www.oeko.de

CONNECTING REALITY WITH CLIMATE GOALS: CASE STUDIES OF GAS DISTRIBUTION SYSTEM PLANNING AND REGULATION

Country Report Germany

Malte Bei der Wieden (Öko-Institut)
Veit Bürger (Öko-Institut)
Carmen Loschke (Öko-Institut)
Megan Anderson (RAP)
Sibylle Braungardt (Öko-Institut)
Tilman Hesse (Öko-Institut)
Marc Stobbe (Öko-Institut)
Jan Rosenow (RAP)

Background and objectives

- Fossil gas consumption in the EU must decline rapidly to meet energy and climate targets, as well as in the context of energy security concerns, and gas price volatility.
- Declining gas demand will lead to higher grid fees for remaining customers as fewer people use the gas infrastructure, with potential high increases of grid fees.
- Proposals to replace fossil gas with hydrogen face technical and economic challenges, with hydrogen being less efficient and more expensive for heating compared to electrification and district heating.
- Continued investment in gas infrastructure without a decommissioning plan risks stranded assets, as the long lifespans of gas grids do not align with decreasing gas usage and climate targets.
- Regulations are beginning to address these issues, with some countries taking steps towards orderly gas grid decommissioning to manage costs and transition to alternative energy sources efficiently.
- In view of these challenges ahead, the objectives of this country sheet are to
  - provide an overview the status quo of gas consumption and gas distribution networks
  - Outline how regulations related to the gas grid embrace this challenge and identify gaps
  - Highlight opportunities for stakeholders to interact in the process

Summary of the country report for Germany

- Germany has a high share of natural gas in its primary energy demand of 23%.
- The landscape of distribution grid operators is fragmented with over 700 of different size and ownership structure.
- No decline can be seen in gas demand, gas boiler sales and gas infrastructure investments.
- A ban on newly installed gas boilers came into force in 2024: for new buildings from 2024 on, for existing buildings with a transition period from mid-2026 or -2028 depending on the completion of the local heat planning, which is mandatory for all communities.
- The plan for a hydrogen transmission grid (H2-backbone) is completed. An increase of biomethane and hydrogen is anticipated. Heating with hydrogen is allowed in to be designated hydrogen grid expansion areas.
- There is a clear mismatch of the future gas demand in the network development plan by the grid operators and the sharply decreasing gas demand of scenarios reaching climate targets.
- Regulatory barriers for/while decommissioning occur due to:
  - an obligation to connect consumers (§ 17/18 EnWG)
  - grid charges may rise with less consumers due to depreciation periods
  - investment obligations in concession contracts
  - no plans for mandatory gas decommissioning areas in local heat planning
- A process to revise the regulatory framework of the distribution grid has started in March 2024.
- Vulnerable households are not considered in infrastructural planning.

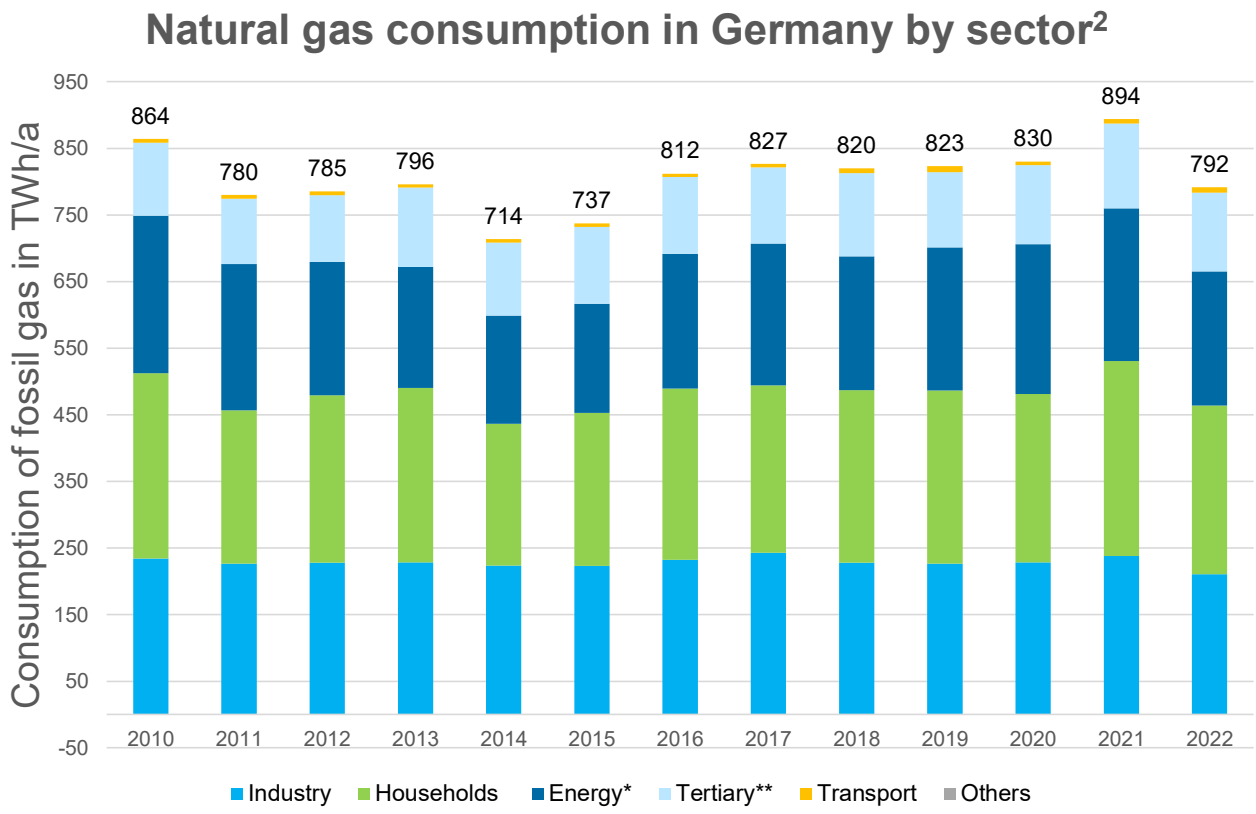
Content and structure of the country report

1. **Development of Fossil Gas Consumption + Heating Market/Systems:** This chapter provides an overview of historical trends and current statistics regarding fossil gas usage and the evolution of heating systems.
2. **Distribution Network - Development and Current State:** This section discusses the infrastructure that supports the distribution of gas, including an assessment of its development over time and its condition today.
3. **Network Regulation, Costs vulnerable and low-income Energy Users:** Here, we analyze the regulatory framework governing the distribution network and detail the associated costs of maintaining and expanding this infrastructure.
4. **Current and Anticipated Role of Alternative Gases:** This chapter evaluates the expected role of alternative gases like biogas and hydrogen in transitioning away from fossil fuels, including current applications and future projections.
5. **Alignment with Climate Scenarios:** We explore how gas grid planning is aligned with national climate goals, examining scenarios that aim to reduce greenhouse gas emissions.
6. **Transparency of Information and Stakeholder Input:** The final section discusses transparency and highlights opportunities for stakeholder engagement.

Content

Development of natural gas consumption

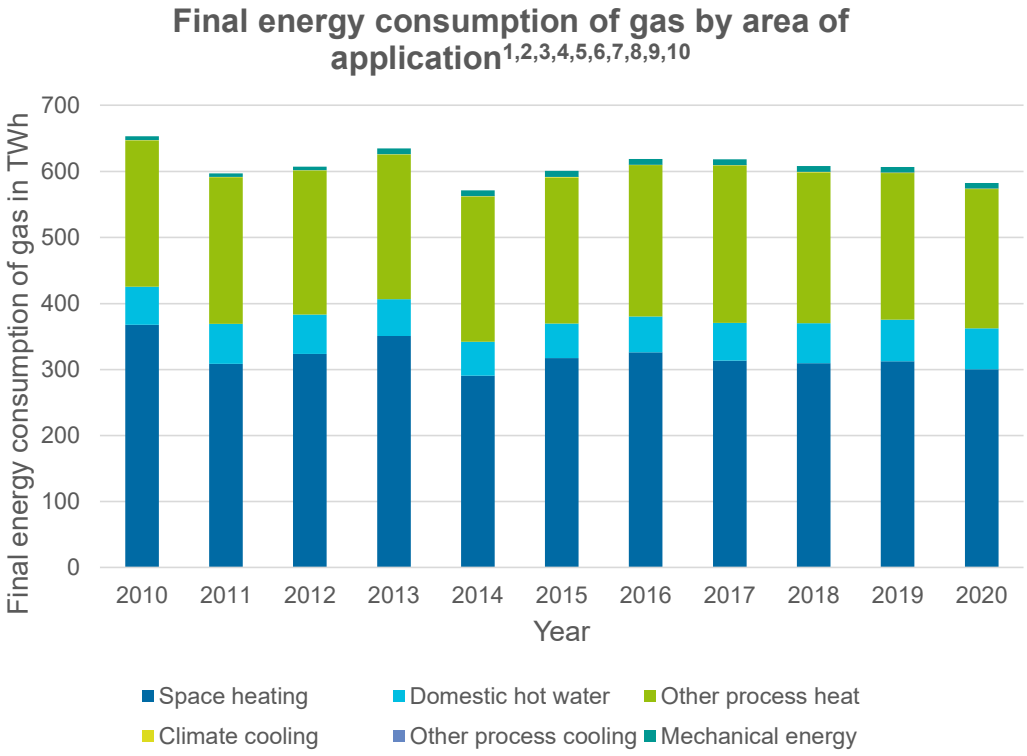
- The total consumption of fossil gas in Germany has remained consistently high in recent years (since 2016) at around 820 TWh per year.
- In 2021, consumption exceeded the 2010 level of 864 TWh, reaching more than 890 TWh.
- Fossil gas is a crucial source for the heating supply in private households, the tertiary sector, industry (especially for process heat), and in the energy sector.
- Fossil gas has a share of 24% of the primary energy demand among all energy uses.[1]



