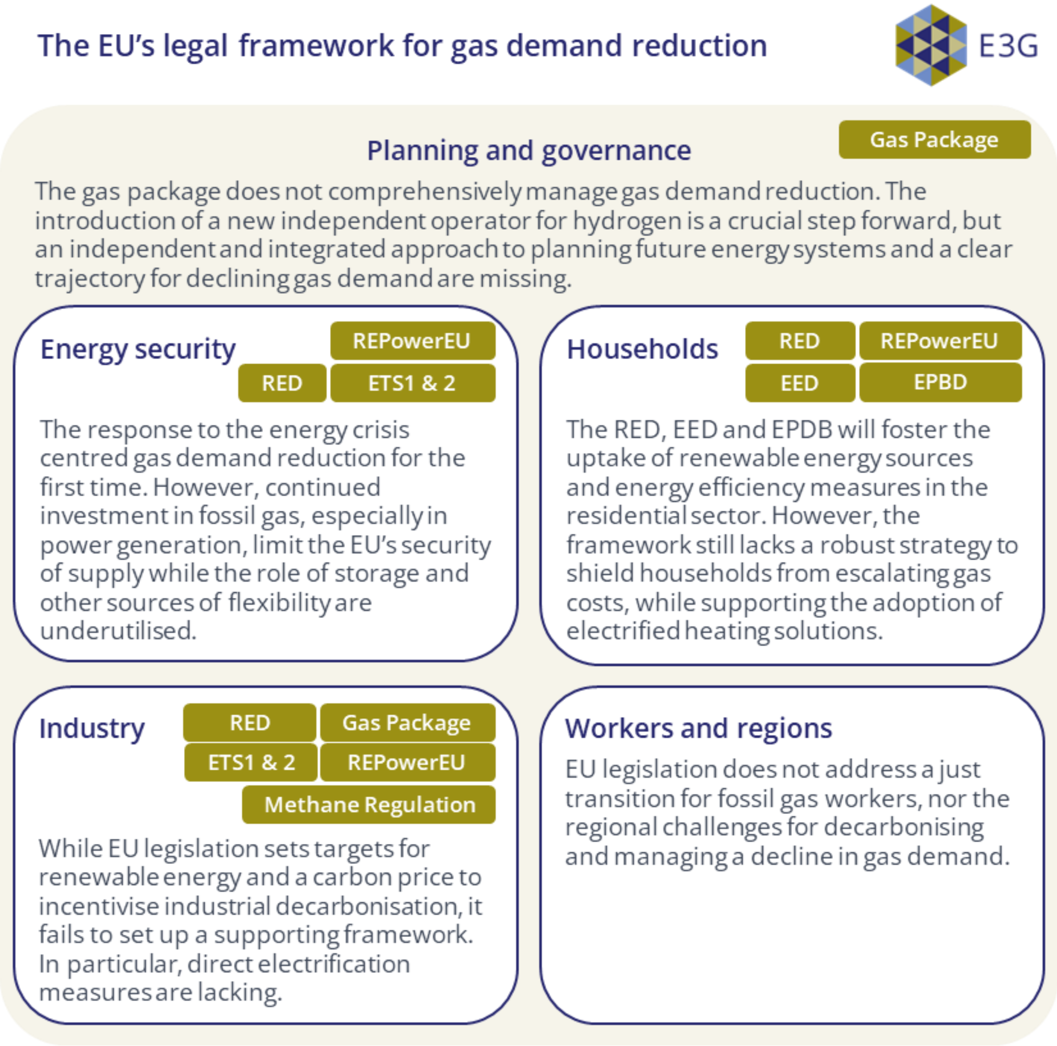

Figure 5: The EU's legislative measures for gas demand reduction do not add up to a comprehensive framework for a managed gas transition. Legislation is particularly lacking in the policy areas of workers & regions, and planning & governance. See page 21 in this section for more detail on the legislative measures, and following chapters in this report for detail on what exists – and what is needed – in each policy area.

Other measures, such as increased renewable energy and renewable fuels targets under the Renewable Energy Directive (RED), 2040 fossil fuel boiler phase-out in the Energy Performance of Buildings Directive (EPBD), and increased energy savings target of the Energy Efficiency Directive (EED), all contribute to the decline of gas demand.

However, these measures do not actively manage the deployment of alternatives, infrastructure planning or other emerging challenges. In particular, the Gas Package's approach missed a key opportunity to deploy alternatives, plan infrastructure and manage a declining gas market. While the package – along with several other measures like joint-purchasing or eventually phasing gas boilers out of buildings – tweak the edges of the gas market structure, they fail to address the real problem: how to manage a shrinking gas market. **This leaves a serious gap: will the EU let gas markets fall into chaos, or will it actively plan and manage a transition, supporting consumers and industry?**

Assessment of the impact of EU legislative files on gas demand

Renewable Energy Directive (RED)[27]

Introduced a new 42.5% (45% collective) target for share of renewables in final energy consumption, of which 5% should be innovative renewable technology. The target was watered down from the 45% by 2030 reduction originally proposed, but will still be instrumental for driving gas out of power production. The target is complemented by sub-targets for renewable energy in buildings, heating and cooling, and industry.

The RED lays down the right bases for increasing green hydrogen production and its conditions of deployment, so it does not come at the cost of increasing renewable power capacity (additionality).

Energy Efficiency Directive (EED)[28]

Increases the target of annual final energy savings and sets various provisions prioritising energy efficiency in transmission networks, public buildings and district heating. The strengthening of consumer rights and measures addressing energy poverty are also positive. The various exemptions for fossil gas are problematic, especially in the heating sector.

[27] EUR-Lex, October 2023, **Directive (EU) 2023/2413 of the European Parliament and of the Council**

[28] EUR-Lex, September 2023, **Directive (EU) 2023/1791 of the European Parliament and of the Council**

Gas package[29]

Fails to set a clear trajectory for fossil gas phase-out across sectors. However, a key development is the obligation for distribution system operators (DSOs) to develop National Decommissioning Plans "when a reduction in gas demand is expected" (Art. 52b). These plans would be an important first step for managing a decline in required gas infrastructure. Plans should be updated every four years in cooperation with hydrogen, electricity and district heating operators, and should include public consultations and prioritise demand side measures.

The package also establishes an independent European Network of Network Operators for Hydrogen (ENNOH) to govern future hydrogen networks. The package offers weak unbundling rules for transmission system operators (TSOs) and potentially leaves the door open for hydrogen boilers. The definition of "low-carbon gas" also remains to be set via Delegated Act (most likely in late 2024).

REPowerEU emergency gas measures[30]

In response to the energy crisis and Russia's invasion of Ukraine, the Council (using emergency powers under Article 122 of the Treaty on Functioning of the EU in Emergency) passed several pieces of regulation aimed at mitigating energy costs and stabilising supply.

Overall, the measures did (at least in part) lead to lower gas prices in 2023, reduced dependence on Russian gas (down from 45–50% to 15%) – though mainly through diversification, reduced gas demand in 2022 and 2023 (down 18%, though only part of this was structural and permanent), high levels of gas storage by October 2023, and a record year for renewable energy deployment.

Energy Performance of Buildings Directive (EPBD)[31]

The EPBD has been severely watered down: Minimum Energy Performance Standards (MEPS) now only apply to non-residential buildings; fossil fuel boilers are not phased out as soon as needed (not before 2040), and there is room left for hydrogen in household heating. Nevertheless, it accelerates the deployment of renewables, sets zero-emission buildings as the norm for new builds, and sets a trajectory for getting fossil gas out of buildings. A binding energy consumption trajectory for the residential sector also sets the right direction for member states to deliver efficiency improvements to citizens.

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[29] EUR-Lex, June 2024 **Directive (EU) 2024/1788**, **Regulation (EU) 2024/1789**

[30] European Council, last reviewed April 2024, **Energy prices and security of supply**

[31] EUR-LEX, April 2024, **Directive (EU) 2024/1275**

Emissions Trading System (ETS1)[32]

ETS1 covers large industrial installations and electricity generators, and has been in operation since 2005. To date, it has been largely ineffective at driving fossil gas demand reduction due to a combination of low carbon prices – sometimes even incentivising fuel switching from coal to gas for electricity generation – and industry not needing to pay for their emissions ("free allocation").

Recent reforms have significantly strengthened ETS1, however. The 2030 emissions reduction target has been significantly strengthened and annual emissions permits are set to reach zero by 2039, essentially setting that as a deadline to end the use of (unabated) gas. The system of free allocation will be gradually phased out for industry, starting in 2026. In recent years the carbon price has increased dramatically, which is now starting to drive reductions in the consumption of fossil fuels, including gas.

