

Gas Network Development Plan 2022–2032

Supplement to the Scenario Framework

Consultation



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Supplement to the Scenario Framework

**Gas Network Development Plan
2022–2032** commissioned by the German
transmission system operators (TSOs)

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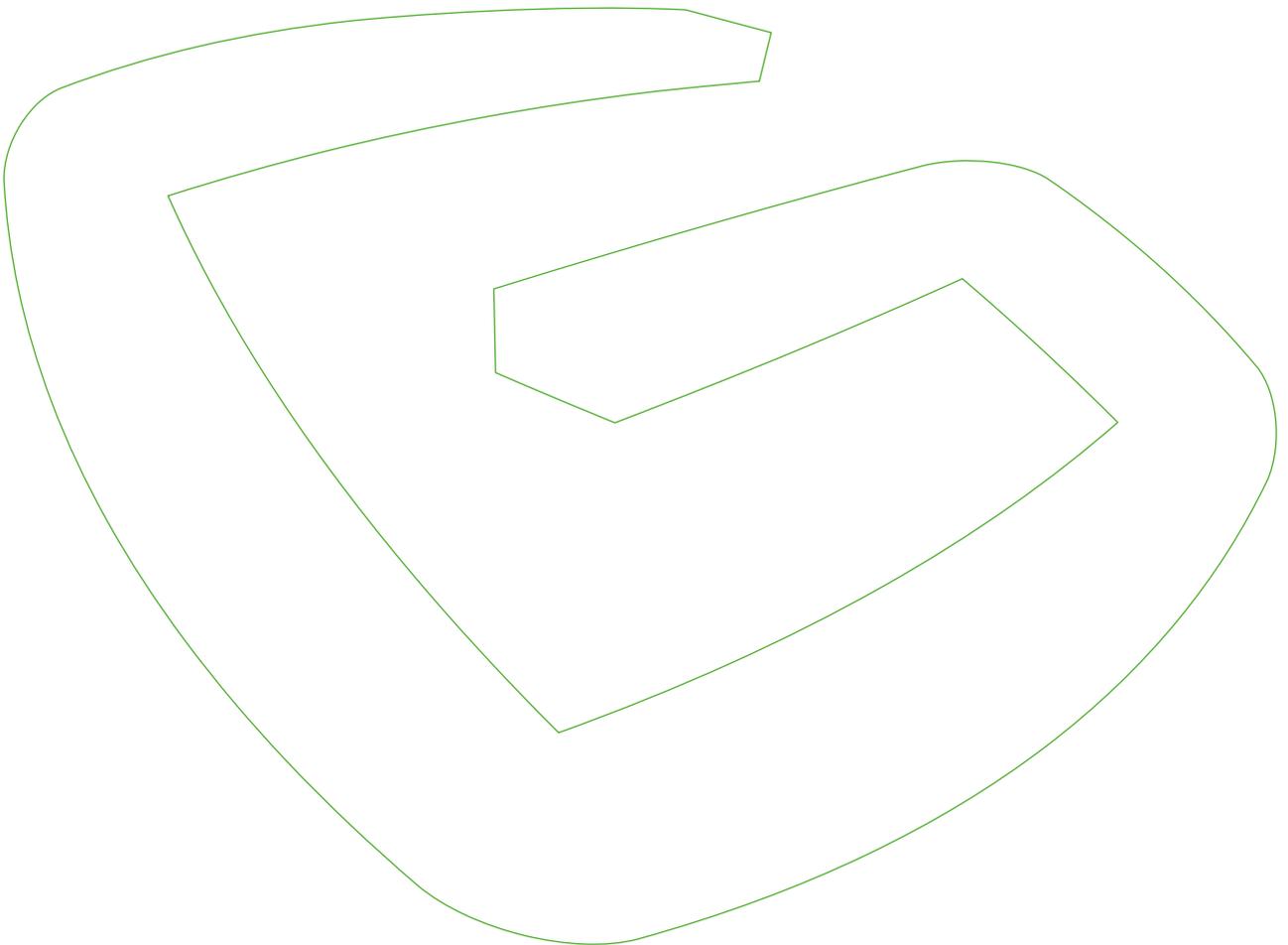
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Background 1



1 Background

With the Russian war of aggression on Ukraine and its aftermath, the general energy economy framework conditions for Germany and Europe are changing. The supply of Russian natural gas was secure for decades. The new circumstances require reduced dependency on Russian energy sources, especially natural gas. This can be accomplished by increasing the diversification of gas supply sources and replacing Russian natural gas, for example with liquefied natural gas (LNG). Another forward-looking approach would be to switch from natural gas to green, carbon-neutral gases such as hydrogen as quickly as possible.

These developments have a significant impact on the framework conditions for gas, as the load flows are changing significantly. Therefore, in consultation with the Federal Network Agency (BNetzA), the transmission system operators have decided to take the changed environment into account in the current Network Development Plan.

The interim status published in July comprises the base variant, which is based on the Scenario Framework 2022 confirmed in January 2022. Due to its timing, the base variant does not reflect the new framework conditions on the gas market. In consultation with BNetzA, the transmission system operators have calculated additional LNG security of supply variants in order to reflect the diversification of supply sources through LNG for a partial replacement of Russian natural gas quantities and the changed load flows for now. The hydrogen variant is also part of the Network Development Plan interim status.