Source: [1]Arbeitsgemeinschaft Energiebilanzen (2023a); [2] Eurostat (2023) complete energy balances. *Energy sector = Transformation input - energy use; **Tertiary sector = commercial and public services + agriculture and forestry + fishing. Note: The Eurostat data is slightly above the data of Arbeitsgemeinschaft Energiebilanzen (2023), but still falls within the range of statistical differences

Development of natural gas consumption

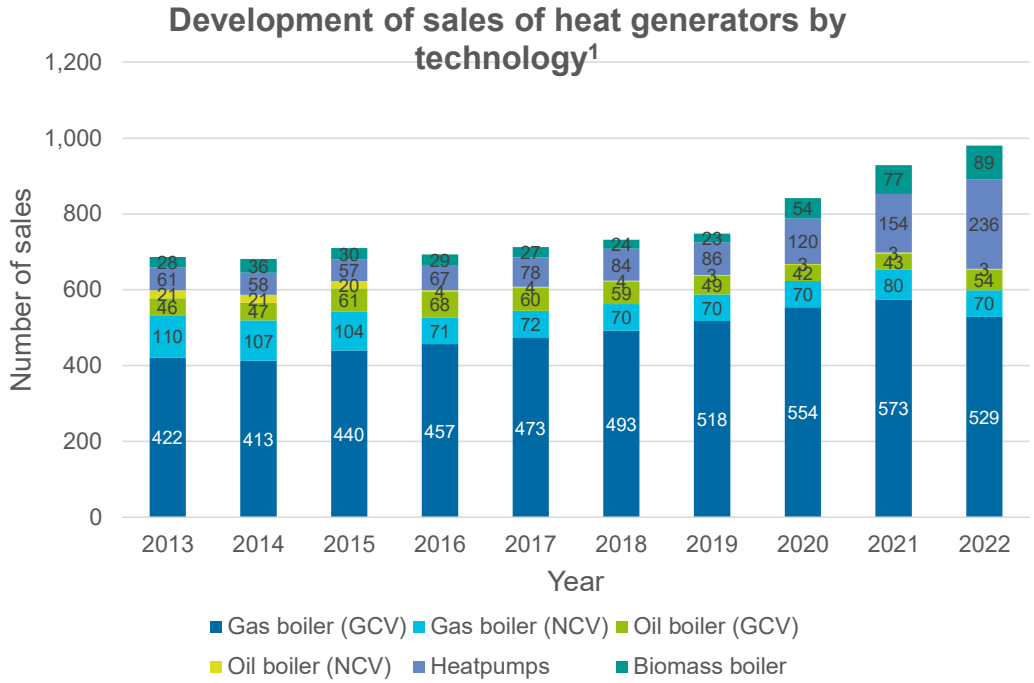
- The largest share of the final energy consumption for gas is used for space heating and domestic hot water (more than 50%).
- The second most common use of gas is process heat, followed by mechanical energy.
- Cooling has not yet been a significant factor in the final energy consumption of gas.

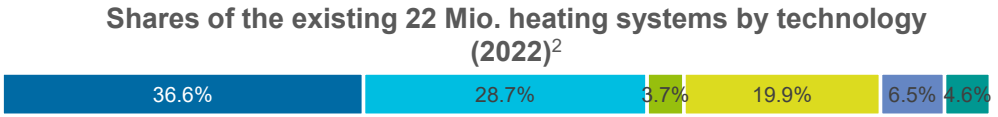


Sources: [1]Federal Network Agency (BNetzA) (2023); [2]Federal Network Agency (BNetzA) (2022a); [3]Federal Network Agency (BNetzA) (2021); [4]Federal Network Agency (BNetzA) (2020); [5]Federal Network Agency (BNetzA) (2019); [6]Federal Network Agency (BNetzA) (2018); [7]Federal Network Agency (BNetzA) (2017); [8]Federal Network Agency (BNetzA) (2016); [9]Federal Network Agency (BNetzA) (2015); [10]Federal Network Agency (BNetzA) (2014)

Development of heating systems

- Gas boilers have been the dominant heating system in the market for the past decade, accounting for 70-80% of the market share. However, due to the recent gas crisis, their market share dropped to around 60% in 2022.[1]
- Despite this, the sales of gas boilers have continued to rise steadily from 2013 to 2021, with the sales number for 2022 still higher than all sales numbers before 2020. [1]
- In 2022, gas boilers make up close to two-thirds of the existing stock of heating systems. With a lifetime of 20 to 30 years, they will continue to play a significant role.[2]



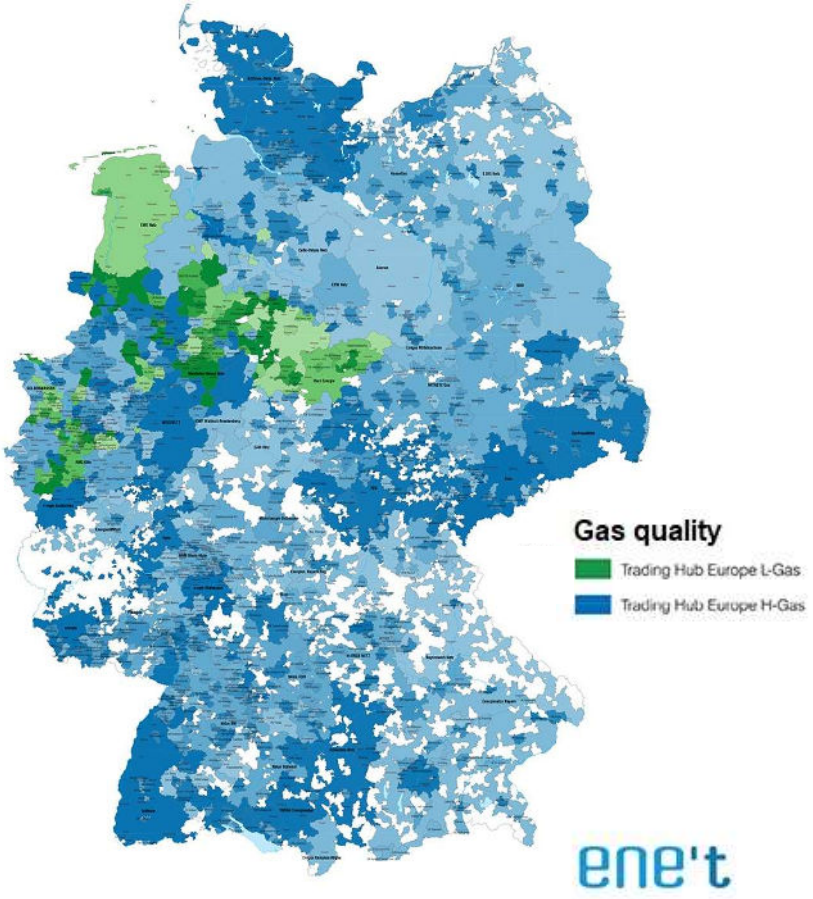


Note: GCV/NCV = gross/net calorific value, connections to heating grids not included
Sources: [1]Bundesverband der deutschen Heizungsindustrie (2023a); [2]Bundesverband der deutschen Heizungsindustrie (2023b)

Content

Map of the network operators (Status January 2023)

- The German gas network has a total length of more than 570 thousand km. In total, more than 14.5 million consumption points are connected to the gas grid.[1]
- A total of 703 distribution system operators and 16 transmission system operators are running the German gas network.[1]
- In Germany, the gas distribution networks are very fragmented between network operators (often called “Stadtwerke”), as the map shows.[2] They are privately and publically owned, often mixed.
- Some network operators cover comparatively large areas. There are large regional differences in the distribution network systems.[2]
- Some regions are not connected to the gas grid (white areas).
- Low calorific gas (L-gas) and high calorific gas (H-gas) are the two existing types of fossil gas in Germany. The gas type and thus the calorific value differ depending on the origin of the gas. Because of the different calorific value, the two types of gas must be transported in separate gas networks.[2]
- Due to declining gas imports from the Netherlands and lower gas production within Germany, there is a continuous switch from L-gas to H-gas in the mainly concerned north-western regions. By 2030 the transition from L-gas to H-gas is planned to be close to completed.[3]