ETS2: Buildings and transport[33]

ETS2 covers upstream fuel distribution for use in buildings, transport and small industry, and is expected to enter into force in 2027. Fossil fuel distributors will then be obliged to pay a carbon price on the good sold to these consumers, passing on (a share of) these costs to final consumers.

This changes the economics of fossil gas consumption, addressing the current distortion where consumption of electricity is covered by a carbon price (through ETS1) but direct consumption of fossil gas in these sectors is not – which disincentivises electrification. ETS2 also sets a clear trajectory for the decline of fossil fuel consumption, including gas, in these sectors as the annual emissions limit is set to reach zero by 2044.

While ETS2 helps to shift the economics in favour of clean energy consumption, it also risks increasing costs for final consumers, especially vulnerable households who do not have the means to respond to this price signal (for example, by buying a heat pump). Policymakers must therefore act to scale up delivery of building renovation and switch away from fossil-based heating, to protect citizens and businesses across Europe from rising costs.

[32] European Commission, 2024, **What is the EU ETS?**

[33] European Commission, 2024, **ETS2: buildings, road transport and additional sectors**

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Methane Regulation[34]

The Methane Regulation introduces new requirements for the oil, gas and coal sectors to measure, report and verify methane emissions (MRV rules). It also adds methane abatement measures with leak, detection and repair rules (LDAR), and a ban on routine venting and flaring (BRVF). The MRV will also cover emissions from imported energy sources which make up the majority of the EU's gas consumption.

However, the lack of an overall CH_4 emissions reduction target, and the long timeline for introducing a Methane Intensity Threshold (not enforced until 2030), severely weaken the regulation and are not in line with the Global Methane Pledge (to reduce methane emissions by 30% by 2030).

[34] Council of the European Union, December 2023, **Interinstitutional file 2021/0423(COD)** (PDF)

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CHAPTER 2
THE ECONOMIC OPPORTUNITY

The electric future

The transition away from fossil gas in power generation, household heating, and industry is already underway. Decarbonised electricity will become the primary source of energy, with the European Commission estimating that the share of electricity in the EU's final energy consumption will double from around 25% today to 50% in 2040.[35]

Aside from supporting delivery of climate goals, electrification of the economy will deliver a range of benefits:

> **Improving lives:** Electric heat pumps are proven technologies capable of effectively providing clean, efficient warmth. Where combined with appropriate insulation, they can significantly improve the comfort of homes and lower energy bills. They can potentially also contribute to reducing energy poverty when combined with support to cover upfront costs.[36] Electrical appliances can be readily integrated with digital controls to create a modern and convenient building energy management system. Moreover, the health benefits of clean air are considerable and an important consequence of reducing the use of fossil fuels including gas.[37]

> **Opportunities for businesses:** Businesses currently use gas for a significant variety of purposes, from high-temperature production processes through to simple space heating for offices. Electrification provides significant opportunities to eliminate the use of fossil gas.[38] This will help to insulate businesses from gas price shocks, while setting up industry to reap the long-term benefits of an EU competitive advantage in the green transition. However, the overall competitiveness of European industry will require access to cheap renewables and support to scale the deployment of new technologies, together with improvements to energy and material efficiency.

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35 European Commission, 2024, **Commission Staff Working Document Impact Assessment Report Part 1**

36 ECF and EHPA, 2023, **Europe's leap to heat pumps**

37 E3G, 2022, **The link between gas and health: a rapid review**

38 Madeddu et al., 2020, **The CO2 reduction potential for the European industry via direct electrification of heat supply (power-to-heat)**

> **Macroeconomic benefits:** Traditional fiscal analysis generally captures only a small proportion of the interactions between the energy transition and fiscal policy, such as eroding fuel duty income or the need for low-carbon investment while capital is locked into fossil fuel infrastructure. However, gas prices are inherently volatile, which can severely impact the EU economy by increasing inflation,[39] as demonstrated by the recent energy price crisis. Recent analysis further suggests that reducing emissions by 90% by 2040 could save over €800bn on fossil fuel imports between 2025 and 2040 and strengthen energy security.[40] Insulating consumers from future gas price shocks reduces the need for expensive, government funded support packages when prices escalate.

The energy transition has become a global economic imperative with huge growth potential. The economic advantages of being leaders in the transition are significant as new products and services are developed: the global market for clean energy technologies is expected to expand to $650 billion (€588 billion) by 2030.[41] By 2050, it is estimated to be worth $10 trillion (€9 trillion), with $5.3 trillion (€4.8 trillion) coming from renewable electricity creation and $316 billion (€286 billion) from clean energy equipment according to Oxford Economics.[42] This comes on top of avoiding costs resulting from unmitigated climate change – which can be vast[43] – by reducing emissions from fossil gas.

Planning to capture the benefits

The nature of energy supply and demand is already changing radically and involves a shift away from fossil gas to electricity (see Chapter 1). This shift will require large-scale change in the infrastructure of our energy systems. New networks will be required for electricity and possibly for hydrogen and carbon dioxide, while existing gas networks will need to operate with reduced gas

[39] A recent report by the UK Office of Budget Responsibility has shown that the debt impact of future volatility in gas prices is 13% of the UK gross domestic product (GDP) to 2050. This dwarfs the debt impact of 6% of GDP for investing in net zero. A similar situation is likely to exist in EU countries using significant amounts of fossil gas.

[40] Strategic Perspectives, 2024, **Forging Economic Security and Cohesion in the EU**

[41] IEA, 2023, **Energy Technology Perspectives**

[42] Portala, Reuters, 2023, **Green industries could be worth $10.3 trln to economy by 2050**

[43] Extreme weather and climate-related events over the last 40 years have already cost the EU over €487 billion, including over €5 billion on flooding every year and €2 billion in forest fire damage. European Council, 2022, **Climate change costs lives and money**. The global economy could lose up to 18% of its GDP, with Europe losing 11% by 2050 if no action is taken to mitigate climate change. World Economic Forum, 2022, **Climate change has cost the EU €145 billion in a decade**

volumes and ultimately be decommissioned. The timescales for developing new network infrastructure are such that decisions must be made well in advance of the requirement to connect future supplies and demands, and before their exact nature is known: so-called "anticipatory investment".

The uptake of new technologies, such as heat pumps, typically follows an "s-curve" whereby slow initial penetration is followed by rapid mass adoption with residual usage then continuing for some time.[44] New smart distribution power system operational practices, alongside hydrogen and carbon dioxide infrastructure, must be in place to meet the accelerating demand for electric cars, residential heat pumps and decarbonised industrial processes. This is especially important for industrial expansions necessary to deliver economic growth. There is a risk that investments will be put on hold due to inadequate network capacity, thereby restricting growth opportunities.

Conversely, investments in gas assets that are not needed as demand reduces will become stranded, imposing a large additional cost on energy consumers or taxpayers. This risk of stranded assets is especially severe in the gas network where the rate of declining usage is uncertain and expensive re-use strategies (e.g. hydrogen re-purposing) are being contemplated without any reliable predictions of future supply or demand. Maintaining a large gas network as demand reduces can result in high costs for residual gas consumers and action is required to avoid unacceptable costs being placed on those who are vulnerable. A clear plan for gas network decommissioning will enable regulators to implement optimal cost recovery structures to avoid escalations in consumer bills or the requirement for government funded bailouts.

Transitioning from fossil gas towards decarbonised electricity supplies will also create new challenges for operators of electricity grids. Many countries are now implementing strategies to produce electricity largely from renewable electricity supplies, and members of the G7, including Germany, Italy and France, have committed to fully decarbonise their electricity systems by 2035.[45]

While fossil gas is currently used to provide energy storage and operational flexibility, alternatives are now being deployed to deliver these services. Demand

[44] While it is often considered that power sector decarbonisation will occur before heat, transport and industrial sectors, these transitions will all run in parallel to a degree. For example, residual back-up gas power generation may be required for some time (see Chapter 3).

[45] Federal Ministry for Economic Affairs and Climate Action Germany, 2022, **G7 countries send clear message for more climate action and ambitious environmental policy**

side response and batteries can provide operational flexibility; other technologies, such as hydrogen produced by electrolysis, can be stored over long timescales to cover prolonged periods of “renewable drought”. System operators from across Europe are developing approaches to maintain a stable system while operating with 100% renewable electricity – so-called inverter-based systems.[46] While the basic technical solutions are available, regulations and markets need to evolve to take advantage of these technological innovations.[47]

Capturing the benefits of the transition away from fossil gas use will, therefore, depend critically on effective processes for coherent cross-sector infrastructure planning alongside the implementation of new power system operational practices.