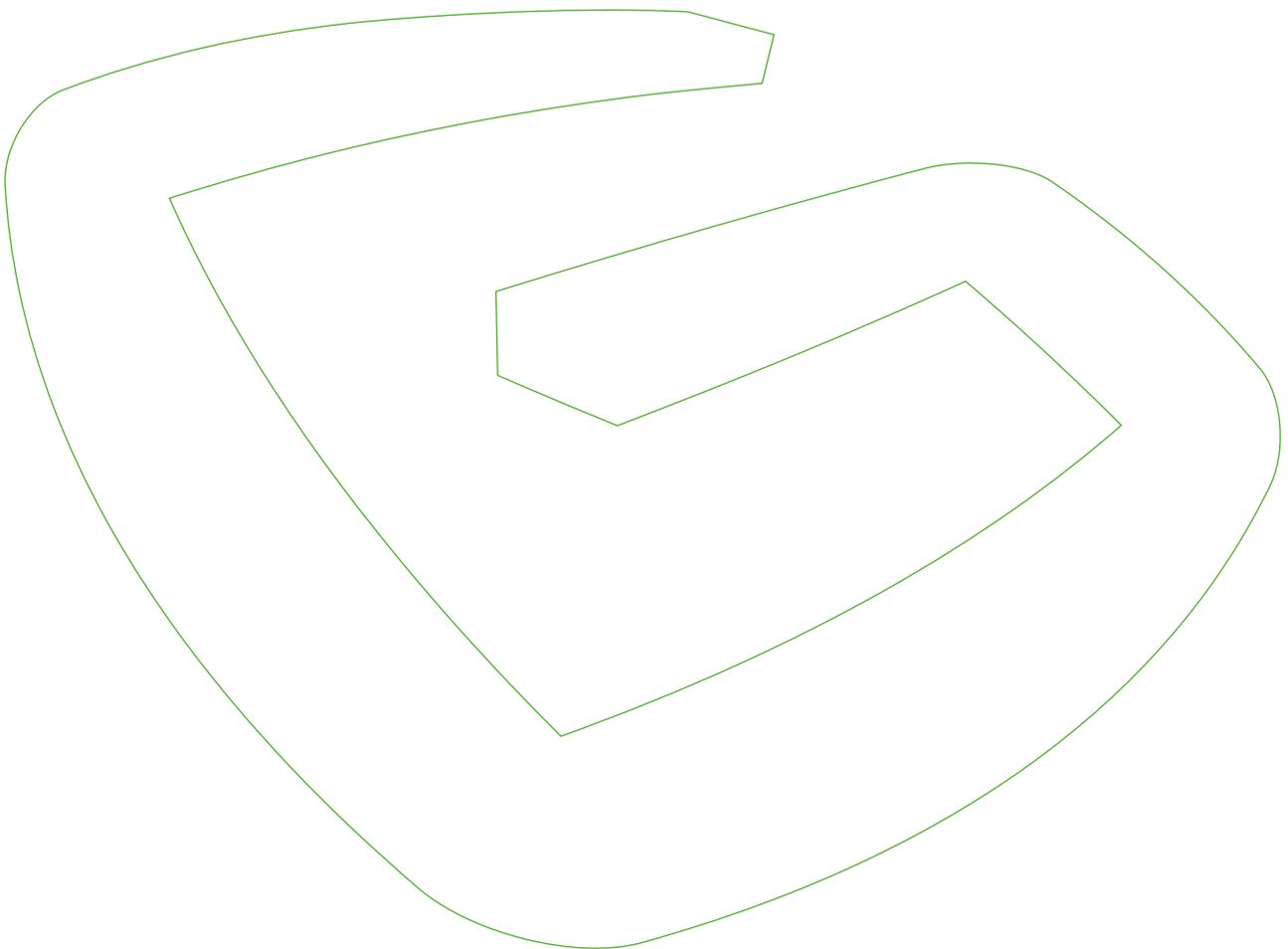
The BNetzA has announced to the transmission system operators that it will re-cast parts of the Scenario Framework 2022 due to the changes on the gas market. Based on this information, the transmission system operators originally intended to publish the consultation document on the Gas Network Development Plan 2022–2032 by autumn, mainly to reflect a complete replacement of Russian natural gas quantities.

Generally speaking, the Gas Network Development Plan represents a medium- to long-term plan for the Germany's network expansion in line with demand to ensure security of supply for the next 10 years. Given the circumstances, the transmission system operators also provide short-term responses to current events.

The transmission system operators consider it necessary to supplement the Scenario Framework, which had already been confirmed in January 2022. It was proposed to BNetzA by the transmission system operators that three further modelling versions (LNGplus security of supply variants) be calculated. This serves the purpose of accelerating the process and determining the expansion measures that are necessary for security of supply as quickly as possible. In each variant, the natural gas quantities from Russia are supposed to be completely replaced by connections to German or Western European LNG terminals or natural gas sources and hydrogen. Furthermore, natural gas consumption reduction is considered.

In the tenor hearing on 22 September 2022, BNetzA requested the transmission system operators to consider three LNGplus security of supply variants. Accordingly, the present document is added to supplement the Scenario Framework. The transmission system operators have included the requested LNGplus supply security variants in the document and integrated the new input parameters and modelling variants agreed in advance of the consultation with BNetzA. Chapter 2 discusses the revised LNG input variables and chapter 3 goes into the revised demand forecasts. Chapter 4 then describes the various LNGplus supply security variants. As the modelling variants contain significant changes and this document is part of the Scenario Framework 2022, the industry considers it necessary to carry out a renewed consultation pursuant to section 15a of the EnWG (German Energy Act). Comments on this part of the Scenario Framework 2022 can be submitted to the Gas transmission system operators until 16 October 2022. Due to the existing deadlines within the framework of the tenor hearing by the BNetzA, a consultation period of three weeks is planned. The results of the consultation will be included in the comments of the transmission system operators regarding the tenor hearing. After that, the new partial decision is expected for the confirmation of the Scenario Framework. The consultation document for the Gas Network Development Plan 2022–2032 will be based on the new partial decision and is expected to be made available to the public before the end of 2022.

Changed input variables for LNG 2



2 Changed input variables for LNG

The construction of LNG terminals in Germany, the associated connection to the pipeline transmission system and the corresponding provision of capacities were already the subject of the Gas Network Development Plan 2018–2028 and the Gas Network Development Plan 2020–2030.

For the Gas Network Development Plan 2022–2032, the transmission system operators have capacity reservations or capacity expansion claims in accordance with sections 38/39 of the GasNZV (Gas Network Access Ordinance) for the onshore LNG terminals in Brunsbüttel, Stade and Wilhelmshaven. For accelerated capacity provision via so-called floating storage and regasification units (FSRU), there are also further requests at the Brunsbüttel, Lubmin and Wilhelmshaven sites.

This chapter describes the status of these planned LNG terminals with connection to the pipeline transmission system in Germany as of 1 September 2022.

So far, requests for capacity reservations or capacity expansion claims under sections 38/39 of the GasNZV have not yet been received for all the sites mentioned in the LNG Acceleration Act. The transmission system operators will consider requested capacity reservations or capacity expansion claims for LNG terminals pursuant to sections 38/39 of the GasNZV in the modelling of the LNGplus security of supply variants by the deadline of 30 September 2022.

The transmission system operators have established clusters reflecting the LNG terminal requests received to date. The clustering combines the requested capacities of LNG terminals that affect a network area. Very high requested capacities in a cluster would result in large network expansions for transport within the respective network area and beyond. Therefore, the transmission system operators consider a limitation of the LNG terminal capacity within the clusters to be appropriate to ensure an efficient network expansion. Furthermore, the amount of LNG capacity required for Germany in total and per cluster is supposed to be determined as part of the preparation of the Gas Network Development Plan 2022–2032. The following table shows the LNG terminal requests on file with the transmission system operators and the status of the LNG terminal locations mentioned in the LNG Acceleration Act.