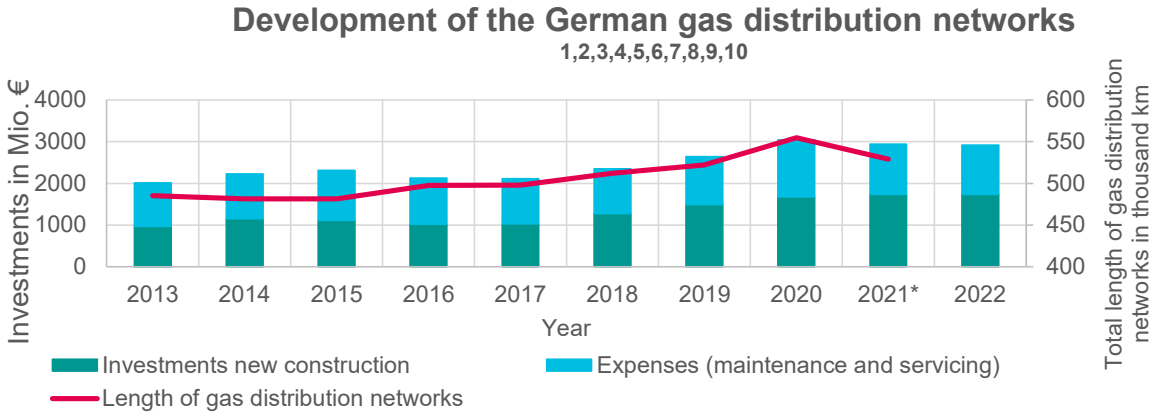


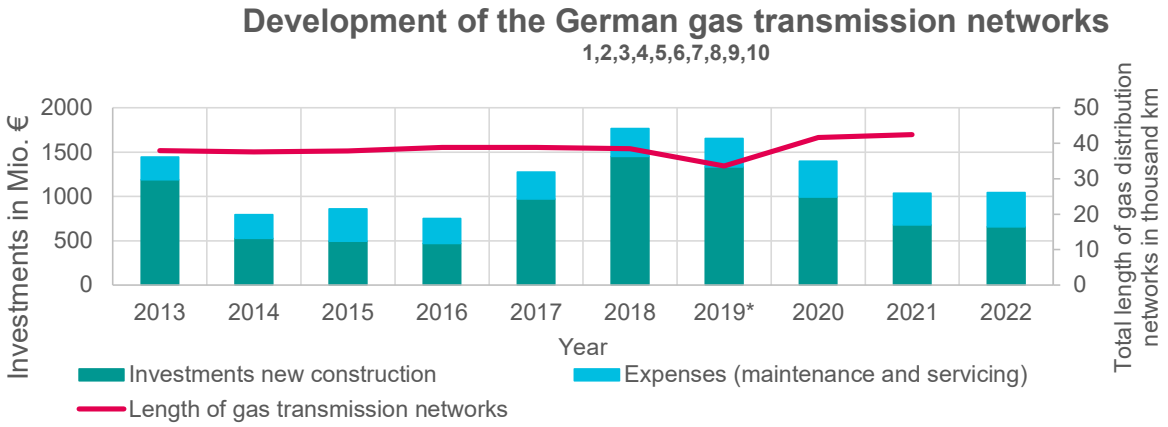
Sources: [1]Federal Network Agency (BNetzA) (2023); [2]ene't GmbH (2023); [3]Federal Network Agency (BNetzA) (2022b)

Development of the gas transmission and distribution network

- The German gas distribution networks have grown over the past 10 years. On average, around € 1.3 billion per year was invested in new network construction and around € 1.2 billion per year in maintenance. A total of € 24.7 billion was invested in the German gas distribution networks between 2013 and 2022. The total length now exceeds 500 thousand km. [1,2,3,4,5,6,7,8,9,10]

- Germany's gas transmission networks have also grown over the past ten years and now cover a total length of 42.4 thousand km (2021). From 2013 to 2022, € 12.0 billion have been invested in the construction, maintenance and repair of the transmission networks. [1,2,3,4,5,6,7,8,9,10]



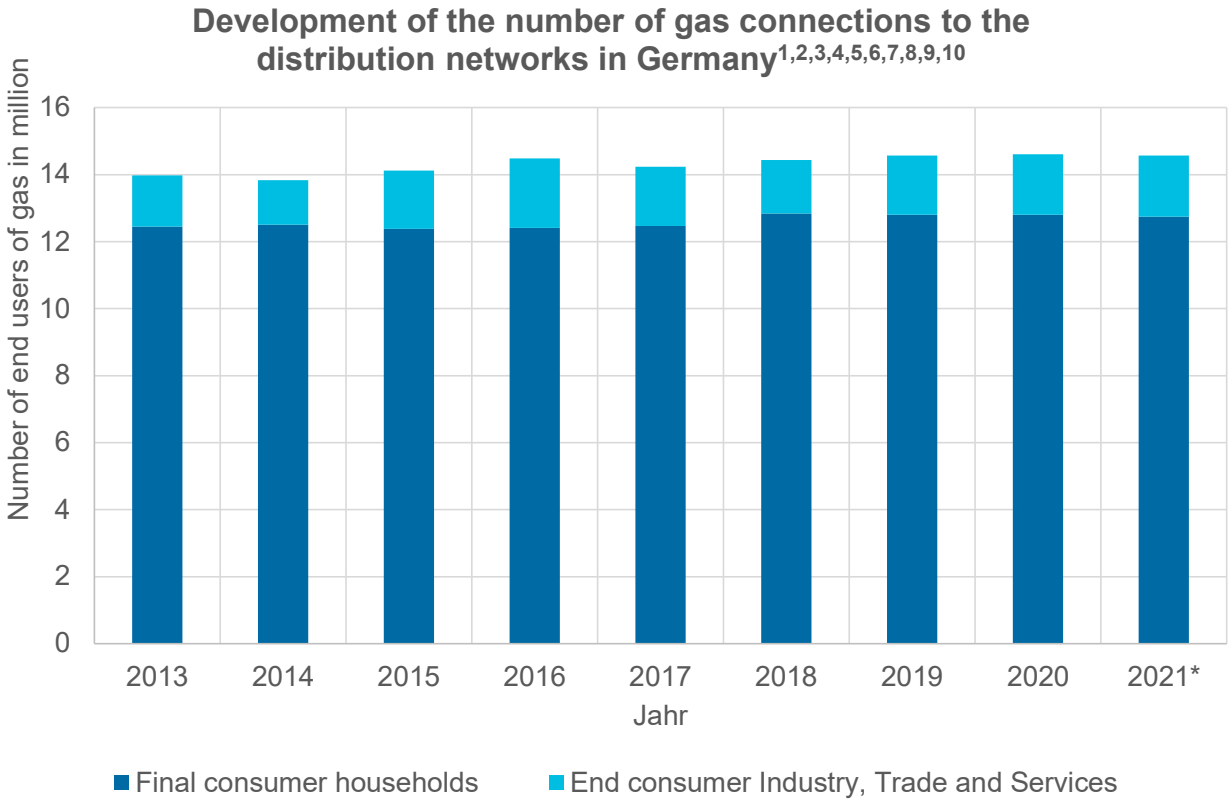


* The lower total lengths of 2021 for the distribution networks and 2019 for the transmission networks result from statistical data gaps.

Sources: [1]Federal Network Agency (BNetzA) (2023); [2]Federal Network Agency (BNetzA) (2022a); [3]Federal Network Agency (BNetzA) (2021); [4]Federal Network Agency (BNetzA) (2020); [5]Federal Network Agency (BNetzA) (2019); [6]Federal Network Agency (BNetzA) (2018); [7]Federal Network Agency (BNetzA) (2017); [8]Federal Network Agency (BNetzA) (2016); [9]Federal Network Agency (BNetzA) (2015); [10]Federal Network Agency (BNetzA) (2014)

Development of the gas transmission and distribution network

- The number of consumption points connected to the gas network has been stable over the past ten years, with close to or above 14 million consumption points. [1,2,3,4,5,6,7,8,9,10]
- A high number of consumption points means that the network and pipeline costs are covered by a broad gas consumer base. They are collected via gas grid charges on the actually consumed gas.
- For the distribution networks, around 12.5% (or 1.8 million) of all consumption points are for the industrial and tertiary sectors.[1(p. 359)]
- For the transmission networks there are 0.5 million end-consumption points for the industrial sector. [1 (p. 359)]

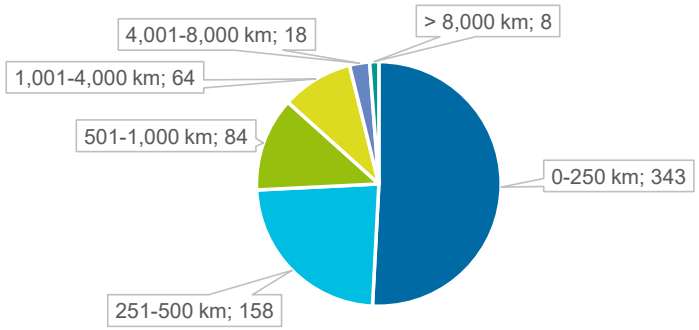


Sources: [1]Federal Network Agency (BNetzA) (2023); [2]Federal Network Agency (BNetzA) (2022a); [3]Federal Network Agency (BNetzA) (2021); [4]Federal Network Agency (BNetzA) (2020); [5]Federal Network Agency (BNetzA) (2019); [6]Federal Network Agency (BNetzA) (2018); [7]Federal Network Agency (BNetzA) (2017); [8]Federal Network Agency (BNetzA) (2016); [9]Federal Network Agency (BNetzA) (2015); [10]Federal Network Agency (BNetzA) (2014)

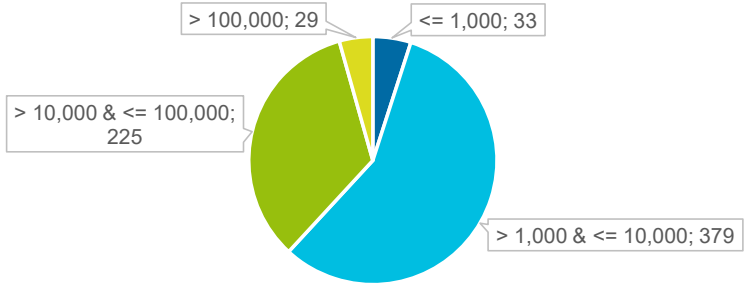
Sizes of the distribution network operators

- Distribution network operators in Germany differ substantially in terms of grid length and connection points.[1]
- While 343 distribution network operators operate a gas network of less than 250 km, there are 26 distribution network operators that manage networks of over 4,000 km.[1]
- This spread is also reflected in the number of connection points. While the majority manage between 1,000 and 10,000 consumption points (379), 29 distribution network operators manage more than 100,000 consumption points each.[1]

Distribution system operators by grid length (Quantity)[1]



Distribution network operators by number of connection points (Quantity)[1]



Source: [1]Federal Network Agency (BNetzA) (2023)
Note: Unfortunately, *data is not available for all 703 distribution system operators. All data available from the Federal Network Agency in 2022 is included in the graphs.*