[46] EIRGRID and SONI, 2022, **Operational Policy Roadmap 2023-2030**

[47] E3G, 2024, **Cheap, clean electricity for Great Britain by 2030**

CHAPTER 3
ENERGY SECURITY

The new energy security paradigm

The energy transition is changing the context for the EU's energy security policy, which has arisen through decades of dependence on hydrocarbons. The focus has been on boosting domestic production and maintaining the geopolitical and international trade conditions to ensure access to sufficient fossil fuel resources. Replacing fossil fuel dependence with energy supplies provided by renewable energy sources – together with increased energy savings, demand side management, flexibility and storage – presents the realistic prospect of energy security where prices are not driven by international events. Also, a more decentralised and flexible system supplied by many relatively small sources is inherently more secure than one dependent on a few large providers.

The most significant new energy security challenge will be to maintain a stable, balanced system in the face of dramatically changing supplies and demands. Additionally, coherent whole-system planning will be important to efficiently manage the declining dependence on fossil fuels – but this is largely an issue of cost rather than system security. There are risks of over-investment in network infrastructure and paying high prices due to inaccurate forecasts of demand. It is sometimes argued that geopolitical tensions will not disappear since the EU will need to maintain access to materials required by supply chains for a renewables-based energy system. However, materials security is very different: there are more possibilities to substitute materials, materials can be stored in high volumes, and demand could be reduced significantly through the development of a circular economy. Promoting recycling and reuse will reduce the requirement for imports over time since, once in the economy, these resources do not disappear. Finally increases in material costs only affect new investments, in contrast to fossil fuel prices which directly feed through to energy prices, impacting the whole economy. The price shock potential from materials is therefore very different to that experienced with fossil fuels.

However, the EU must maintain a geopolitical focus on proactively managing relationships with fossil fuel producer partners who are currently economically locked into meeting EU gas demand. This is necessary to avoid new geopolitical tensions and consequences such as migration and the associated costs.

There will additionally need to be an increased focus on cyber security in the future energy system, but that is largely independent of the energy sources. Digital technologies and artificial intelligence will inevitably be a feature of any future energy system given their ability to improve operational efficiency and support new consumer products.

Electricity system reliability

Fossil gas fired power generators are currently critical to ensure electricity supply and demand can be balanced, and that the overall system remains stable and secure. They can rapidly change output and automatically provide other services that maintain voltage and frequency within statutory limits. Conversely, the availability of renewable electricity is variable and depends on the weather and the extent of electricity storage.[48] Also, renewables do not automatically provide the full range of services required to maintain system stability such as demand side management, flexibility and storage. It will only be possible to reduce and eliminate dependence on fossil gas for power generation when other sources of flexibility and grid services are available.

Significant work has been undertaken to map out the pathway for progressively integrating more renewable electricity supplies to phase out fossil gas and achieve a decarbonised power system. For example, the IEA has set out a six-stage process to achieve this goal.[49] EU TSOs are now beginning to address this issue.[50] So-called "capacity mechanisms", designed to only procure firm peak capacity rather than the range of services needed to eliminate dependence on fossil gas generation, have now become an integral feature of many EU electricity markets.[51] Capacity mechanisms have generally been designed specifically to procure gas generation since this was historically the cheapest way to provide the capacity and flexibility required. Unless these are reformed, there

[48] In a fossil fuel-based electricity system, generation adequacy is ensured provided there is enough generation capacity to meet the annual peak demand. If this is the case, supply flexibility means that demands can be met all year. Variable renewable supply creates two additional situations that must be addressed to ensure generation adequacy: firstly, when demand and supply are changing rapidly and in opposite directions and secondly, periods of sustained low capacity due to weather conditions.

[49] IEA, **Renewable Integration**

[50] ENTSO-E, 2022, **ENTSO-E Vision: A Power System for a Carbon Neutral Europe**

[51] Although the recent Electricity Market Reforms have gone some way to align capacity mechanisms with the need to increase grid flexibility.

is a risk that they will continue to procure fossil gas generators and erect barriers to the decarbonisation of electricity supplies.

EU member states must develop a new framework to determine the required level of system reliability and the consequential need for the full range of flexibility products, demand side response and grid services. They must also implement new mechanisms to efficiently procure the resources that are required. The box below explains how capacity mechanisms need to be adapted to ensure resource adequacy is maintained as the electricity system is progressively decarbonised.

Capacity mechanisms for the future

Capacity markets exist because energy-only markets proved unable to give rise to the forward contracts that balance the consumer need for security at a price they are prepared to pay, with the investor need for a predictable return on their investment. Ultimately, electricity consumers have rarely considered how they value electricity at different times, and they generally lack the ability to reduce consumption when prices are too high.

However, demand side response must become a key element of a future energy system to avoid excessive costs as significant new electricity demands and variable renewable electricity supplies are introduced. Once consumers have the capability to readily control demand, the value that they place on electricity supplies is likely to be low where consumption can easily be shifted to a period of low expected price, but increase significantly if shortage is prolonged.

This suggests that in future the most valuable security "product" will evolve from firm peak capacity to sustained generation in periods of renewable drought.

Demand side response is currently limited and the extent to which it will evolve is uncertain. Significant policy focus should be maintained on building this capability. A process is also required to evolve capacity mechanisms into a future-proof system that ensures sufficient firm peak capacity, flexibility and sustained generation. This will avoid locking the power system into dependence on gas-fired power generation which is incompatible with future requirements.[52]

Importantly, all required products must be provided from zero emissions sources as soon as they are technically available and cost-effective. A multi-product optimisation is required since some options can provide firm capacity and sustained generation but not flexibility (e.g. nuclear) and many storage technologies and demand response cannot address the challenge of sustained low generation. Some long duration storage technologies (such as hydrogen storage and power generation) that can potentially provide all three will be especially valuable to the future electricity system.

Security of electricity supply cannot be maintained purely through changing market mechanisms. Inadequate or inappropriate network infrastructure can exacerbate the security of supply challenges by restricting the sharing of energy, flexibility and other services across regions. Also, replacing current assets with new technologies will involve additional risks and uncertainties. Policy decisions must be based on the latest best scientific views on the capabilities and deployment potentials of all technologies. Coherent and technically expert whole system planning will be essential to ensure markets are delivering a secure and cost-effective electricity system that allows gas fired power generation to be eliminated.

Questions to address

Electricity market regulations and operational practices will need to be reviewed to allow system operators to effectively plan for the closure of fossil gas power generators and build a new approach to delivering energy security. To do so the following questions need to be addressed:

> Have the EU and member states developed the diplomatic capacities to understand and promote a changing definition of 'energy security' in the evolving geopolitical landscape?

> Are capacity markets and other procurement mechanisms (such as those designed to support hydrogen-fired power generators) being evolved to

[52] The UK is currently considering migrating from the current capacity mechanism to a multi-product design, with dedicated mechanisms to procure flexibility and sustained zero emissions generation in the meantime whilst these technologies are immature.

meet the changing system reliability requirements alongside the need to eliminate gas fired power generation?

- Are market prices sufficiently granular to ensure all resources are contributing to supporting security of supply alongside the efficient use and developments of grids?
- Have TSOs or National Regulatory Authorities been mandated to assess the system reliability requirements given the changes in system stress factors?
- Are priority projects being developed to the highest standards of public participation and transparency?

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CHAPTER 4
HOUSEHOLDS

Reducing gas demand in the EU's homes

Understanding household energy consumption patterns, preferences, and challenges is essential for designing effective clean energy policies and programs. Households consume fossil gas both directly, for heating and cooking, and indirectly, through electricity generated from gas-fired power plants. Households can therefore play a crucial role in the clean energy transition as both consumers and decision makers. Clean energy adoption can only succeed by engaging with households to raise awareness of relevant decisions, provide incentives for and information on alternatives, and address barriers such as affordability and technical infrastructure.

There are three distinct phases in the transition of households from fossil gas to an electrified system. Early adopters are the first to implement new clean energy technologies. Next, the broader population follows suit in a mass shift. Finally, the last group able to transition requires additional support to overcome structural barriers to adoption.

As clean energy and electrification technologies becomes increasingly mainstream, the fossil gas transition in homes has entered the second stage and is even beginning to reach the third stage. Slower adopters will therefore require increasing support to address structural barriers and to enable change. Guaranteeing a smooth transition, protecting consumer interests, and maintaining affordability and accessibility ensure that no-one gets left behind.