Table 1: Requests for LNG terminals on the Network of the transmission system operators' network (Date: 1 September 2022)

No.	TSO	Cluster	LNG project locations	Gas connection capacity [MW]	Status	FSRU	onshore LNG terminals
1	OGE	Wilhelmshaven	Wilhelmshaven	26,000	section 39 GasNZV	yes*	yes
				10,600		yes	no
				5,500		yes	no
Total cluster Wilhelmshaven				42,100			
2	GUD	Lower Elbe	Brunsbüttel	8,700	section 39 GasNZV	no	yes
				1,975		no	yes
				3,125		no	yes
				15,469		yes	no
3			Stade	9,300	section 39 GasNZV	no	yes
				6,950		no	yes
				5,450		no	yes
4	-		Hamburg	-	-	-	-
Total cluster Lower Elbe				50,969			
5	-	Baltic Sea	Rostock	-	-	-	-
6	Fluxys D, GASCADE, GUD		Lubmin	6,000	section 38 GasNZV	yes	no
		11,100		section 38 GasNZV	yes	no	
Total cluster Baltic Sea				17,100			
Total of all clusters				110,169			

* until completion of the onshore LNG terminal, part of the capacity will be provided via an FSRU

Source: Transmission system operators

Date: 26 September 2022

The formed clusters are Wilhelmshaven, Lower Elbe (Brunsbüttel, Stade, Hamburg) and the Baltic Sea (Rostock, Lubmin). They are shown in the figure below and are described in the following.

Figure 1: Possible LNG sites and their clustering



Source: Transmission system operators

Cluster Wilhelmshaven

For the consultation by the transmission system operators and the confirmation of the Scenario Framework 2022 by BNetzA, the only project developer of the Wilhelmshaven LNG terminal at that time had withdrawn its request for capacity reservation pursuant to section 38 of the GasNZV. Accordingly, no capacities for LNG terminals at the Wilhelmshaven site were considered in the Base for the Gas Network Development Plan 2022–2032 (Base 2022).

At the start of planning for the Network Development Plan 2022 interim status, OGE had capacity reservation requests in accordance with section 38 of the GasNZV amounting to 26 GWh/h for LNG terminals in Wilhelmshaven; the supply of synthetic methane in the amount of 10 GWh/h, which was already included in the base variant, was included in the requests.

In the meantime, OGE has received Network expansion requests for 42.1 GWh/h for LNG terminals at the Wilhelmshaven site from three project developers in accordance with section 39 of the GasNZV. Two of them are FSRUs and one is an FSRU that is intended to be expanded by a fixed onshore LNG terminals starting in 2025.

For quick connection of the first planned LNG plant, which is expected to be commissioned as early as the end of 2022, OGE has started construction of a capacity reinforcement pipeline (WAL Part 1; Wilhelmshaven pipeline link) and the associated Gas Pressure Regulating and Metering Stations (GPRMS) between the existing transmission network near Etzel and Wilhelmshaven. The WAL Part 1 pipeline was already the result of the modelling of the base variant (ID 818-01) and the LNG security of supply variants (ID 851-01). The WAL Part 2 pipeline (ID 825-01) and the associated GPRMS will connect the other two LNG terminals to the pipeline transmission system.

With the construction of the Wilhelmshaven–Leer gas connecting pipeline (GWL), consisting of the measures for Sande Nüttermoor/Jemgum pipeline (ID 862-01) and the associated GPRMS (ID 863-01, ID 864-01 and ID 865-01), GTG North is creating further transport capacities from the Wilhelmshaven LNG site to the Nüttermoor, Jemgum und Huntorf gas storage terminals and to the regional distribution networks. The GWL was already the result of the modelling of the LNG security of supply variant and is scheduled to be completed by the end of 2023.

Cluster Lower Elbe (Brunsbüttel, Stade, Hamburg)

Brunsbüttel (onshore)

The Brunsbüttel LNG plant project was included in the Gas Network Development Plan 2018–2028 via a capacity expansion claim in accordance with section 39 of the GasNZV. The expansion measures required to provide the feed-in capacity of 8.7 GW and the connection infrastructure (ID 502-02a and ID 502-03b) were confirmed by BNetzA.

The system operator has submitted two further capacity expansion claims in accordance with section 39 of the GasNZV in August 2019 and May 2021. The transmission system operators will take the LNG project in Brunsbüttel into account accordingly in the Gas Network Development Plan 2022–2032.

Brunsbüttel FSRU

A capacity expansion claim under section 39 of the GasNZV was made for the Brunsbüttel site in August 2022 in order to be able to feed regasified LNG into the pipeline transmission system in the winter of 2022/2023.

In order to accelerate the provision of LNG quantities, the partial use of the distribution system operator pipeline Brunsbüttel – Klein Offenseth (ID 874-01) was introduced in the interim status for the Gas Network Development Plan 2022–2032.

Stade (onshore)

For the planned LNG terminal in Stade, an application for capacity reservation pursuant to section 38 of the GasNZV was submitted for the first time in June 2019. As the requested capacity could not be made available, the project sponsor asserted its capacity expansion claim under section 39 of the GasNZV. The resulting expansion measures and connection infrastructure (ID 640-02 and ID 641-02) were confirmed by BNetzA in the Gas Network Development Plan 2020–2030.

The updated planning of the project sponsor provides for a significant increase to the originally planned capacity. As a result, further capacity expansion claims were made in November 2020 and March 2021 in accordance with section 39 of the GasNZV.

To accelerate the provision of LNG quantities, the LNG Stade connection pipeline (ID 872-01) and the GPRMS LNG Stade (ID 873-01) were introduced in the interim status for the Gas Network Development Plan 2022–2032.

Hamburg

The Port of Hamburg is explicitly named as a project location in the LNG Acceleration Act and was thoroughly examined as a location for an FSRU procured by the federal government. There are currently no capacity reservations/capacity expansion claims for the Hamburg site pursuant to sections 38/39 of the GasNZV.

Cluster Baltic Sea (Rostock, Lubmin)