Content

Gas grid regulation

- Network development: The Gas Network Development Plan (Netzentwicklungsplan Gas) outlines the future expansion requirements of the German gas transmission grid. It is revised biennially by the transmission system operators, subject to public consultation, and ultimately approved by the Regulatory Authority (Bundesnetzagentur; BNetzA). Forecasts of future gas demand, primarily from industry, power plants, and households, are the central input variable for the expansion requirements of the gas transmission grid. The expansion requirements at the distribution grid level, including gas demand for heating systems, are based on the demand forecasts of the distribution grid operators.[1,2]
- Network regulation: Germany enforces a connection obligation (§§ 17/18 EnWG[1]), which entitles all consumers to be connected to the gas distribution grid, unless there are technical or economic reasons to refuse the connection. However, the term 'economic unreasonableness' is not clearly defined, making it subject to case-by-case evaluation. The obligation to connect new customers reflects the assumption of an infinite infrastructure that does not anticipate any form of decommissioning.[1]
- Grid charges: The GasNEV[3] governs the method for determining network charges for using gas supply networks. It establishes how the costs for using the gas networks are calculated. Grid charges are regulated by the BNetzA. In 2023 grid charges made up approximately 12% of the total gas price for residential customers (22% in 2021).[4,5]

Sources: [1]Energy Industry Act (EnWG); [2]BDEW (2024); [3]Gas Network Charges Regulation (GasNEV); [4]Federal Network Agency (BNetzA) (2023); [5]Federal Network Agency (BNetzA) (2022a)

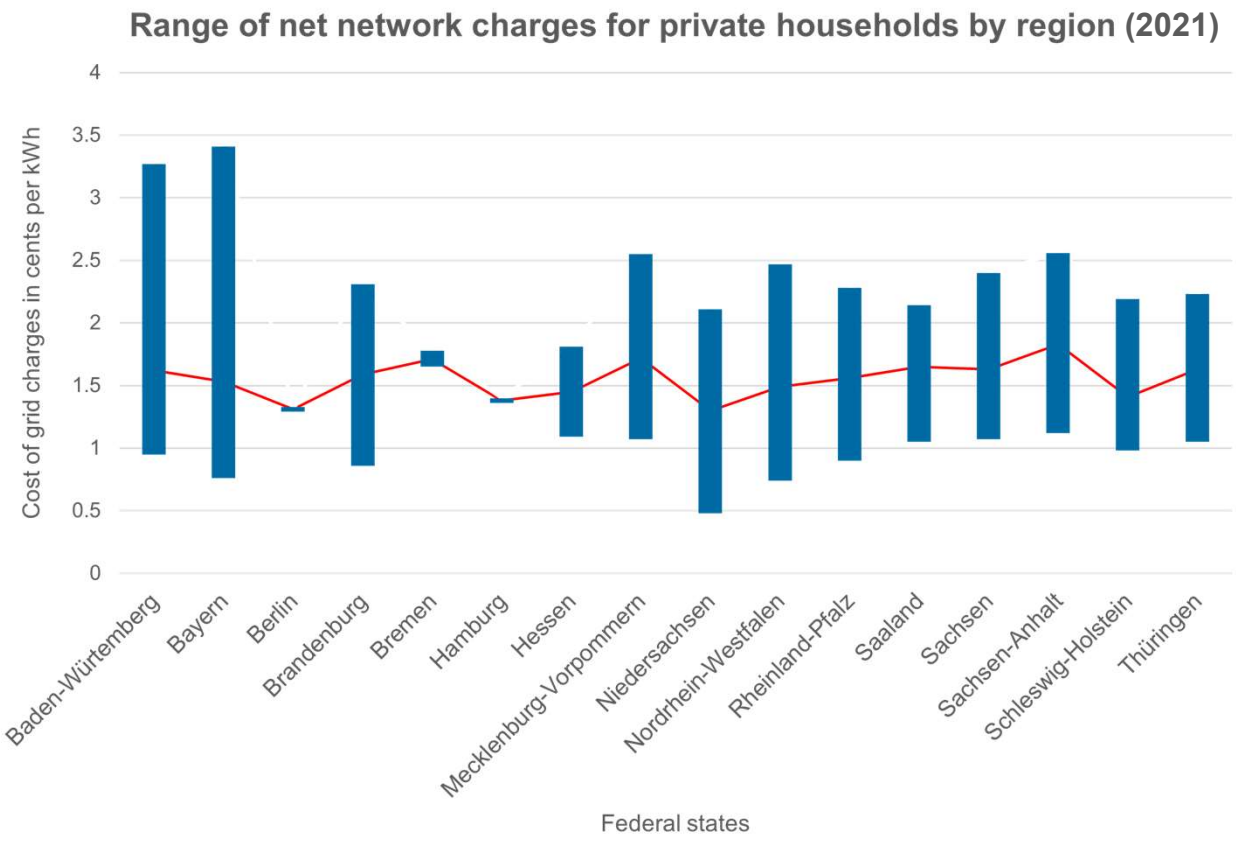
Gas grid regulation

- Depreciation: Distribution grid operators are permitted to depreciate new infrastructure investments until 2045, which is the target year for climate neutrality. However, investments made in the past are still subject to a depreciation period of 45 to 55 years. Grid operators must make corresponding asset value adjustments if parts of the gas distribution network are decommissioned before the end of this period. In 2021, the residual value of the distribution grid pipelines was in the range of between 25-60 billion EUR. The regulatory authority BNetzA has published a plan to change the procedure for determining the adjustment of the imputed useful life and the depreciation methods for natural gas pipeline infrastructure in 2024 so that declining balance depreciation will also be possible in the future, so that network costs can be passed on early and to many customers.[1,2]
- Concessions: Municipalities enter into concession agreements with network operators, allowing them to use public land for their gas networks. In exchange, the municipalities receive a concession fee, which is determined by the number of inhabitants in the municipality. Concessions are typically awarded for a maximum of 20 years. It can be part of a concession agreement that grid operators are obliged to invest in the expansion of their grid.[3,4,5]

Sources: [1]Agora Energiewende, BET (2023); [2]Federal Network Agency (BNetzA) (2024b); [3]Federal Cartel Office and Federal Network Agency (BNetzA) (2015); [4]Konzessionsabgabenverordnung (KAV) (2006); [5]BMWK (2024a)

Gas grid charges

- Grid charges for private households vary significantly across regions. In Lower Saxony (Niedersachsen), grid charges can be as low as 0.5 cents/kWh, while in extreme cases in Bavaria (Bayern), they can reach up to 3.4 cents/kWh.[1]
- The grid charges reflect the calculated network costs and the accepted revenue ceilings of operators (Erlösobergrenze) by the Federal Network Agency (BNetzA) according to the GasNEV. To cover these grid costs, an annual power price in euros per kilowatt and an energy price in cents per kilowatt-hour are determined for each consumption point.[1,2]
- The regional cost differences are due to individual distribution network costs, fixed revenue caps, different consumption patterns, and varying user densities in each distribution network.[1]

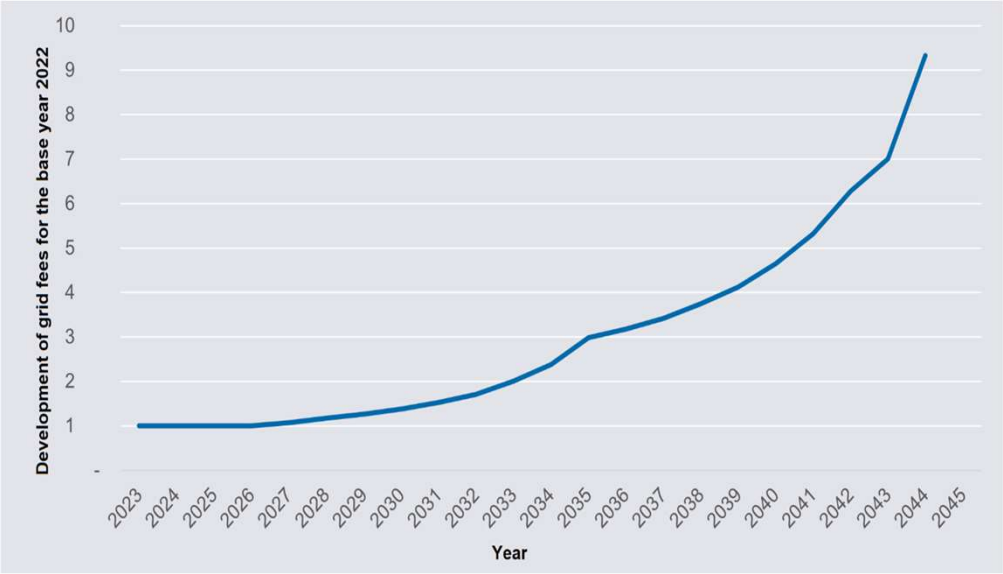


Sources: [1]Federal Network Agency (BNetzA) (2022a); [2]GasNEV

Possible future development of grid charges

- By switching from fossil gas to renewable energy sources or electrical heat pumps (and thereby a predominantly non-gaseous heat supply), the energy demand for gas as well as the number of gas consumers will continuously decrease.
- However, as the distribution grids still have to be operated and maintained, which means that the associated costs are passed on to a shrinking consumer base. Grid charges for the remaining consumers risk rising significantly in the future.
- An independent study from 2023 estimates the potential increase in grid charges due to this effect. The study concludes that, depending on the age structure of the grid considered, the remaining customers' grid charges could increase by a factor of 9 to 16 by 2045 (based on the current regulatory framework).[1]
- The Federal Network Agency has recently (March 2024) started a consultation process on two different models for calculating grid charges in the future; the models are meant to (1) shorten the depreciation time of gas infrastructure investments such that these investments can be recovered in time; and (2) protect the last remaining consumers from high grid charges.[2]

Development of gas grid charges without adjustments to the regulatory framework (indexed grid charges, 2023 = 1,0)[1]



Sources: [1]Agora Energiewende, BET (2023); [2]Federal Network Agency (BNetzA) (2024a)