The European Clean Energy Package (CEP) introduced in 2016 first established measures to address transparency, fairness and affordability, and safeguard consumers during the early stages of the transition. It included provisions such as consumer protection rules, improved billing transparency, support for vulnerable consumers, and measures to enhance competition in the energy market. These measures were a first step designed to prevent adverse effects on consumers as new energy technologies and infrastructures were rolled out.

Though effective for addressing the early stages of the transition, the CEP does not fully address the evolving needs of consumers as the energy transition progresses. As clean energy adoption expands, issues of equitable access become increasingly pressing. The developing stages of the transition will require a much stronger focus on balancing incentives and accessibility, as well as penalties to encourage sustainable practices and accountability.

Challenges for household decarbonisation

Modelling at the EU level indicates that gas demand – including of alternative gases such as hydrogen and biomethane – will decline by 71–74% by 2050 as part of the path to net zero climate targets. The residential sector is expected to see the largest drop in gas consumption by 2040: gas usage in this sector is projected to decrease by 55 Mtoe (–70%) to 64 Mtoe (–82%) compared to 2020 levels.[53] This significant reduction in gas consumption means that gas grid fees will rise substantially as operating costs for existing gas infrastructure remain high, but with less gas being transported and fewer customers using the gas grid. Gas grid fees are estimated to increase tenfold in the UK, fivefold in Germany, and threefold in France by 2050, and fourfold in Austria by 2040.[54] For example, in the UK, the annual cost for an average household could rise from £200 to £2,000.

This escalating cost will incentivise more people to leave the gas grid, exacerbating the burden on those who remain, particularly low-income households, who may struggle to afford the high maintenance costs. As gas demand falls, the costs of maintaining infrastructure will soar, potentially leading to a "gas grid death spiral".[55]

Regulators should act swiftly to set depreciation rates, define decommissioning criteria, and minimise investments in gas infrastructure. Countries like France, the Netherlands, and Denmark are already implementing measures to address these challenges. Meanwhile, in some other member states, the challenge lies in avoiding the construction of costly new gas infrastructure that will only be used temporarily.

Related to this issue is the question of hydrogen in heating systems. Although the gas package introduces Distribution System Operators (DSOs) for hydrogen to integrate it into existing infrastructure, hydrogen for heating has proven to be

[53] European Commission, February 2024: **Impact assessment on a 2040 Climate Target**

[54] Rosenow, Lowes and Kemfert, Science Direct, 2024, **The elephant in the room: How do we regulate gas transportation infrastructure as gas demand declines?**

[55] ACER, 2022, **ACER publishes a Study on Future Regulatory Decisions on Natural Gas Networks**

impractical and a waste of public resources.[56] Countries like the UK and Spain have either abandoned or never proposed plans for hydrogen heating due to its low viability and profitability. Promoting "hydrogen-ready" boilers poses substantial risks of technological lock-in, making it crucial to critically evaluate and ultimately reject hydrogen-based heating solutions.

Similarly, high hopes for the potential of biomethane risk delaying the transition to electric heating or low-carbon heat networks. While biomethane is considered a renewable energy source, an excessive focus on its potential can divert attention and resources away from necessary electrification efforts and, moreover, does not solve the problem of rising costs associated with maintaining a gas grid for a significantly reduced volume of gas.

Beyond pure infrastructure issues, affordability and practical issues, such as planning rules, pose significant barriers to the adoption of clean heating technologies. High upfront costs for new systems, limited access to financial incentives, and stringent planning regulations can deter consumers from making the switch. Addressing these barriers is crucial to facilitate wider adoption of clean heating.

Moreover, inequalities in clean energy adoption can occur at the local level due to differences in local administrative resources, infrastructure, and policy support. These disparities mean that not all communities can equally participate in and benefit from the clean energy transition. On a personal level, some consumers may experience anxiety or resistance when considering the transition to clean heating, particularly if it involves replacing traditional boilers and renovating homes, or altering established routines that consumers deem convenient. Finally, subsidies and taxation disparities further complicate the shift to clean heating technologies. Variations in financial incentives and tax policies across regions and countries create barriers to adoption and uneven market conditions.

[56] **The case against hydrogen blending: A costly distraction**, E3G, 2023

Solutions: overcoming issues of affordability and inequality

Energy-efficient and electric heating options offer substantial non-monetary benefits, including enhanced comfort and improved health. As upfront costs and installation challenges may deter some households, addressing these barriers and emphasising the health and comfort benefits of clean heating is essential for accelerating adoption.

Recognising these benefits can help shift consumer perceptions and promote wider acceptance of clean energy solutions. Intermediaries, such as public authorities and community groups can serve as trusted sources of information, offering guidance on energy efficiency, renewable energy options, and financial incentives. They can also help fighting mis- and disinformation surrounding heat pumps. Misconceptions and fake news about their effectiveness, affordability, and suitability for different housing types can deter consumers from considering them as viable alternatives to traditional heating systems. Clarifying their benefits via awareness campaigns is crucial to dispel myths and build confidence among consumers.

Fostering citizen participation and community engagement in heating planning and energy system governance can further empower individuals to actively participate in decision-making processes. This engagement contributes to a broader acceptance of the transition and ensures that diverse perspectives are considered in the development of energy policies – thereby ensuring they work for everyone. Leveraging digital technologies and AI could also enhance the efficiency, reliability, and affordability of clean energy systems. Smart meters, energy management systems, and predictive maintenance can optimise energy use, reduce costs, and improve consumer experiences.[57] These technological advancements can play a pivotal role in streamlining the transition to clean energy and making it more accessible to all.

However, while the resistance to change can be mitigated through tailored communication, awareness raising, and support, affordability remains a significant challenge, as heat pumps are expensive and require financial incentives to encourage their adoption. Achieving the EPBD targets requires closing an annual investment gap of €150 billion by 2030,[58] a goal that can be

[57] SmartEN, 2022 **Demand-side flexibility in the EU: Quantification of benefits in 2030**
[58] Bruegel, 2024, **How to finance the European Union's building decarbonisation plan**

made more attainable through energy savings from electrification and retrofitting, as well as effective use of EU funds. A combination of grants, loans, and obligations is necessary, with a focus on the worst-performing buildings to maximise climate, health, and economic benefits. "Energy as a service“ models—where consumers pay monthly fees or use micro-loans to access energy—can reduce financial barriers, though creditworthiness issues for low-income households persist. Additionally, engaging the banking sector and adjusting energy prices are crucial for fostering private–public financing mechanisms and streamlining the renovation process. At the EU level, harmonising subsidies and taxation frameworks and providing targeted support can help facilitate the transition to electric heating and promote equitable access to clean energy solutions.

For vulnerable consumers, targeted funding and support programmes are needed to ensure the inclusivity of heating decarbonisation policies. Local governments play a crucial role in identifying these inequalities and promoting inclusive transition pathways that ensure communities can move forward together.

The later stage of the transition also means managing the process and costs associated with decommissioning gas networks amid residual domestic gas use. The recent adoption of the “Wet Gemeentelijke Instrumenten Warmtetransitie” (WGIW), or “law for municipal instruments for the heating transition” in the Netherlands is an inspiring example of effective management.[59] This legislation grants municipalities the authority to disconnect neighbourhoods from gas infrastructure in favour of more affordable and sustainable alternatives, thereby reducing gas grid costs and accelerating the rollout of district heating networks by improving the business case for investors.

Finally, the clean energy transition has social implications, including impacts on employment, community cohesion, and social equity [see Chapter 6]. Supporting worker transitions, promoting community ownership of clean energy projects, and ensuring access for vulnerable populations are essential for a fair and inclusive transition. Addressing these social dimensions can foster broader support for clean energy initiatives and ensure that the benefits of the transition are shared equitably.

[59] Tweede Kamer, 2023, **Wet gemeentelijke instrumenten warmtetransitie**

Questions to address

> How accessible and affordable are alternative solutions to different socioeconomic groups?

> How are public authorities, TSOs, and regulators incentivised to provide excellent consumer experience and high-quality service?

> Is the necessary data on the energy transition's impacts on households, including social indicators (citizen engagement, public consultation processes, and job impacts) available for informed decision-making?

> What indicators will be used to measure the success of gas demand reduction efforts and their impact on households?

> How can the transition be made accessible, affordable, and convenient? Specifically, how can renovation and energy efficiency programmes be made more attractive and accessible?