Rostock

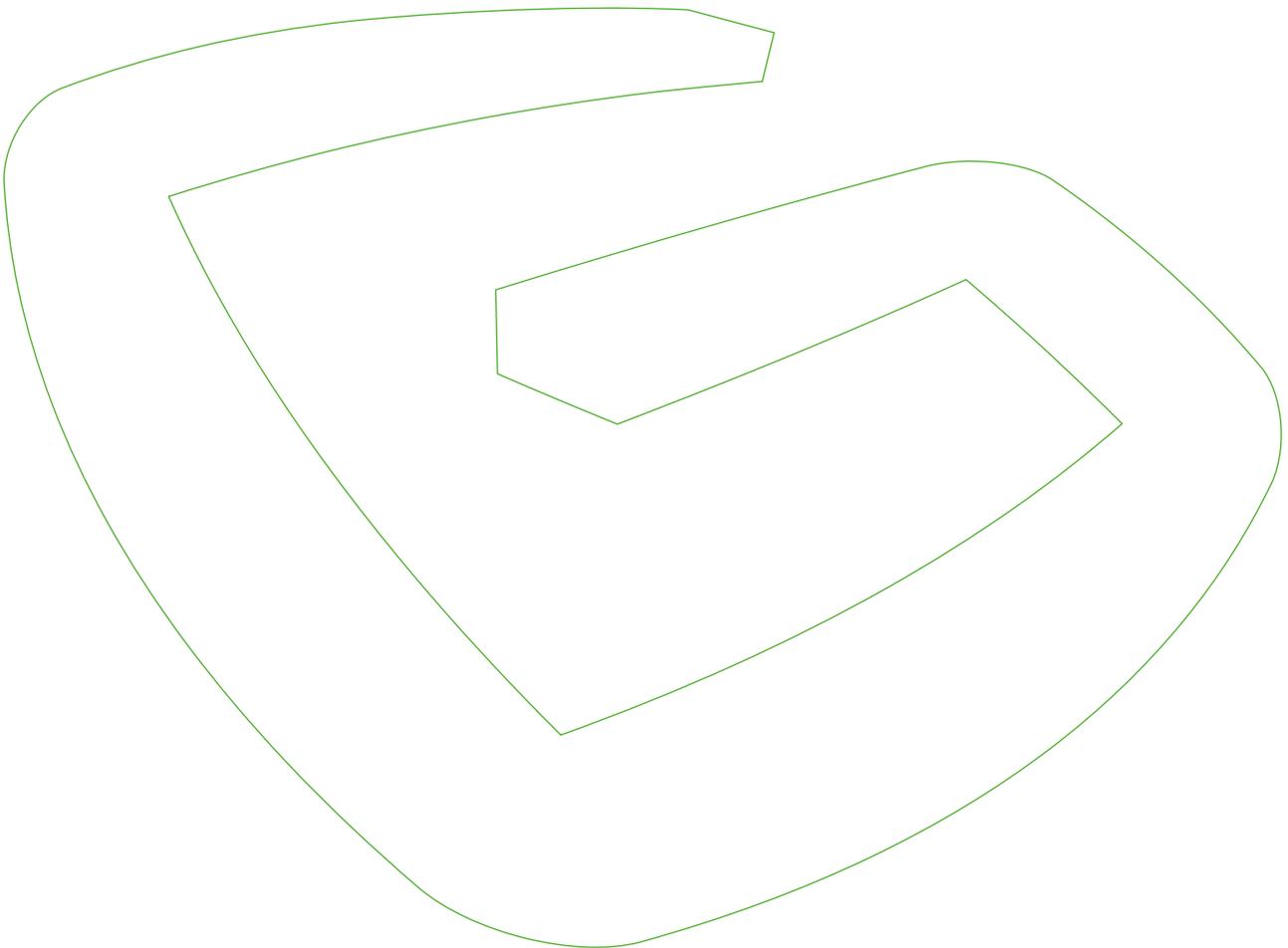
There are currently no capacity reservations/capacity expansion claims for the Rostock site pursuant to sections 38/39 of the GasNZV. The Port of Rostock is explicitly named as a project site in the LNG Acceleration Act and was thoroughly examined as a site for one of the FSRUs committed by the federal government. Based on current information, these FSRUs are deployed at other locations. A deployment in Rostock could only take place after the planned expansion of the port infrastructure (probably 2025). However, talks with a private investor for the short-term provision and connection of a smaller FSRU solution are still ongoing. Moreover, Rostock is still under discussion for an onshore LNG terminal.

If it materialises, according to the interim status of the Gas Network Development Plan 2022–2032, a connecting pipeline and a GPRMS will be required for connection to the NEL (North European Gas Pipeline).

Lubmin

For the Lubmin site, the transmission system operators have received capacity reservation requests in accordance with section 38 of the GasNZV for Phase I with 6 GWh/h and for Phase II with another 11.1 GWh/h. For Phase I, regasified LNG is initially supposed to be fed into the German pipeline transmission system via an FSRU in the industrial port of Lubmin. For Phase II, the feed-in has been requested for the end of 2023. The work on the connecting pipeline and the connection to the FSRU is on schedule, so that the commissioning for Phase I can probably take place on 1 December 2022.

Changed input variables for gas demand



3 Changed input variables for gas demand

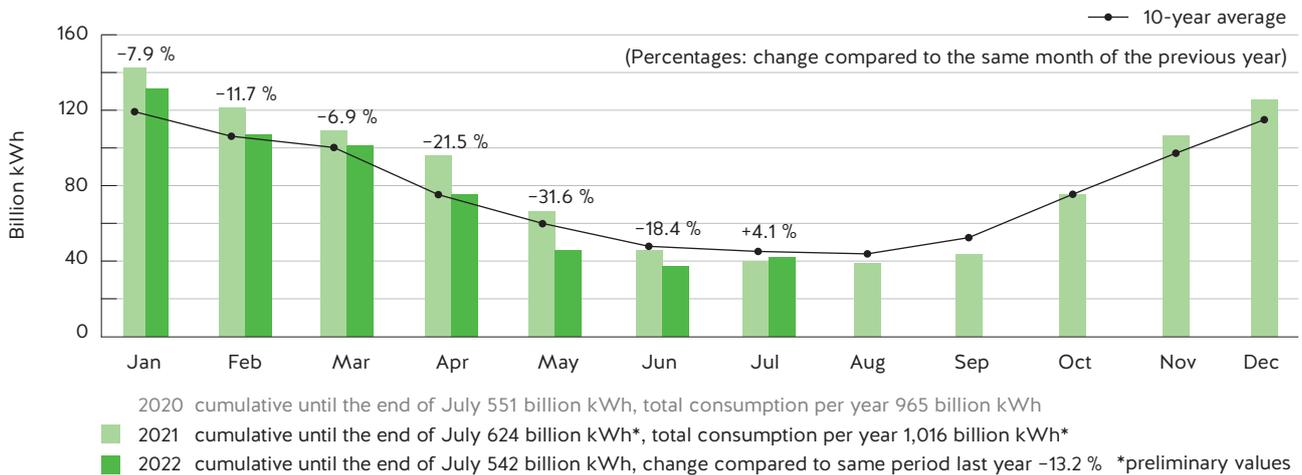
The changed framework conditions described in chapter 1 have an impact on the future gas demand development. After analysis of the current gas consumption (cf. Chapter 3.1), this chapter presents the changed assumptions for the gas demand development up to 2032 (cf. Chapter 3.2).

3.1 Analysis of current gas consumption

The actual natural gas consumption in 2021 was around 1,016 TWh. Adjusted for temperature (i.e. eliminating the influence of temperature fluctuations on energy consumption), natural gas demand in 2021 was around 991 TWh [BDEW 2022a].

The current BDEW statistics [BDEW 2022a] show that gas consumption up to July 2022 has reduced by around 13 % compared to the same period in 2021 (cf. Figure 2). In addition to weather conditions, this decline is attributable to the current geopolitical situation and the associated gas supply situation with corresponding gas price increases. Adjusted for temperature, the decline in gas consumption is only about 7 %.