Heat planning

- The new Heat Planning Act (Wärmeplanungsgesetz; WPG) requires all municipalities to develop a heat plan. As part of this, municipalities must develop spatially resolved heat transition strategies that aim to achieve climate neutrality by 2045 by converting decentral heat generation and all central heat-relevant infrastructure, primarily heat, gas, and electricity distribution networks.[1]
- Deadlines: The submission deadline for the heat plan is 30.06.2026 for municipalities with more than 100,000 inhabitants and 30.06.2028 for smaller municipalities. The heat plans must be reviewed and updated every five years and must be approved by the municipal councils.[1]
- As part of the heat planning process, the municipality divides its area into prospective heat supply areas (categories: district heating areas, hydrogen grid areas, areas for decentralized heat supply or areas for which the future priority supply still needs to be assessed). This division is based on an analysis of the existing situation (status quo) and availability of renewable heat sources, unavoidable industrial excess heat etc., and the economic viability of the various options for ensuring a climate-neutral heat supply in the area. In addition to economic viability, the local authority must also consider criteria such as security of supply, implementation risks, and cumulative greenhouse gas emissions associated with the various heat supply options.
  The WPG does not provide an explicit designation of the areas where the gas distribution network is to be decommissioned, even if this results automatically from the zoning.[1]
- The local heat plans are not legally binding and serve primarily as information tool.
- Municipalities have the option (but are not obliged) to designate certain areas as district heating or hydrogen expansion areas. In the hydrogen expansion areas, building owners may continue to install gas boilers if they are hydrogen-ready (as outlined in the boiler regulation, see next slide for details). However, this decision is made on a property-by-property basis and building owners do not have a legal right to demand such designations.[1]
- Implementing the EU Energy Efficiency Directive the WPG defines that heat plans must outline the role of energy communities and consider the Energy-Efficiency-First-Principle, also in terms of system efficiency.

Source: [1]Deutscher Bundestag (2023)

Gas boiler regulations

- According to the Building Energy Law (Gebäudeenergiegesetz; GEG), every newly installed heating system must use at least 65% renewable energy or unavoidable waste heat from 01.01.2024. This applies to all buildings, residential and non-residential. New buildings are obliged from 2024 on. For existing buildings there is a transmission phase until mid-2026/2028 (see below).[1]
- Homeowners can meet the 65% requirement through various options, for example heat pumps (monoenergetic or hybrid), connecting to district heating, solar collectors, solid and gaseous biomass, green/blue hydrogen and, in the case of very efficient buildings, direct electrical heating.[1]
- The 65% requirement is linked to local heating planning requirements. For cities with more than 100,000 inhabitants, the 65% requirement will apply from mid-2026, for smaller municipalities from mid-2028 (deadlines from the WPG, see above). To enable owners to find the most suitable solution for them, a heating system that does not meet the 65% requirement can still be installed for a transitional period of five years.[1]
- Further use of gaseous fuels (natural gas, biomethane, hydrogen) [1]:
  - Homeowners may continue to install gas boilers until the respective deadlines in 2026/2028. However, operators of these systems must gradually convert the corresponding boilers to more climate-friendly fuels (biomethane, green or blue hydrogen). The quotas are 15% from 2029, 30% from 2035 and 60% from 2040.
  - Furthermore, once a heat plan is available, homeowners can continue to install gas boilers if they are hydrogen-ready and the building is located in an area that has been explicitly designated as a hydrogen expansion area by the municipality as part of its heat planning. This requires the gas distribution grid operator to submit a binding roadmap showing how the affected grid area will be completely converted to hydrogen by 2045 at the latest (including technical and time-related conversion steps for the infrastructure and the connected heating systems as well as hydrogen supply). This plan must be approved by the Regulatory Authority (BNetzA).
- Installing new heat generators meeting the 65% renewables requirement is subsidized with up to 70%.[2]

Sources: [1]Gebäudeenergiegesetz (GEG) (2023); [2]Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2024a)

Addressing vulnerable energy consumers and broader social justice concerns

- There are several policies in place which shield vulnerable households from high gas bills. Temporary measures during the energy crisis 2022/2023 contained a gas price cap (Gaspreisbremse) and direct subsidies for heating (via income tax and as part of the housing benefit programme).[1,2]
- Low-income households (less than 40.000 € income per year) which live in their own property get a 30% higher subsidy rate for changing their heating system towards renewable energy sources. In total, they can get a 70% subsidy until 2028.[3]
- Nevertheless, the process of decision making for infrastructure does not specifically include social aspects. Neither do the regulations for network operators e.g., in terms of grid charges.

Sources: [1]Erdgas-Wärme-Preisbremsengesetz (EWPBG) (2022); [2]Wohngeldgesetz (WoGG) (2023); [3]BMWK (2024a)

Current discussion on revising the national gas grid regulation

- In March 2024, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) published proposals on how to implement the EU Gas-Directive. This “Green Paper” brings into discussion the following aspects:[1]
  - Lowering the rights of consumers to get connected to the gas grid and making it easier for operators to decommission parts of their grid
  - Building up financial reserves for dismantling parts of the gas grid
  - Cancellation of investment obligations in the expansion of a gas grid in concession contracts
  - Changes in the depreciation methods (see also next bullet point)
- Also in March 2024, the Federal Network Agency (BNetzA) started a stakeholder-process with the goal to revise the Gas Network Charges Regulation (GasNEV) on behalf of the rules for depreciation of gas infrastructure (Kalkulatorische Nutzungsdauern, KANU 2.0), at latest for the “fifth regulatory period” starting 2028. This seems necessary to avoid rising grid charges and stranded assets. The BNetzA proposes the following reforms:[2]
  - Change of the depreciation method from linear to a declining balance method in order to distribute the costs earlier on more consumers.
  - Lowering of the mandated depreciation periods for new investments to avoid stranded assets in 2045
  - Adaption of the rules revenue cap (Erlösobergrenze) of grid operators reflecting a lower demand for new gas grid infrastructure.
- A study from Agora Energiewende (2023) recommends further adaptions on the gas grid regulation, such as:[3]
  - Efficient transformation pathways: connecting binding plans for gas grid decommissioning with local heat planning
  - Suitable framework for grid operators: shorter regulation periods defining the revenue caps to increase flexibility, revision of concession law, revision of the efficiency comparison (Effizienzvergleich) between grid operators to incentivize faster decommissioning
  - Social safeguards: distribution of costs (differentiated grid charges, uniform transmission grid charges, building up financial reserves), subsidies, more involvement of citizens in infrastructural decisions, passing on incentives for decommissioning

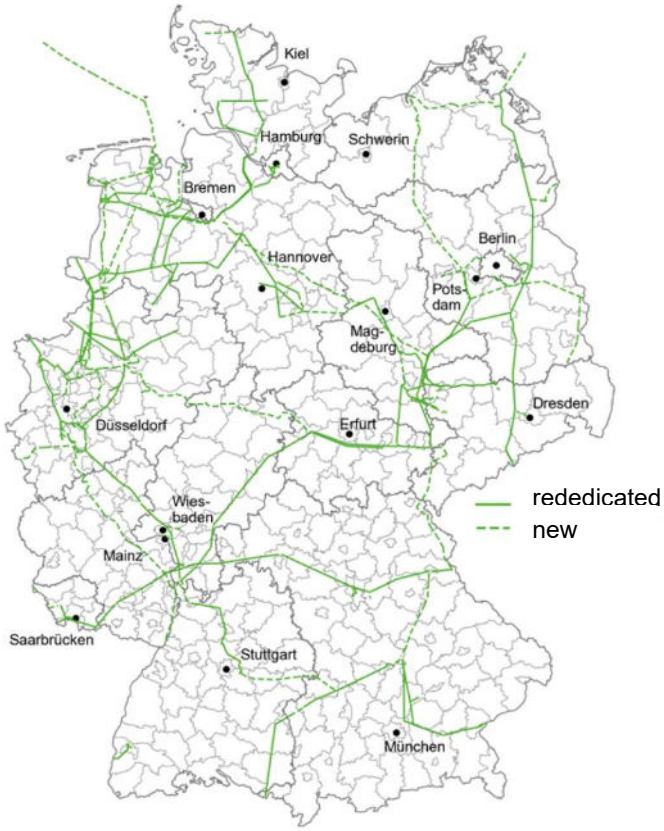
Sources: [1]BMWK (2024b); [2]BNetzA (2024); [3]Agora Energiewende and BET (2023)

Content

Hydrogen

- In 2023 the government set out plans for a so-called core hydrogen network (Wasserstoff-Kernnetz) connecting the main industrial and power generation hubs as well as import points. It is supposed to cover close to 10,000 km and be fully operational by 2032. Parts of this H_2-grid will be newly built, around 60% of the grid will consist of rededicated old pipelines. Its feed-in capacity is planned to be around 100 GW (electrolysis in Germany plus imports) while its feed-out capacity is set to be around 87 GW (industrial/power plants as well as exports).[1]
- As only few consumers will be connected to the H_2-network in the first few years, the high initial investment costs cannot be fully passed on to them. Therefore, a state-backed amortisation account is planned to allow for a time-shift in network charges: the reduced income incurred in this first phase will be offset by additional income later on when more hydrogen consumers are connected to the grid.[2]
- By 2030 the German government expects a hydrogen demand of between 95 to 130 TWh, of which 50-70% will be imported.[3]
- Imports are planned from other European countries (e.g., the Netherlands, Norway) as well as globally via LNG terminals at seaports.
- The amendment to the Energy Industry Act (EnWG), which came into force in July 2021, already contains regulations on transitional regulation and the development of a hydrogen grid infrastructure. Part of this amendment a description of the current state of expansion of the hydrogen network and future network planning until 2035.[4]