> Are there vulnerable groups within the community who may be disproportionately impacted by gas demand reduction measures? How can they be identified and supported? How will the affordability of energy be ensured for low-income households during the transition period?

> How will coming changes and impacts be communicated to the public and their input be taken into consideration?

> Has sufficient consideration been given to lowering the overall costs of electricity prices for households (considering taxes, levies, profits)?

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CHAPTER 5
INDUSTRY

While sectors like power and even households are driving fossil gas reductions, industry gas demand has so far remained relatively stagnant.[60] Without the right framework to support decarbonisation in industry, the gas transition may risk passing industry by – putting both the EU's climate targets and the long-term competitiveness of Europe's industry at risk.

Industry is not yet on a path to structural gas reduction

As outlined in Chapter 1, the industry sector is currently a major consumer of fossil gas. Gas demand in industry has remained relatively stable over the past decades, with the share of fossil gas in industry remaining at roughly one-third since the late 1990s.

Notably, the sector did see significant declines in gas demand during the energy crisis as a result of exorbitant prices, with demand falling 23% below the 2017–2021 average.[61] However, governments' approach of relying on emergency measures to shield industry from high costs, or relying on price signals to incentivise reduced consumption, meant very little of this reduction was structural or permanent. Of the 25 bcm reduction, 13 bcm was due to production curtailment, and a further 7 bcm was due to gas-to-oil fuel switching. Particularly energy intensive industry, such as fertilisers, reduced production and resorted to importing intermediate goods.[62]

However necessary in the short term, these measures are not sufficient to meet long-term decarbonisation targets nor to insulate European industry from volatile gas markets. Instead, they are indicative of the fundamental challenge for industry: the short-term economics of energy prices do not align with the long-term benefits of the clean transition.

[60] Strategic Perspectives, 2024, **EU Gas Insights**

[61] MET, 2024, **EU industrial gas demand not expected to recover**

[62] IEA, 2023, **Europe's energy crisis: What factors drove the record fall in natural gas demand in 2022?**

The solutions to decarbonise industry are direct and indirect electrification, energy efficiency measures, or resorting to carbon capture and storage where other options are not available. Recent events – the energy crisis, value chain disruptions, and competition with China – have pushed industry higher on the political agenda, and policymakers are beginning to realise that a comprehensive framework to enable the sector's transition is missing. There is also more recognition for the future benefits of greening industry, including reduced exposure to volatile gas prices, lower electricity prices from high-RES energy systems, and increased competitiveness from leading on clean technologies.[63] Putting the right policy mechanisms in place to support industry to transition away from fossil gas is therefore a crucial component of a successfully managed gas transition.

The challenges for industry

The 2050 Climate Neutrality target as well as aspects of the Fit for 55 framework (such as the ETS or RED) set a long-term decarbonisation signal for European industry. Elements of the Fit for 55 and REPowerEU legislation address industrial decarbonisation, for instance by setting demand targets for hydrogen and derivatives (the RED target for RFNBOs (renewable fuels of non-biological origin)) in industry, establishing mandatory energy management systems for large industrial energy consumers (EED), and slowly decreasing the free allowances under the EU ETS. Yet these targets do not yet enable industry to address the key challenge for transitioning away from fossil gas: aligning long-term decarbonisation targets with the short-term challenges of high energy prices and upfront investment.

The immediate challenge: the economics

There is significant need for a coherent policy framework to bridge between short-term challenges and reaping long-term benefits.[64] Currently, the overall EU legislation is disjointed, while reporting obligations under the NECPs require very

[63] Already in 2021–2023, the increased renewables capacity saved European electricity consumers an estimated €100 billion – had the EU pushed for a faster rollout, it could have achieved 15% higher savings in the same time frame (IEA, 2023, **How much money are European consumers saving thanks to renewables?**). In particular, the CEE countries have the potential to lower their wholesale power prices by 29% by 2030 if they take advantage of its wind and solar capacity (Ember, 2023, **CEE can lower electricity prices by a third by 2030 with ambitious wind and solar deployment**).

[64] E3G, 2020, **Fostering climate-neutral energy-intensive industries in Europe: a policy vision for the EU Industrial Strategy**; E3G, 2021, **From blockage to breakthrough in EU industrial transition: Benchmarks for Fit for 55 and beyond**.

little granularity on industrial decarbonisation or on the development of cleantech industries.

In particular, the role of direct electrification – one of the most important levers for industrial decarbonisation – is missing. While not applicable for all industrial processes, direct electrification could displace nearly half of the current industrial gas consumption[65] and as much as 78% of total energy demand with currently available technologies.[66] But making those technologies competitive – and overcoming the structural barrier of their higher operating costs – in turn requires increasing the accessibility of affordable renewable electricity for industry. This includes increasing generation of renewable electricity and addressing barriers in supply side pricing and taxation, as well as addressing the economics of the demand side by covering the "green premium".[67] Meanwhile, indirect electrification technologies, using hydrogen or its derivatives, should continue receiving financial support to cover upfront investments, while their effective deployment requires careful prioritisation and planning of demand and infrastructure. Yet the existing policy framework effectively fails to address the primary challenge for European industry: aligning long-term decarbonisation signals with the short-term economic challenges of high energy prices and upfront investments.

Further challenges

While the economic challenges are the most immediate, the fossil gas transition in industry will also raise further questions. Historically, industry has developed in different parts of Europe due to locational factors which gave preference to the development of specific industries. Proximity to markets, access to infrastructure or resource inputs, and available human capital all played a role. But among the most important was access to cheap energy. This favoured a "geographic pattern of industrialisation" in Europe that matched the geologic distribution of coal and later the location of refineries, with a few exceptions for access to ports or in the case of abundant hydropower.[68]

However, as the energy transition reduces the significance of fossil fuels, access to renewable electricity will become the new driver of industrial activity, based

[65] Bellona, Ember, RAP, E3G, 2022, **EU can stop Russian gas imports by 2025**,

[66] Madeddu et al, Environmental Research Letters, 2020, **The CO2 reduction potential for the European Industry via direct electrification of heat supply (power-to-heat)**,

[67] Breakthrough Energy, **The Green Premium**

[68] Bruegel, 2021, **A new economic geography of decarbonisation?**

on the relative costs of capturing and transporting energy.[69] While not all industry will change location – existing industrial clusters may still provide other benefits – certain industries may be more exposed to the risks and benefits of these changes.

Managing the gas transition for industry will therefore also require careful consideration of the benefits of maintaining competitive energy access at existing locations for incumbent industry, or whether the new geography of renewables can provide opportunities for new regions and industries. The former approach will require significant fiscal resources, while the latter could allow leveraging new clean technology value chains.[70] Decision makers will need to make strategic choices and plan accordingly to develop effective industrial policies that consider the gas demand of industries and the decarbonised alternatives like renewable electricity and green hydrogen.

Finally, some industrial sectors will take longer to transition than others. This presents a risk of an incomplete gas transition for industry – as demand changes and gas networks are decommissioned, the impacts on the remaining gas users may become increasingly significant, including changes to available supply and infrastructure, but also to related supply chains as other industries relocate. Conversely, as industrial gas network customers increasingly disconnect from the gas grid and switch to alternate energy sources, the needs of future gas grid infrastructure will also change, requiring well-planned gas grid decommissioning. Long-term planning and transparent assessment of industry gas demand will be critical for managing these changes.

Overcoming challenges: solutions are readily available

Alongside increasing energy efficiency and more efficient use of (energy-intensive) material inputs, replacing gas demand in industry is already possible with existing technologies such as heat pumps, electric boilers, or electric arc furnaces.[71] Further solutions will vary across different industries, depending on the level of gas needs in different applications: 1) use of feedstocks (i.e. chemicals, steel or refining); 2) low- to medium-temperature process heat (i.e. food processing); 3) high-temperature heat (i.e. cement, steel); and 4) general

[69] Bruegel, 2021, **A new economic geography of decarbonisation?**

[70] E3G, 2023, **Making clean technology value chains work for EU economic convergence, a case study on Portugal**,

[71] Agora Industry, FutureCamp, 2022, **Power-2-Heat: Gas savings and emissions reduction in industry**,

space heating. The primary challenge will be scaling these technologies and managing adoption.