Figure 2: Natural gas consumption in Germany



Source: BDEW 2022a (as of 08/2022)

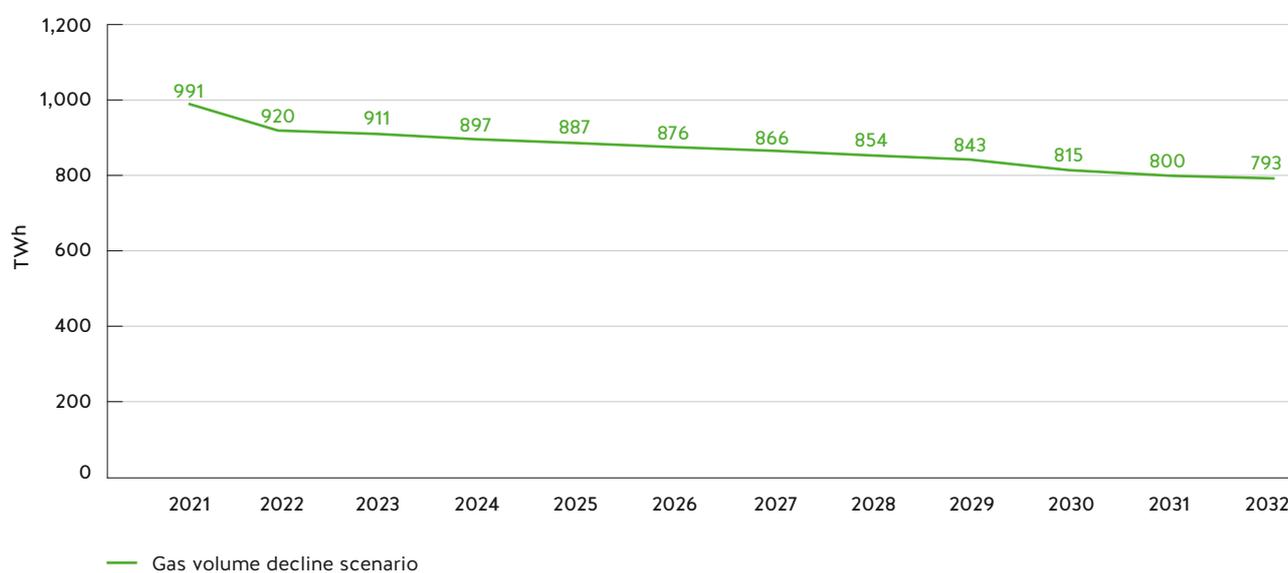
3.2 Gas demand development up to the year 2032

Gas consumption (volume) in Germany is already declining due to geopolitical developments. This decline will continue in the future due to decarbonisation efforts and must be reflected in the LNGplus supply security variants. Current analyses [BDEW 2022b, DIW 2022, Agora 2022] primarily examine the short- and medium-term reduction and substitution potentials for natural gas.

For the LNGplus modelling versions, the transmission system operators assume that gas demand will be reduced by around 20 % by 2032 (cf. Figure 3). This means a reduction of around 200 TWh compared to 2021, consisting of a natural gas reduction of around 15 % and an additional substitution of methane to hydrogen of around 5 %. In this context, the transmission system operators consider the significant decrease in gas demand that can already be observed in 2022.

The decline in gas demand (volume) is assumed across all consumption sectors; no differentiation of the decline in demand between the sectors is made here.

Figure 3: Development of gas demand



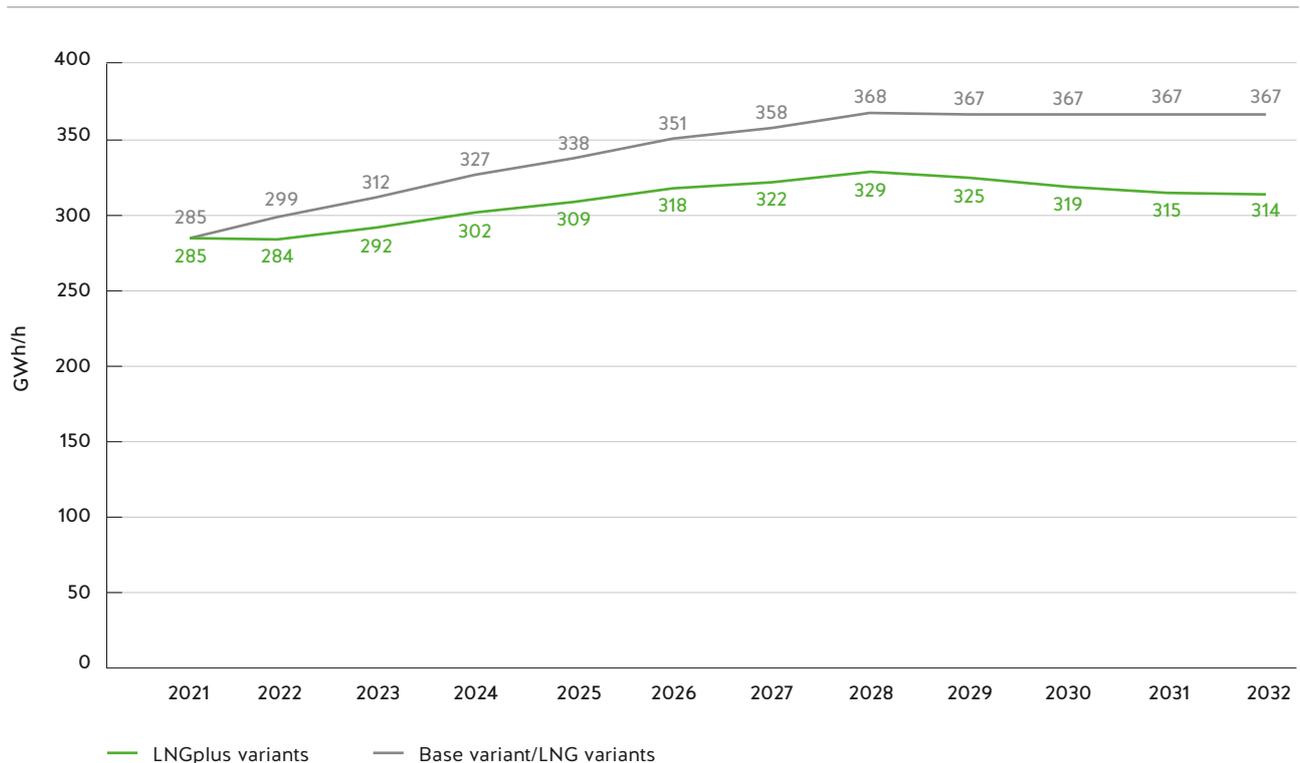
Source: Transmission system operators

The assumed decline in gas volumes has an impact on the exit capacity development for modelling in the LNGplus supply security variants. For this purpose, the transmission system operators make the following assumptions:

- For the distribution system operators (incl. L-H-gas conversion) and industry, the gas volume decline translates into a decline in capacity. The “Study on factors influencing the future demand of distribution system operators” [FfE 2014] is used for this purpose. This study analysed the correlation between capacity and volume development and led to the conclusion that on average a gas volume reduction of 10 % capacity to a gas capacity reduction of 6 %. Consequently, the reduction in gas volume leads to a reduction in capacity, but it is somewhat dampened in comparison to its volume.
- For new and existing power plants, the transmission system operators do not make any capacity adjustments compared to the confirmed 2022 Scenario Framework. The reason for this is to ensure supply security in the electricity sector; appropriate changes should only be made here in consultation with the transmission system operators and BNetzA.