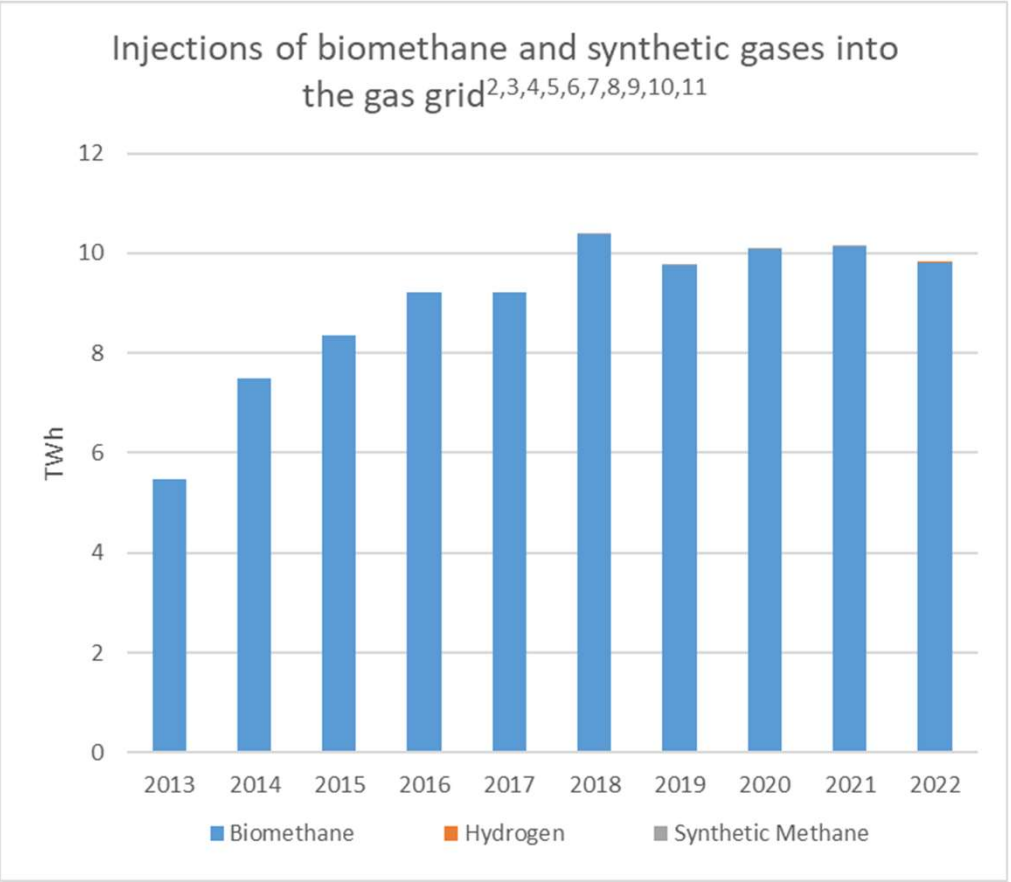
Hydrogen network vision for 2032[1]



Source: [1]BMWK (2023a), [2]BMWK (2023b), [3]BMWK (2023c), [4]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2023)

Biomethane

- The amount of biomethane injected into the gas grid has nearly doubled from 2013 to 2022 and is now stable at around 10 TWh per year. This means that biomethane has a share of around 1% of total gas consumption in 2022.[2,3,4,5,6,7,8,9,10,11]
- Biogas (in contrast to biomethane) was also used to provide 50 TWh of final energy in 2021. It is mostly used in combined heat and power plants. A small amount goes into fuel production. Biogas is not included in the figure because it is not relevant for the gas distribution grid due to its lower share of methane. It is mostly used directly on site in agricultural settings.[1]
- The share of synthetic hydrogen with 3.5 GWh and synthetic methane with 0.1 GWh in 2021 has been very low so far and is therefore hardly visible in the graph. [2,3,4,5,6,7,8,9,10,11]

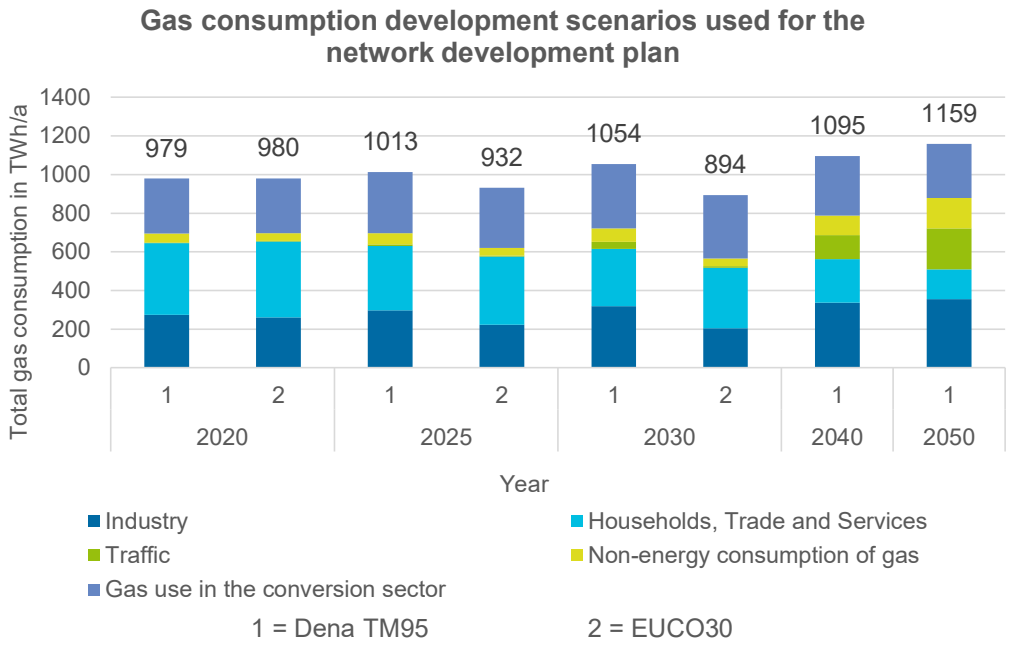


Sources: [1]DBFZ Deutsches Biomasseforschungszentrum gemeinnützige GmbH (2022); [2]Federal Network Agency (BNetzA) (2023); [3]Federal Network Agency (BNetzA) (2022a); [4]Federal Network Agency (BNetzA) (2021); [5]Federal Network Agency (BNetzA) (2020); [6]Federal Network Agency (BNetzA) (2019); [7]Federal Network Agency (BNetzA) (2018); [8]Federal Network Agency (BNetzA) (2017); [9]Federal Network Agency (BNetzA) (2016); [10]Federal Network Agency (BNetzA) (2015); [11]Federal Network Agency (BNetzA) (2014)

Content

Climate Scenarios and fossil gas demand

- The distribution system operators (DSOs) prepare a 10-year gas demand forecast and submit it to the transmission system operators (TSOs). The TSOs in turn use the forecast to develop the scenario framework.[1,2,3]
- For the network development plan 2020-2030 (Netzentwicklungsplan Gas) two different scenarios for gas development were considered: In the first scenario, gas demand increases continuously to nearly 1,160 TWh per year in 2050. The second scenario only considers the period until 2030 and assumes a slight decrease in gas demand to close to 900 TWh per year by 2030.[2]
- Scenario 1 is based on the Dena TM95 and scenario 2 on the EUCO30 by the European Commission. In the TM95 scenario, the climate targets are achieved mainly using power-to-X technologies with 37% of these synthetic gases covered by imports from outside the EU. The EUCO30 models the achievement of the 2030 climate and energy targets as agreed by the European Council in 2014, including an energy efficiency target of 30%.[2]



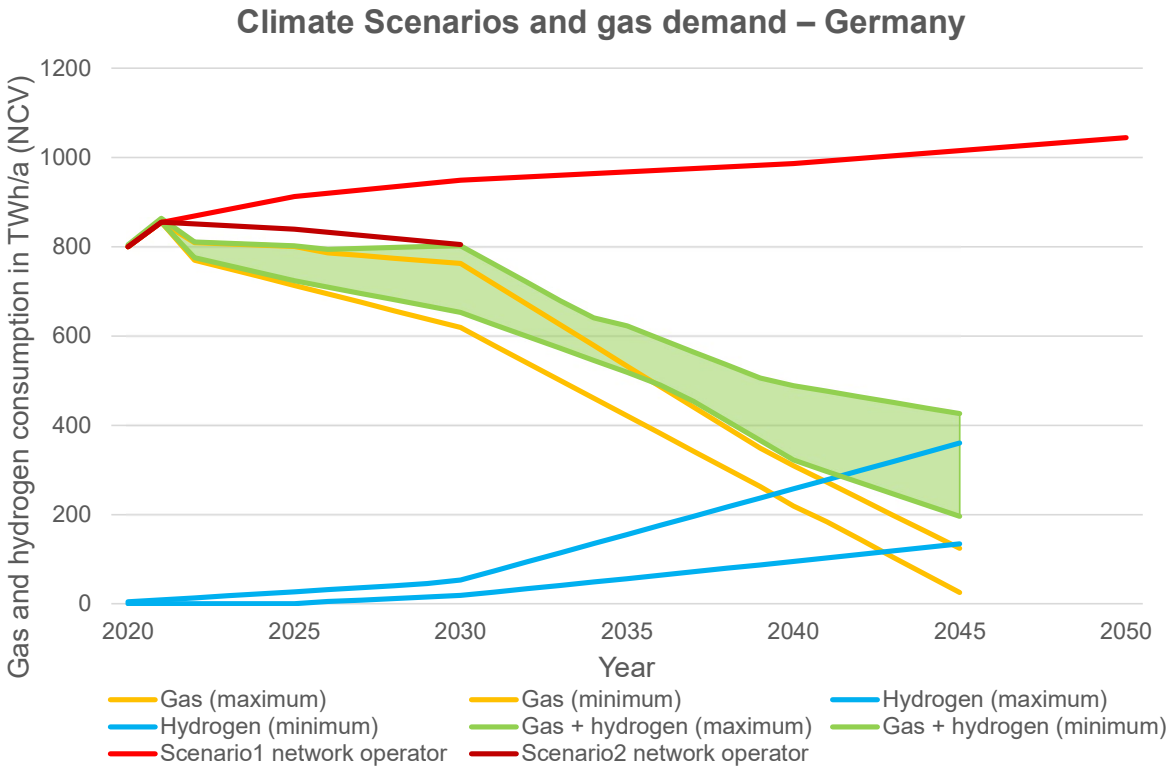
Dena TM95: Technology Mix 95 scenario from "dena-Leitstudie - Integrierte Energiewende" 2018. Available online at https://www.dena.de/fileadmin/dena/Dokumente/Pdf/9261_dena-Leitstudie_Integrierte_Energiewende_lang.pdf