Managing gas demand reduction therefore requires different approaches for different types of industrial gas demand. A significant share of low- to medium-temperature heat – nearly 60% of demand[72] – can already be directly electrified via mature technologies. Meanwhile, industries with heat demand in higher temperature ranges (where electrification will require changes to production technology) will require scaling or developing alternative technologies, including direct electrification, hydrogen-based solutions or alternative feedstocks – and therefore a longer time horizon for reducing gas demand.[73] An industrial policy framework should assess and differentiate support mechanisms based on the different solutions for replacing fossil gas demand.

Questions to address

The following are key questions to ask when managing the impact of gas demand reduction on industry:

> How can the short-term economic challenges of the transition for industry be aligned with the long-term trajectory and benefits of reducing fossil gas demand?

> What are the risks and benefits of a new energy geography based on access to renewable energy for the EU's industrial geography? How can changes to the energy geography be leveraged to take advantage of opportunities for new regions and industries? How will impacts on incumbent industries be managed?

> Is industry meaningfully yet transparently being involved in planning processes, for both electricity and gas network planning?

> How can industrial policy frameworks be tailored to meet the needs of different industries as well as drive ambition?

[72] Fraunhofer ISI, 2024, **Direct electrification of industrial process heat: An assessment of technologies potentials and future prospects for the EU**

[73] Madeddu et al., Environmental Research Letters, 2020, **The CO2 reduction potential for the European Industry via direct electrification of heat supply (power-to-heat)**; Fraunhofer ISI, 2024, **Direct electrification of industrial process heat: An assessment of technologies potentials and future prospects for the EU**

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CHAPTER 6

CROSS-CUTTING ISSUES: WHOLE SYSTEM PLANNING AND A JUST TRANSITION FOR WORKERS AND REGIONS

Transition governance

The need for anticipatory investment in power networks and orderly decommissioning of the gas network highlights the importance of whole system planning. While future gas demands in power, household and industrial sectors will, in part, be a consequence of policy decisions, these will be driven by a series of underlying technical and behavioural drivers. Planning assumptions about these drivers must be consistent across the energy system such that policy decisions can be aligned with energy and climate policy targets. Currently, across the EU, infrastructure plans are developed by individual network operators with varying degrees of co-ordination and independent oversight. EU legislation does require ENTSO-E and ENTSOG (and the soon to be established ENNOH) to work together where infrastructure has EU-level significance. However, this is based on long-standing institutional models and may not reflect the importance of coherent cross-sectoral planning or the dangers of vested commercial interest.

Strengthening the EU's independent planning

The EU must decide if it has the right governance in place to deliver the enhanced functionality that is now required in energy system planning, operations and markets. The UK is about to establish an independent energy system operator, with the responsibility of planning all energy infrastructure at local and national levels.[74] It is also undertaking a fundamental review of electricity market arrangements and has appointed a single body to facilitate local power market development.

The challenges facing EU member states are the same as those in the UK, which has concluded that an independent gas and electricity system operator and

[74] The Annex explains the policy issues which led to this move.

planner is necessary to deliver the enhanced functionality involved in system operation and planning while managing potential conflicts of interest. The UK has also shown that such a body can be established without posing risks to the secure and efficient operation of the energy system. The move has strong support from a wide range of stakeholders and was not challenged by the incumbent gas and electricity network companies.

The governance of energy system planning is not a cosmetic issue. Decisions about energy infrastructure will determine whether the opportunities of the energy transition are realised or whether it is beset by unnecessary costs and delays. Preparing the required spatial energy plans requires expertise beyond that currently possessed by system operators and the need for expert independent advice will increase significantly. The European Commission can set out a vision for the efficient and effective institutional structure to deliver these new requirements and implement them at EU level.

An effective spatial energy plan which is built on realistic assumptions about future gas demands will not only enable the necessary network infrastructure to be built but will ensure a just transition plan can be developed for the many workers currently employed in the fossil gas industry.

Managing impacts on workers

The transition is already impacting fossil gas sector jobs

As gas demand declines, there will be increasing impacts on the demand for workers in the gas sector. The EU currently has around 150,000 workers employed directly in the gas sector[75], but this number becomes much larger when including indirect jobs such as gas boiler installers. According to the association of the European Heating Industry, there are around 1.5 million installers of heating technologies, of which only a fraction are qualified to install heat pumps (between 10% and 30% depending on the member state)[76] while the majority of heat technology installers, many of which are small- or medium-sized enterprises, are not prepared for the decline of gas boilers and the rapid increase in heat pump deployment – which has risen 38.9% in 2022.[77]

[75] Czako, V., 2020, **Employment in the Energy Sector Status Report 2020**

[76] EHI, 2022, **Heating systems installers Expanding and upskilling the workforce to deliver the energy transition**

[77] EHPA, 2023, **European Heat Pump Market and Statistics Report 2023**

Table 2: The impact of the fossil fuel transition is already seen in falling employment in fossil fuel sectors. However, many more people are employed in related industries, where the transition away from fossil gas is likely to result in decreased demand for some skills and increased demand for others.

Employment by economic sector, million people	2020	2021	2022
Fossil fuel sectors	0.46	0.41	0.37
Electricity, gas, steam and air conditioning supply	1.46	1.50	1.48
Energy intensive industry	4.90	4.87	4.98
Services	123.20	124.85	128.15
Construction and architecture services	15.37	15.68	16.25

Source: Eurostat data, taken from **European Commission 2040 Impact Assessment**

Without timely and appropriate planning, workers currently employed in jobs that depend on fossil gas will be confronted by rapid changes and insecurity[78] as Europe's gas demand declines. Conversely, meeting EU targets under REPowerEU and the demands of the energy transition is expected to require an additional 0.75 million heating installers (a 50% increase) by 2030,[79] create 160,000 new jobs in the construction sector,[80] and require 198,000–300,000 new manufacturing jobs for net zero technologies.[81]

Carefully anticipating and managing the transition of workers in the gas industry, is therefore critical for both workers and the success of the clean energy transition. Workers currently in affected sectors must be supported to find alternatives. A slow transition and failure to transparently communicate the extent of the gas sector's decline risks limiting career options, missed

[78] IndustriAll, 2023, **Challenges and opportunities for employment in the gas sector in the context of the European energy transition**

[79] EHI, 2022, **Heating systems installers Expanding and upskilling the workforce to deliver the energy transition**

[80] European Commission, 2020, **Renovation Wave: doubling the renovation rate to cut emissions, boost recovery and reduce energy poverty**

[81] Kuokkanen, A., European Commission, 2023, **Skills for the energy transition in the changing labour market**

opportunities, and disruptions or shortages of needed skills. At the same time, careful planning is also needed to ensure that a declining gas sector will still have access to employees with the right skills and training to meet the needs of critical safety measures for infrastructure and the decommissioning of gas networks.

Overcoming structural barriers

Clean energy jobs are growing faster than any other sector in Europe,[82] and globally clean energy jobs (35 million) already surpassed employment in the fossil fuel sector (32 million) in 2021.[83] The IEA estimates that globally "half of workers in fossil-fuel sectors who face redundancy risks this decade have skills demanded by growing clean energy sectors" and many could switch to new roles in the clean energy sector with only four weeks of additional dedicated training. In the UK, a recent study by the IPPR found that 93% of the 115,000 workers in the gas sector already share more than 50% of their existing work tasks with jobs in green industries or industries that don't entail high carbon emissions.[84]

Training and re-training

There is significant potential for gas sector workers to shift to careers in other sectors with the right training. In many sectors, much of the needed training could be done on-the-job (for instance for heat pump installations), while others would require more significant training (switching from offshore gas to offshore wind).[85] Workers must therefore be supported with both the direct and indirect costs of training. The gas sector in particular has a significant proportion of very small enterprises (VSEs) and small and medium-sized enterprises (SMEs)[86] for whom the finances and resources needed to offer their employees the opportunity to learn new skills or re-train pose significant barriers. Further barriers to (re-)training include wage and compensation schemes (i.e. paid vs unpaid training hours), career development planning offered by companies, training materials, and whether workers have access to support via unions. The phase-out of fossil gas will also lead to changes in related sectors, such as chemicals, construction, biomethane, electrification uptake and so on, widening the scope of impacted workers, but also the scope of new career opportunities.

[82] European Commission, 2024, **Do we have sufficient skills for the energy transition in the changing labour market?**

[83] IEA, 2023, **World Energy Employment 2023**

[84] IPPR, 2024, **Revealed: with the right support, most UK gas sector workers could transfer skills to other jobs, report finds**

[85] IEA, 2023, **World Energy Employment 2023**

[86] IndustriAll, 2023, **Challenges and opportunities for employment in the gas sector in the context of the European energy transition**

Overcoming these structural barriers to training and re-training requires clear and comprehensive planning of clean energy transition needs, honest communication, and measures to support workers in transitioning. New clean energy jobs must be accessible, while employers and policymakers must ensure that workers in declining sectors are supported in the process of becoming part of the EU's new clean energy industries.