Under these assumptions, the capacity requirement in H-gas (without border crossing points) increases from around 285 GW in 2021/2022 to around 314 GW in 2032/2033 (cf. Figure 4). The increase is primarily attributable to the L-H-gas conversion, which will lead to consumers switching from L-gas to H-gas by 2028/2029 and to connecting new gas-fired power plants. Compared to the base and the LNG variants (in other words, compared to the previous consumption assumptions in the interim status of the Gas Network Development Plan 2022–2032), there is a decrease in capacity demand of around 53 GW in the year under consideration 2032.

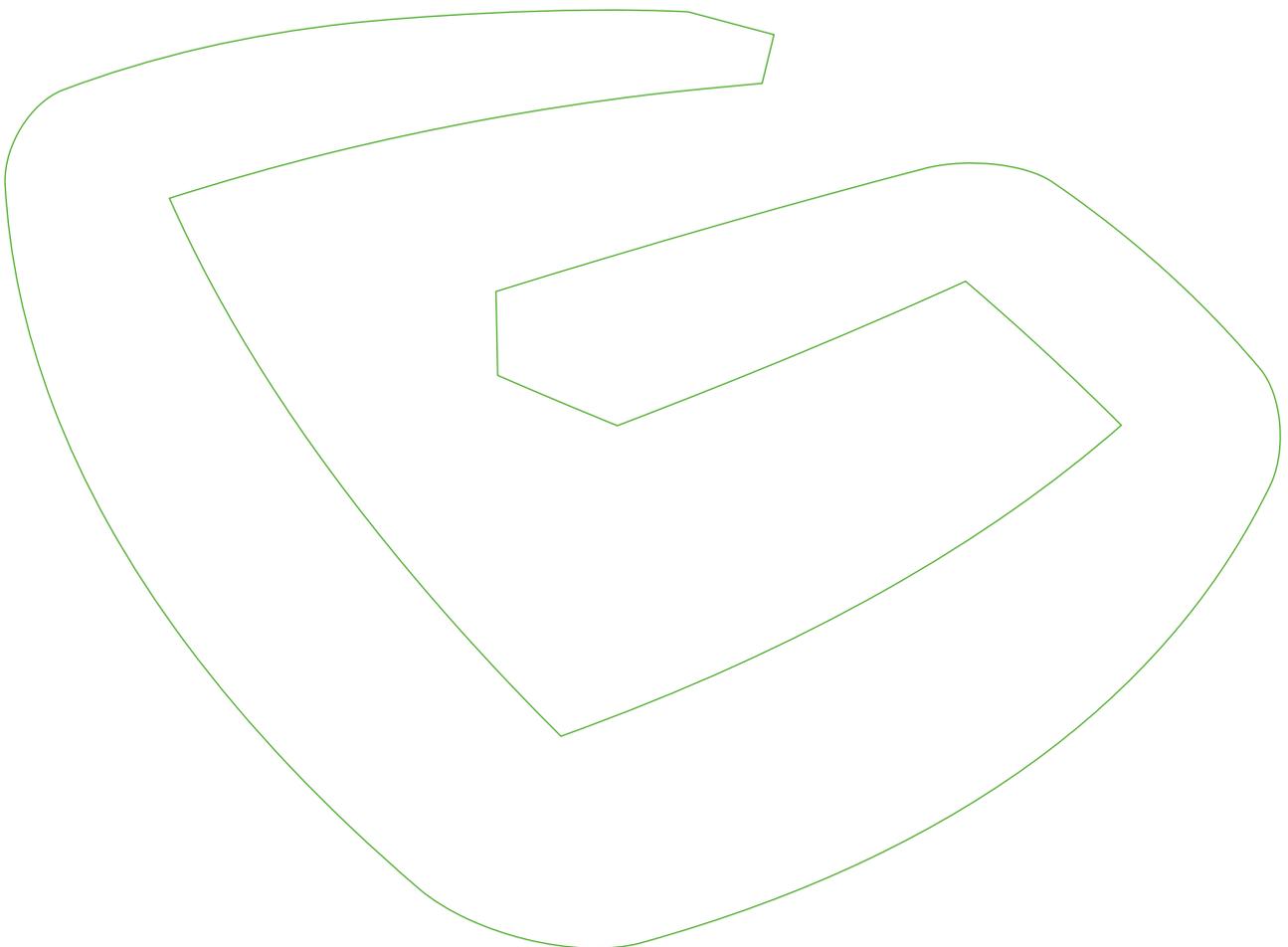
Figure 4: Development of H-gas exit capacity taking the decline in gas demand into account (without exit border crossing points)



Source: Transmission system operators

LNGplus security of supply variants

4



4 LNGplus security of supply variants

In this chapter, the transmission system operators present additional modelling variants. In order to adequately reflect the changed energy-related and geopolitical circumstances, the transmission system operators consider three additional variants. They call them LNGplus security of supply variants and consider them add-ons to the LNG security of supply variants that were previously published in the interim status on 6 July 2022.

The BNetzA hearing dated 22 September 2022 obliges the transmission system operators to perform a network simulation for complete replacement of Russian natural gas injections. Furthermore, they are not supposed to give consideration to Russian natural gas transits; instead, they are expected to take the supply of south-eastern Europe into account.

Based on the changed gas industry environment and the uncertainties of the supply of Russian natural gas, the transmission system operators assume that the demand for methane will change in favour of other energy sources. Nevertheless, methane will continue to play a key role in the energy supply in Germany and neighbouring countries in the future. However, the transmission system operators currently foresee that it will decline over time. In order to properly reflect the anticipated demand development in the network modelling, the transmission system operators assume a capacity decrease in each of the three additional LNGplus security of supply variants as outlined in chapter 3.

4.1 Input variables of the LNGplus security of supply variants

The following table provides an overview of the assumptions of the three additional modelling variants, highlighting the changes compared to the base variant and the LNG security of supply variant described in the interim report on 6 July 2022.