EUCO 30:The EUCO scenarios served as input for various impact assessments and documents accompanying the 'Clean Energy for All Europeans' package, presented by the EU Commission in November 2016. Available online at https://energy.ec.europa.eu/document/download/13deb480-a4a5-4989-a6a4-992f62333f57_en?filename=20170125_-_technical_report_on_euco_scenarios_primes_corrected.pdf

Sources: [1]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2023); [2]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2020), [3]BDEW (2024) (p.29)

Climate Scenarios and gas demand

- Several studies exist on the future development of fossil gas and hydrogen demand in Germany, considering the climate targets. The figure shows the corridor of the projected future development of gas and hydrogen demand in Germany and the assumptions of the gas network operators.[1,2,3,4,5]
- While the demand for fossil gas will have to decline sharply, especially from 2030 onwards, hydrogen demand rises slowly. By 2045, fossil gas demand drops to 200 to 0 TWh per year, depending on the scenario, while hydrogen demand rises to 150 to 400 TWh. Significantly less gas is projected to be needed in 2045. [1,2,3,4,5]
- The network development plan does not adequately reflect the projections of the major energy system studies and therefore bears the risk of stranded investments/assets. [1,2,3,4,5]



Future gas and hydrogen demand in Germany one the one hand based on different scenarios that aim to achieve the climate targets of the country and on the other hand showing the projected developments of the gas network operators. The values in the green corridor do not correspond solely to the sum of the maximum values for gas and hydrogen. Instead, the green corridor represents the range of the total sum of hydrogen and gas within the same scenario for different scenarios. Included scenarios: Agora, dena, BDI, Ariadne Remind, Ariadne REMod, BMWK T45-Strom, BMWK T45-H2, BMWK T45-PtG/PtL.[1,2,3,4,5,6,7]

Sources: [1]Agora Energiewende, BET (2023); [2]Agora Energiewende (2021); [3]BDI (2021); [4]BMWK (2022); [5]dena (2021); [6]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2023); [7]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2020)

Content

Public information

- A network development plan of the 16 transmission system operators is published every two years. In this report, the planned construction projects on the gas grids are published for the next ten years. The gas development assumptions and derived plans must be accepted by the Regulatory Authority (BNetzA).[1]
- The Federal Network Agency (BNetzA) publishes an annual monitoring report. In this report, all developments concerning the gas networks are presented. This includes, among other things, investments in new pipelines, expenditures for maintenance and repairs, the length of the networks, the number of operators and the development of gas consumption. Information on the gas markets is also published.[2]
- According to the Energy Industry Act (EnWG) §23c (6) operators of gas distribution networks are obliged to publish the following network-relevant data without delay and in an appropriate manner, at least on their website[2]:
  - the gas quality regarding the calorific value "H_s" and, on the tenth working day of the month, the settlement calorific value of the previous month at all entry and exit points;
  - rules for the connection of other installations and networks to the network operated by the network operator and rules for the access of such installations and networks to the network operated by the network operator;
  - the standard load profiles to be applied in the local distribution system;
  - a map showing schematically which areas in a municipality are connected to the local gas distribution system.

Sources: [1]Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2020); [2]Federal Network Agency (BNetzA) (2023); [3]EnWG

Public information

- According to EnWG §23c (4) operators of gas transmission networks are obliged to publish the following structural features of their networks once a year:[1]
  - the length of the gas pipeline network separately for the low-pressure, medium-pressure and high-pressure levels
  - the length of the gas pipeline network in the high-pressure level by pipeline diameter class
  - the annual work withdrawn in the previous year by redistributors and final consumers in kilowatt hours or in cubic metres
  - the number of exit points for all pressure levels
  - the simultaneous annual maximum load of all withdrawals in megawatts or cubic metres per hour and the time of the respective occurrence
  - the allocability of each exit point to one or more market areas
  - the minimum requirements for general terms and conditions for entry or exit contracts and for balancing group contracts as well as for cooperation agreements on network access
  - information on the grid connection of biogas and LNG facilities
  - clear presentation of the grid utilisation in their entire grid, including the identification of actual or expected bottlenecks

Source: [1]EnWG

Opportunities for stakeholder involvement

- The next regulatory period of the Federal Network Agency (BNetzA) is scheduled to commence in 2029. Until that time, stakeholders become involved in the regulatory process with a view to ensuring that their recommendations are integrated into the development plans. It is important that stakeholders engage at an early stage, as this allows them to exert influence over the strategic direction and regulatory framework that will govern the gas networks in the upcoming period. For Germany, the country-specific recommendations are as follows:

1. It should be possible to refuse new gas connections and to disconnect existing customers. Infrastructure planning should be linked to municipal heating planning.
2. The depreciation period should be adapted to reflect the actual usage time of the gas networks.
3. Infrastructure planning should be adapted to realistic climate scenarios and the resulting gas demand.
4. The designation of gas-free areas and the decommissioning of gas network infrastructures should be included in municipal heating planning.

- Relevant stakeholders regarding the gas distribution grid in Germany are associations of the energy industry (Bundesverband der Energie- und Wasserwirtschaft, BDEW) and of the municipal companies (Verband kommunaler Unternehmen, VKU).

Source: [1]ARegV (2017)

List of sources

- Agora Energiewende, Bureau for Energy Economics and Technical Planning GmbH (BET) (2023): Ein neuer Ordnungsrahmen für Erdgasverteilnetze: Analysen und Handlungsoptionen für eine bezahlbare und klimazielkompatible Transformation. Available online at https://static.agora-energiewende.de/fileadmin/Projekte/2022/2022-06_DE_Gasverteilnetze/A-EW_291_Gasverteilnetze_WEB.pdf
- Agora Energiewende, Prognos, Öko-Institut, Wuppertal-Institut (2021): Klimaneutrales Deutschland 2045. Wie Deutschland seine Klimaziele schon vor 2050 erreichen kann (Langfassung). On behalf of Agora Energiewende, October 2021. URL: https://www.agora-energiewende.de/veroeffentlichungen/klimaneutrales-deutschland-2045/
- Arbeitsgemeinschaft Energiebilanzen (2023): Anwendungsbilanzen zur Energiebilanz Deutschland – Endenergieverbrauch nach Energieträgern und Anwendungszwecksen. URL: https://ag-energiebilanzen.de/wp-content/uploads/2023/01/AGEB_22p2_rev-1.pdf
- Arbeitsgemeinschaft Energiebilanzen (2023a): Auswertungstabellen zur Energiebilanz Deutschland – Daten für die Jahre von 1990 bis 2022. URL: https://ag-energiebilanzen.de/wp-content/uploads/2023/10/awt_2022_deutsch.pdf
- ARegV (2017): Verordnung über die Anreizregulierung der Energieversorgungsnetze, ARegV.
- Ariadne, Kopernikus Project Ariadne (2021): Ariadne-Report: Deutschland auf dem Weg zur Klimaneutralität 2045 – Szenarien und Pfade im Modellvergleich. Available online at https://doi.org/10.48485/pik.2021.006
- BDEW (2024): Kooperationsvereinbarung zwischen den Betreibern von in Deutschland gelegenen Gasversorgungsnetzen. Available online at https://www.bdew.de/media/documents/20240322_KoV_HT_KoV_XIV_final_clean.pdf
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2023a): Gesetz zur Wasserstoff-Netzplanung und Kernnetz-Finanzierung beschlossen. Available online at https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2023/11/20231115-gesetz-zur-wasserstoff-netzplanung-und-kernnetz-finanzierung-beschlossen.html
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2023b): FAQ zum Wasserstoff-Kernnetz. Available online at https://www.bmwk.de/Redaktion/DE/FAQ/Wassertstoff-Kernnetz/faq-wasserstoff-kernnetz.html
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2023c): Wasserstoffhochlauf erreicht neue Phase. Available online at https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2023/12/20231205-wasserstoffhochlauf-erreicht-neue-phase.html
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2024a): Auf einen Blick: Die neue Förderung für den Heizungstausch. Available online https://www.energiewechsel.de/KAENEF/Redaktion/DE/Downloads/foerderung-heizungstausch-beg.pdf?__blob=publicationFile&v=20
- Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2024b): Green Paper Transformation Gas-/Wasserstoff-Verteilernetze. URL: https://www.bmwk.de/Redaktion/DE/Downloads/G/green-paper-transformation-gas-wasserstoff-verteilernetze.pdf?__blob=publicationFile&v=4
- Bundesministerium für Wirtschaft und Klimaschutz, Bundesministerium für Wohnen, Stadtentwicklung und Bauwesen (2023): Novelle des Gebäudeenergiegesetzes auf einen Blick (GEG). Available online at https://www.bmwsb.bund.de/SharedDocs/downloads/Webs/BMWSB/DE/veroeffentlichungen/geg-auf-einen-Blick.pdf?__blob=publicationFile&v=2
- Bundesnetzagentur (BNetzA) (2024): Eckpunkte zu den Abschreibungsmodalitäten für die Gasnetztransformation. URL: https://www.bundesnetzagentur.de/DE/Beschlusskammern/GBK/Methoden_Ebene2/KANU/Eckpunkte_KANU.pdf?__blob=publicationFile&v=2
- Bundesverband der deutschen Heizungsindustrie (2023a): Marktentwicklung Wärmeerzeuger Deutschland 2013–2022. Available online at https://www.bdh-industrie.de/fileadmin/user_upload/Pressegrafiken/Marktstruktur_zehn_Jahre_2022_DE_022023.pdf