Job quality

Enabling fossil gas sector employees to transition also means making clean energy jobs attractive relative to current career paths. The wage differential between the oil and gas sector and the clean energy sector is a particular challenge: according to the IEA, globally jobs in the wind, solar and hydrogen sectors earn 15–30% less on average than their oil and gas counterparts.[87]

Aside from wages, the attractiveness of new careers also depends on the working conditions, culture and diversity of the clean energy workforce. Employers should seek to take an intersectional approach that would make new careers attractive to a diverse set of candidates, particularly women and minorities[88] as women currently only make up 15% of the global energy sector.[89] This could include addressing pay gaps, promoting inclusivity, offering education and coaching, or involving employees in company decision making. Strengthening workers' rights to collective bargaining would also help to mitigate negative impacts on employment, and support high-quality jobs, fair working conditions, dialogue with local stakeholders, and worker involvement in decision making.[90][91]

Overcoming challenges

The significant potential for gas sector workers to transition to new occupations will require clear planning across employment sectors, honest communication and engagement with workers and unions, and significantly more support at both EU and member state levels to ensure a smooth and fair transition.

[87] IEA, 2023, **World Energy Employment 2023**

[88] IndustriAll, 2023, **Challenges and opportunities for employment in the gas sector in the context of the European energy transition**

[89] IEA, 2023, **World Energy Employment 2023**

[90] IndustriAll, 2023, **Challenges and opportunities for employment in the gas sector in the context of the European energy transition**

[91], ILO, 2024, **Decent work**

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The following could be a useful starting point to consider:

> **Provide certainty for workers** by clarifying the needs of the future energy mix and the decline of gas demand, including decommissioning needs. Clear and transparent communication from gas industry employers that informs employees of the mid- to long-term decline of gas demand and therefore gas sector employment, would provide workers and unions with the information needed to plan for retraining or other alternatives.

> **Strengthen social dialogue and democracy at work**[92] by ensuring workers and unions are actively involved in decision making around salaries, working conditions, health and safety and so on, to better anticipate and manage change and foster worker buy-in to the clean energy transition.

> **Set a right to training obligation** for fossil fuel companies to offer reskilling and training for employees in line with the needs of a green and digital energy transition. Ensure free and accessible training for workers employed in the gas sector to change occupations. Ensure that this extends to workers in rural areas and that VSEs and SMEs are provided additional public support to transition/re-train small-scale installers.

> **Launch a Just Transition Observatory** to collect and report data as well as monitor the social and economic impact of decarbonisation, including the number of jobs created, their quality, geographic spread and sustainability, and data on job destructions, energy poverty, inclusion in the green transition of vulnerable households, and the gender dimension of climate policies. This could be closely linked to monitoring and managing the impacts of gas demand reduction in industry.

[92] Employee participation in training in energy supply and manufacturing sectors was only 14% and 10% respectively in 2022 – significantly under the 60% target for 2030 in the European Pillar of Social Rights Action Plan. European Commission, EU Science Hub, 2024, **Do we have sufficient skills for the energy transition in the changing labour market?**

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Avoiding a two-track transition

A successfully managed gas transition cannot exacerbate existing inequalities between EU member states. Instead, the gas transition could be an opportunity reduce existing inequalities and advance economic cohesion – combining progress on climate targets with meeting one of the EU's main objectives: EU cohesion.

Economic and social convergence in the EU has significantly improved since the 2004 enlargement, but this has been uneven across the EU with some regions continuing to struggle, in large part due to economic shocks and structural barriers.[93] The CEE (Central and Eastern Europe)[94] region in particular has experienced a persistent gap in per capita income compared to Northwestern member states, lower wages and productivity,[95] and faces some of the highest rates of inflation.[96] Characterised by a factory economy model based on manufacturing, the region's economies are also very carbon intensive, with industry and the energy sector generally the largest contributors of greenhouse gas emissions at the regional level.[97]

As a result, the region faces among the highest challenges in the green transition, and thus a managed gas transition: limited green readiness, less advanced technology and lower rates of energy efficiency improvements, extremely limited fiscal capacity, and significant fossil gas investments. At the same time, it would be near impossible for the EU to meet its climate targets, let alone exceed them, without decarbonisation in CEE.[98] A solidarity-based and joint-EU approach is therefore all the more pressing.

Yet EU economic and fiscal policy has so far failed to "distribute economic opportunities equally within and across regions", nor set up a solidarity-based

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[93] European Commission, 2024, **Communication to the European Economic and Social Committee and the Committee of the Regions the 9th Cohesion Report**

[94] Central and Eastern Europe is commonly understood to include the states in Central, Eastern, and Southeastern Europe that joined the EU after 2004.

[95] Hillebrand, Friedrich Ebert Stiftung, 2022, **The Second Transition: Why Central Eastern Europe Needs Proactive Industrial and Innovation Policy Now**

[96] CEEnergyNews, CAN-Europe, 2023, **Ending the energy price crisis in CEE: short-sightedness on energy may prove costly in the long run**

[97] European Commission, 2024, **2040 Impact Assessment Part 3**

[98] E3G, 2023, **Eastern EU countries will make or break the bloc's 2030 renewables goal**

and comprehensive decarbonisation approach.[99] Instead, it has favoured member states with the largest fiscal resources: Germany and France have been responsible for 77% of the €672 billion in approved state aid funding since March 2022.[100] However, the decarbonisation of CEE industry in particular will require significant funding, so efficient and fairly distributed EU funds as well as mobilisation of private finance are needed to ensure the EU as a whole can decarbonise.

Opportunities of a managed gas transition for CEE

A clean energy transition paired with a managed gas transition poses substantial opportunities for the CEE region. Ramping up renewable energy and avoiding the trap of coal-to-gas switching, and securing investments to decarbonise industry and improve the energy efficiency of homes, will help CEE countries leverage the EU's green transition.

The CEE region has significant potential for renewable electricity generation and has already seen significant growth, with twice the EU average wind and solar expansion in 2022.[101] A six-fold increase in wind and solar capacity by 2030 would allow the region to generate a surplus of green electricity for export to neighbouring regions and lower average power prices by almost a third, putting them below the EU average.[102] Low power prices would in turn incentivise the electrification of existing industry and attract new investment to the region as EU businesses increasingly look for affordable and competitive decarbonisation through renewable electricity.

The region has other unique strengths that could be leveraged to improve its competitiveness as well. It is rich in critical minerals that will be needed for the clean energy transition's new supply chains, and the existing manufacturing capacities that would make it attractive for "near-shoring" EU industries.[103]

The EU will therefore need to ensure that its funding mechanisms dedicated to industrial decarbonisation and the phase-down of fossil gas avoid causing further

[99] E3G, CISL, ZOE, 2024, **Building A New European Competitiveness Deal: Six Tests For A Prosperous, Resilient, Fair And Green Economy**

[100] E3G, CISL, ZOE, 2024, **Building A New European Competitiveness Deal: Six Tests For A Prosperous, Resilient, Fair And Green Economy**

[101] E3G, 2023, **Eastern EU countries will make or break the bloc's 2030 renewables goal**

[102] E3G, 2023, **Eastern EU countries will make or break the bloc's 2030 renewables goal**

[103] Hillebrand, Friedrich Ebert Stiftung, 2022, **The Second Transition: Why Central Eastern Europe Needs Proactive Industrial and Innovation Policy Now** and E3G, 2023, **Industrial transformation for all Europeans. Navigating the political economy in Central and Eastern Europe**

divergence. Long-term planning and guidance from the EU as well as fair and solidarity-based financing tools will contribute to successfully and fairly managing the decline of EU gas demand.

Questions to address

Planning and governance

The energy system planning processes and governance must be reviewed to ensure that the crucial aspects of the energy system transition are addressed efficiently and to high quality.

The following questions need to be addressed:

> Is the whole system planning capability in place to ensure the appropriate mix of investment in network infrastructure and other resources (especially demand side flexibility and zero emissions long duration storage)?

> Are the correct institutions in place to deliver the new planning functions required by the transition to net zero? Including for:

  a. Whole system planning.
  b. Expert independent advice to policymakers.
  c. Ongoing market reform.
  d. New system operational practices (at transmission and distribution levels).