Table 2: Additional security of supply variants for LNGplus

Modelling variant	LNGplus variant A	LNGplus variant B	LNGplus variant C
Calculation	complete 2032		
Reference date (capacity provision)	31 December 2032		
Distribution system operator (internal orders)	Start value of 2022 internal orders; capacity reduction until 2032 related to the start value of internal orders according to chapter 3		
H-gas sources	LNG and western border crossing points completely replace Russian feed-in entries		
BCP/VIP	No exit capacity at border crossing points to Belgium, France, Denmark and the Netherlands; no Russian natural gas transits; supply of south-eastern Europe via border crossing points to the Czech Republic		
MBI deployment	No calculation		
L-H-gas convariant	No change in conversion planning		
Underground storage	No change		
Power plants	No change		
LNG	Full consideration of all requests pursuant to sections 38/39 of the GasNZV as of 30 September 2022	Priority, needs-based consideration of German LNG capacities in accordance with chapter 4.2	Priority, needs-based consideration of additional capacities at western border crossing points in accordance with chapter 4.2
Production	No change		
Industry	Capacity reduction according to chapter 3		
Biomethane and synthetic methane	No change		
Hydrogen	No change		

Source: Transmission system operators

The text below explains all input variables that are included in the considerations in deviation from the base variant and the LNG security of supply variants.

Distribution system operator

- Assumption of a capacity reduction compared to the starting value of the internal order of the year 2022 until the target year 2032 according to chapter 3.

Industry

- Assumption of a capacity reduction compared to the firm capacity as of 1 January 2022 according to chapter 3.

Further assumptions for distribution system operators, industry and power plants

- Additional reductions in consumption of natural gas are taken into account for the distribution system operator, industry and power plant sectors. They have already been identified in the hydrogen variant as substitution potential from methane to hydrogen by the transmission system operators (cf. Chapter 3).

LNG

- The transmission system operators will consider requested capacity reservations or capacity expansion claims for LNG facilities pursuant to sections 38/39 of the GasNZV in the modelling of the LNGplus security of supply variant by the deadline of 30 September 2022.
- The approach in the three modelling variants is described in chapter 4.2.

Gas exchange with neighbouring countries at the border crossing points and H-gas sources

- Increase of entry capacities at the western border crossing points to Belgium, Denmark, France and the Netherlands
- No exit capacities in the direction of Belgium, Denmark, France and the Netherlands
- No consideration of Russian natural gas transit flows in the three LNGplus security of supply variants
- Consideration of natural gas supply from South-East Europe with corresponding exit capacities to the Czech Republic in the three LNGplus security of supply variants

4.2 Modelling approach in the LNGplus security of supply variants

The three LNGplus security of supply variants consider a complete substitution of Russian gas supply to Germany.

In the Gas Network Development Plan 2022–2032, H-gas balances and H-gas source distributions are presented for all modelling variants along with the associated effects.

Depending on the LNG capacities to be applied, the additional H-gas injection capacities required at western entry points are examined as part of the modelling of the three LNGplus security of supply variants and presented in the Gas Network Development Plan 2022–2032.

The goal of the calculations for the Gas Network Development Plan 2022–2032 is to determine an efficient network expansion. Rapid provision of the required capacities also plays an essential role here. This applies particularly to the new LNG injections at the entry locations defined in the LNG Acceleration Act.

LNGplus security of supply variant A

The LNGplus variant A provides for full consideration of the capacity reservations or capacity expansion claims available to the transmission system operators in accordance with sections 38/39 of the GasNZV. As of 1 September 2022, they are around 110 GW and thus probably above the foreseeable capacity level required to cover the decreasing gas consumption. This could lead to an inflated network expansion.

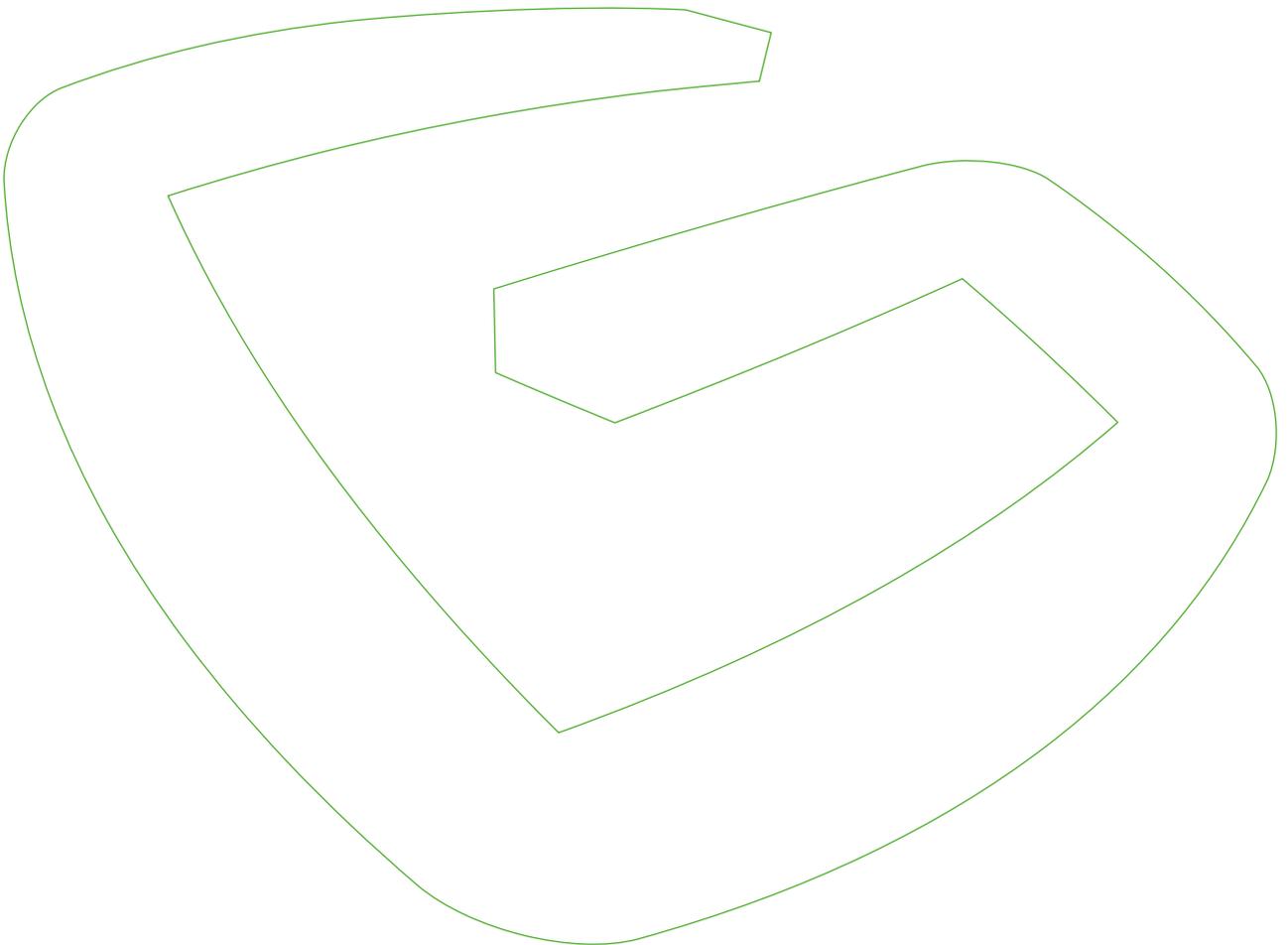
LNGplus security of supply variant B

In LNGplus variant B, demand-based entry capacities of German LNG terminals and Western European border crossing points are supposed to be considered in the modelling. The entry capacities of the German LNG plants are to be prioritised. The additional required capacities are supposed to be applied at the Western European border crossing points to Belgium, Denmark, France and the Netherlands.