List of sources

- Bundesverband der deutschen Heizungsindustrie (2023b): Gesamtbestand zentrale Wärmeerzeuger 2022. Available online at https://www.bdh-industrie.de/fileadmin/user_upload/Pressegrafiken/Diagramm_Gesamtzahl_Waermeerzeuger_2022_DE.pdf
- Burchardt, J., Franke, K., Herhold, P., Hohaus, M., Humpert, H., & Päivärinta, J. (BDI, 2021): Klimapfade 2.0. Ein Wirtschaftsprogramm für Klima und Zukunft. Hg. v. Boston Consulting Group (BCG). Available online at https://bdi.eu/publikation/news/klimapfade-2-0-ein-wirtschaftsprogramm-fuer-klima-und-zukunft/
- Deutscher Bundestag (2023): Gesetz für die Wärmeplanung und zur Dekarbonisierung der Wärmenetze (Wärmeplanungsgesetz - WPG). Online available at https://www.gesetze-im-internet.de/wpg/WPG.pdf
- Deutsche Energie-Agentur GmbH (dena, 2021): dena-Leitstudie Aufbruch Klimaneutralität. Available online at https://www.dena.de/newsroom/publikationsdetailansicht/pub/abschlussbericht-dena-leitstudie-aufbruch-klimaneutralitaet/
- Deutscher Verein des Gas- und Wasserfaches (DVGW) (2023): Der Gasnetzgebietstransformationsplan Ergebnisbericht. Available online at https://www.h2vorort.de/fileadmin/Redaktion/Bilder/Publikationen/Ergebnisbericht-2023-des-GTP.pdf
- Deutscher Verein des Gas- und Wasserfaches (DVGW), energie schwaben gmbh (2023): Gasnetzgebietstransformationsplan. Available online at https://www.h2vorort.de/fileadmin/Redaktion/PDF/gtp-2023-leitfaden.pdf
- Deutsches Biomasseforschungszentrum gemeinnützige GmbH (DBFZ, 2022): Die Rolle von Biogas für eine sichere Gasversorgung in Deutschland. Available online at https://www.dbfz.de/fileadmin/user_upload/Referenzen/Statements/Positionspapier_Biogas_Ukraine.pdf
- ene't GmbH (2023): Karte der Netzbetreiber Gas. Available online at https://www.enet.eu/portfolio/karten#&gid=1&pid=3
- EnWG (07.07.2005): Gesetz über die Elektrizitäts- und Gasversorgung (Energiewirtschaftsgesetz). Available online at https://www.gesetze-im-internet.de/enwg_2005/EnWG.pdf
- Equinor (2023): https://www.equinor.com/energy/equinor-rwe-cooperation
- Erdgas-Wärme-Preisbremsengesetz vom 20. Dezember 2022 (BGBl. I S. 2560, 2894), das zuletzt durch Artikel 1 des Gesetzes vom 26. Juli 2023 (BGBl. 2023 I Nr. 202) geändert worden ist. Available online at https://www.gesetze-im-internet.de/ewpbg/EWPBG.pdf
- Eurostat (2023): Complete energy balances. DOI: 10.2908/nrg_bal_c. Available online at https://ec.europa.eu/eurostat/databrowser/bookmark/64535145-5172-4804-b176-ba06dfe39e61?lang=en
- Federal Cartel Office and Federal Network Agency (BNetzA) (2015): Gemeinsamer Leitfaden von Bundeskartellamt und Bundesnetzagentur zur Vergabe von Strom- und Gaskonzessionen und zum Wechsel des Konzessionsnehmers. Available online at https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/EntflechtungKonzession/KonzessionsVertraege/LeitfadenKonzessionsrecht/Leitfaden_Konzessionsvertraege_2te_Auflage_2015.pdf?__blob=publicationFile&v=1
- Federal Ministry for Economic Affairs and Climate Action (BMWK) (November 15, 2022): Langfristszenarien. Available online at https://www.langfristszenarien.de/enertile-explorer-de/index.php
- Federal Ministry for Economic Affairs and Climate Action (BMWK) (2024): Bundesförderung für effiziente Gebäude (BEG). Available online at https://www.energiewechsel.de/KAENEF/Redaktion/DE/Dossier/beg.html
- Federal Network Agency (BNetzA) (2024a): Eckpunkte zur Anpassung der Abschreibungsmodalitäten im Gassektor. Available online at https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/DE/2024/20240306_AbschreibungGas.html

List of sources

- Federal Network Agency (BNetzA) (2024b): Festlegungsverfahren zur Anpassung von kalkulatorischen Nutzungsdauern und Abschreibungsmodalitäten von Erdgasleitungsinfrastrukturen (KANU 2.0). Available online at https://www.bundesnetzagentur.de/DE/Beschlusskammern/GBK/Methoden_Ebene2/KANU/start.html
- Federal Network Agency (BNetzA) (2023): Monitoring Report 2022. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Monitoringberichte/MonitoringberichtEnergie2022.pdf;jsessionid=280DA177FD1F3034855CCEC97868534F?__blob=publicationFile&v=5
- Federal Network Agency (BNetzA) (2022a): Monitoringbericht 2021. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht_Energie2021.pdf?__blob=publicationFile
- Federal Network Agency (BNetzA) (2022b): Umstellung von L- auf H-Gas. Available online at https://www.bundesnetzagentur.de/DE/Vportal/Energie/UmstellungGas/start.html
- Federal Network Agency (BNetzA) (2021): Monitoringbericht 2020. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundeskartellamt.de/SharedDocs/Publikation/DE/Berichte/Energie-Monitoring-2020.pdf?__blob=publicationFile&v=4
- Federal Network Agency (BNetzA) (2020): Monitoringbericht 2019. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht_Energie2019.pdf?__blob=publicationFile&v=6
- Federal Network Agency (BNetzA) (2019): Monitoringbericht 2018. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Berichte/2018/Monitoringbericht_Energie2018.pdf?__blob=publicationFile&v=7
- Federal Network Agency (BNetzA) (2018): Monitoringbericht 2017. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht2017.pdf?__blob=publicationFile&v=4
- Federal Network Agency (BNetzA) (2017): Monitoringbericht 2016. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht2016.pdf?__blob=publicationFile&v=2
- Federal Network Agency (BNetzA) (2016): Monitoringbericht 2015. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2015/Monitoringbericht_2015_BA.pdf?__blob=publicationFile
- Federal Network Agency (BNetzA) (2015): Monitoringbericht 2014. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2014/Monitoringbericht_2014_BF.pdf?__blob=publicationFile&v=3
- Federal Network Agency (BNetzA) (2014): Monitoringbericht 2013. Monitoring Report according to § 63 (3) in conjunction with § 35 EnWG and § 48 (3) in conjunction with § 53 (3) GWB. Available online at https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2013/131217_Monitoringbericht2013.pdf?__blob=publicationFile&v=9
- Gebäudeenergiegesetz (GEG) vom 8. August 2020 (BGBl. I S. 1728), das zuletzt durch Artikel 1 des Gesetzes vom 16. Oktober 2023 (BGBl. 2023 I Nr. 280) geändert worden ist. Available online at https://www.gesetze-im-internet.de/geg/GEG.pdf
- GasNEV (25.07.2005): Verordnung über die Entgelte für den Zugang zu Gasversorgungsnetzen (Gasnetzentgeltverordnung). Available online at https://www.gesetze-im-internet.de/gasnev/GasNEV.pdf

List of sources

- GasNZV (03.09.2010): Verordnung über den Zugang zu Gasversorgungsnetzen (Gasnetzzugangsverordnung).). Available online at https://www.gesetze-im-internet.de/gasnzv_2010/GasNZV.pdf
- Konzessionsabgabenverordnung vom 9. Januar 1992 (BGBl. I S. 12, 407), die zuletzt durch Artikel 3 Absatz 4 der Verordnung vom 1. November 2006 (BGBl. I S. 2477) geändert worden ist. Available online at https://www.gesetze-im-internet.de/kav/KAV.pdf
- Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2023): Planungsstand Wasserstoff-Kernnetz. Available online at https://fnb-gas.de/wp-content/uploads/2023/07/2023-07-12_FNB-Gas_Planungsstand-Wasserstoff-Kernnetz.pdf
- Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2020): Entwurf Netzentwicklungsplan Gas 2020–2030. Available online at https://fnb-gas.de/wp-content/uploads/2021/09/fnb_gas_nep_gas_2020_de.pdf
- Vereinigung der Fernleitungsnetzbetreiber Gas e.V. (2021): Szenariorahmen Netzentwicklungsplan Gas 2022–2032. Available online at https://fnb-gas.de/wp-content/uploads/2021/09/210909_DE_FNB_GAS_2022_SR.pdf
- Wohngeldgesetz vom 24. September 2008 (BGBl. I S. 1856), das zuletzt durch Artikel 17 des Gesetzes vom 22. Dezember 2023 (BGBl. 2023 I Nr. 408) geändert worden ist. Available online at https://www.gesetze-im-internet.de/wogg/WoGG.pdf

Contacts

Sibylle Braungardt, Marc Stobbe

Öko-Institut e.V. – Institute for Applied Ecology
Postfach 17 71
D-79017 Freiburg
Germany

Mails:
s.braungardt@oeko.de
m.stobbe@oeko.de

Jan Rosenow

Regulatory Assistance Project (RAP)
Anna-Louisa-Karsch-Straße 2
D – 10178 Berlin
Germany

Mail:
jrosenow@raponline.org