> Are the institutions involved in these issues:

  a. Sufficiently expert across all technologies?
  b. Transparent: can decisions be traced and is the process clear and transparent for third parties?
  c. Capable of ensuring and actively encouraging meaningful stakeholder involvement?

Just transition for workers

A framework must be developed to ensure all gas industry workers can benefit from and transition to the new opportunities afforded by clean energy industries and the gas transition.

The following questions need to be addressed:

> What kind of future for the fossil gas sector is being communicated to workers? Is this in line with EU and national modelling for the demands of the future energy system?

> How can workers be supported to receive training or re-training to transition away from jobs in the gas sector? How can direct and indirect costs be mitigated or avoided? What kind of support beyond training can be offered, such as support for relocation, career change or early retirement?

> How can workers and unions be proactively involved in decision making, both within companies and in wider planning of the energy transition?

> How can new clean energy jobs be made more attractive, with good working conditions, quality pay, and inclusive internal cultures?

Avoiding a two-track transition

A successful gas transition in the EU will need to ensure that regional differences and inequalities are addressed in order to leverage new opportunities and make the most of the gas transition.

The following questions should be addressed:

> Do actions taken at the EU level, particularly when it comes to funding, consider the resource gap between Northwestern Europe and Central and Eastern Europe for managing the gas transition?

> How can the decarbonisation of power and industry in CEE be tailored to the competitive advantages of the region?

> How can the transition from coal leapfrog fossil gas for heating and instead directly electrify household heating (through heat pumps)?

> How can investments in energy infrastructure be directed into future-proof technologies that will be competitive in the long term? How can decentralised and resilient energy infrastructure be prioritised to ensure CEE's energy security?

> How can regional cooperation be leveraged to enable competitive value chains and socio-economic development?

CHAPTER 7
CONCLUSIONS

The EU's gas transition must be planned

The European Green Deal initiated the reduction in EU fossil gas demand, but it was accelerated by the recent energy crisis, and a clear trajectory for reduction in the medium to long term is now in place. The transition away from fossil gas presents significant opportunities for the EU, including the competitiveness, health, and technology benefits of an electrified future energy system. At the same time, key challenges remain to be managed and the EU's current policy framework is not fit for purpose. Effectively planning a managed gas transition, across sectors and with a whole energy system approach based on clear and well-defined future demand projections, is vital to ensure an orderly transition.

Fossil gas use has already begun to reduce significantly, yet it remains important in meeting the current energy needs of the power, households and industry sectors. While alternatives exist, the EU has yet to effectively build demand for these solutions, enable their deployment at scale, and ensure efficient planning of energy system needs. This report has outlined the critical questions which much be addressed for each sector to develop a managed fossil gas transition framework.

Creating a strategic spatial energy plan is central to addressing all those questions. Only through strategic planning and a "whole of system" approach can the opportunities of the gas transition be realised, and challenges mitigated or overcome. While incumbent planning processes were designed to address single energy vectors and slow change over time, the EU has entered a phase of rapid change to energy systems which are increasingly interlinked. Energy system planning must therefore adopt a new, innovative, forward-looking approach that integrates sectors and energy vectors to successfully prepare the EU for an increasingly electrified and decarbonised future.

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Recommendations: A new framework for the fossil gas transition

The critical next step lies in effectively managing this transition. Failure to do so could result in higher bills for businesses, industry and consumers, reduced investor certainty and wasted public funds. A comprehensive framework to address these challenges and ensure a successful fossil gas transition should implement several key recommendations:

> **Review energy system planning processes and governance** to deliver a forward-looking approach in line with an electrified and decarbonised future. Integrate planning across different energy vectors and energy sectors, while ensuring independent, transparent processes.

> **Adopt clear and well-defined projections** of future EU fossil gas demand reduction to provide clarity for planning and policy strategies.

> **Build a new approach to delivering energy security** which does not depend on fossil gas power generation. Update operational practises to manage systems with high renewable generation and review the procurement of flexibility and back-up services as part of the planned 2026 review of electricity market design.

> **Safeguard households from the rising costs** of lock-in to volatile fossil gas by developing a citizen-focused strategy that addresses the economic and social impacts to enable everyone to shift away from fossil gas in a managed and fair way.

> **Develop a strategy that enables industry to bridge the gap** between the short- and long-term economics of the clean energy transition: prioritise direct electrification in industry and enable access to affordable renewable electricity as well as upfront support for clean investments.

> **Create a strategy to transition direct and indirect gas industry workers** who are impacted by declining gas demand: plan across employment sectors to meet future needs; transparently communicate and plan together with workers and unions; and enable access to high quality clean energy jobs.

> **Address the regional differences** in exposure to gas demand and fiscal space across the EU, to leverage regional advantages in new clean economy opportunities and socio-economic development to build a competitive and cohesive European clean economy.

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ANNEX
THE UK NATIONAL ENERGY SYSTEM OPERATOR

The UK government has taken powers to establish a new, publicly owned National Energy System Operator as part of the Energy Act 2023. It is expected to be formally created as an independent public corporation in autumn of 2024. It will advise on the impacts and trade-offs across energy sectors and plan and co-ordinate the energy system from a strategic, whole system perspective.

The NESO will plan electricity and gas (including hydrogen) networks at transmission and distribution levels. It will have the objective to ensure security of supply of the electricity and gas system and assess impacts on existing and future energy consumers. It will also have a statutory duty to provide advice, analysis and information to the government and regulator to support their policy decision making.

This annex summarises the reasons it was created and the benefits it is expected to deliver.

Potential conflicts of interest

System operation and planning was integrated with network ownership when the power system was liberalised. This assumed that detailed understanding of the network was essential to operate the system effectively. However, concerns have always existed that the actions of the system operator would be driven by a desire to increase profits for the network owners at the expense of other providers of system services and energy consumers.

The UK government first introduced business separation requirements in 2013 when the system operator assumed a role in delivering certain market outcomes including capacity market procurement. While there was no evidence of wrongdoing by National Grid, concerns persisted and, in 2019, the government and regulator implemented formal business separation of electricity system operation functions within the National Grid Group. This included separate licences, distinct governance, different staff, and ringfencing of information. The same concerns were not apparent with gas system operation and separation provisions from the gas network owner were not applied.

Net zero delivery

The net zero delivery agenda has raised further concerns over the role of system operation beyond those related to conflict of interest. Significant changes to the electricity and gas systems will be required and new systems such as hydrogen and carbon capture, use and storage may be needed. The government and regulator must take decisions about the future development of heat, transport and energy based on high quality whole system analysis. This requires new and enhanced roles and functions, including network planning and development, competition to fulfil specific system needs, co-ordination (both across energy sectors and regional decarbonisation), and developing engineering and data standards.

In 2017, the Institute of Engineering and Technology produced a landmark report which identified that the net zero agenda required 35 new or significantly modified functions by 2030.[104] This, alongside interventions from other influential stakeholders arguing for an independent system operator, led to the regulator undertaking a review of system operations.[105] It concluded that net zero requires a step-change in whole system coordination and planning. The regulator recommended that new functions should be undertaken by those with the necessary expertise and capabilities, greater co-ordination was required, and key strategic decisions needed to be informed by whole-system insight and impartial, technical advice.

The requirement for independent system operation

The regulator's report set out a compelling case for a new organisation expert in both gas and electricity to address the increasing complexity of operational and planning challenges and provide advice on policy decisions. The government argued that any organisation fulfilling these requirements must be technically expert, operationally excellent, accountable to consumers and able to support the delivery of net zero on behalf of the public, independently minded, and operationally and financially resilient. It concluded that the electricity and gas

[104] IET, 2017, **Future Power System Architecture – Synthesis Report**,

[105] Ofgem, 2021, **Review of GB energy system operation**

system operators already possessed many of the qualities required to fulfil these functions and creating a new organisation from scratch would take time and constitute unnecessary duplication.

However, the business separation provisions introduced to manage conflicts of interest would require an overhaul to allow electricity and gas system operation to be effectively integrated. Moreover, concerns remained that an organisation structurally embedded with a network company would not be able to effectively discharge the new functions. It may choose not to engage in a topic because of potential conflicts, the government and regulator may be tempted to verify the advice given, and industry parties may change their behaviour towards the system operators based on a perception of conflict of interests.

The government therefore concluded that it needed to create an independent system operator and planner and consulted on detailed proposals in 2021. The decision to go ahead was made in 2022 and the necessary enabling legislation included in the 2023 Energy Act.[106]

[106] Department for Business, Energy & Industrial Strategy and Ofgem, 2021, **Proposals for a Future System Operator role**