LNGplus security of supply variant C

In LNGplus variant C, demand-based entry capacities of German LNG terminals and Western European border crossing points are supposed to be considered in the modelling. The entry capacities of the Western European border crossing points to Belgium, Denmark, France and the Netherlands are to be prioritised. The additional required capacities are supposed to be applied to German LNG terminals.

Glossary



Transmission system operators

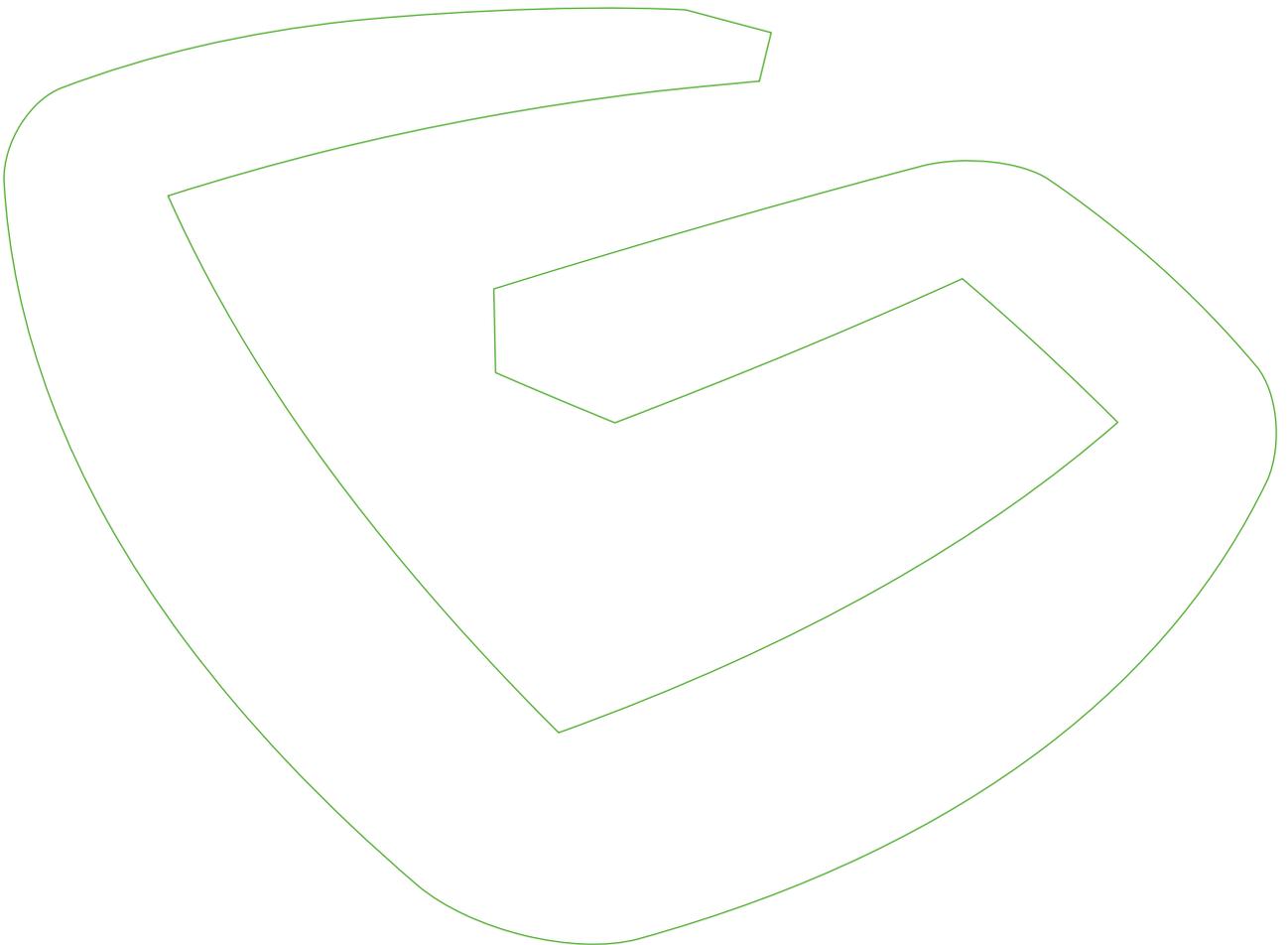
bayernets	bayernets GmbH
Ferngas	Ferngas Netzgesellschaft mbH
Fluxys	Fluxys TENP GmbH
Fluxys D	Fluxys Deutschland GmbH
GASCADE	GASCADE Gastransport GmbH
GRTD	GRTgaz Deutschland GmbH
GTG Nord	Gastransport Nord GmbH
GUD	Gasunie Deutschland Transport Services GmbH
LBTG	Lubmin-Brandov Gastransport GmbH
NGT	NEL Gastransport GmbH
Nowega	Nowega GmbH
OGE	Open Grid Europe GmbH
OGT	OPAL Gastransport GmbH & Co. KG
ONTRAS	ONTRAS Gastransport GmbH
terranets	terranets bw GmbH
Thyssengas	Thyssengas GmbH

Other abbreviations

BCP	Border crossing point
BDEW	Bundesverband der Energie- und Wasserwirtschaft e.V. – German Federal Association of Energy and Water Industries
BNetzA	Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen – German Federal Network Agency for Electricity, Gas, Telecommunication, Post and Railways
EnWG	Energiewirtschaftsgesetz – Energy Industry Act
FfE	Forschungsstelle für Energiewirtschaft – Research Institute for the Energy Economy
FSRU	LNG Floating Storage and Regasification Units
GWL	Gas pipeline Wilhelmshaven-Leer
GasNZV	Verordnung über den Zugang zu Gasversorgungsnetzen/Gasnetzzugangsverordnung – German Gas Network Access Regulation
GPRMS	Gas-Druckregel- und Messanlage – Gas pressure regulating and metering station
kWh	Kilowatt hour
LNG	Liquefied natural gas
LNGG	Gesetz zur Beschleunigung des Einsatzes verflüssigten Erdgases (LNG-Beschleunigungsgesetz) – Law to accelerate the use of liquefied natural gas (LNG Acceleration Act)

MBI	Market-based instruments
MW	Megawatt
NDP	Network Development Plan
NEL	Nordeuropäische Erdgas-Leitung – Northern European natural gas pipeline
TWh	Terawatt hours
TSO	(Gas) transmission system operators
WAL	Wilhelmshavener Anbindungsleitung – Wilhelmshaven pipeline link

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