Preventive Action Plan 2023
The Netherlands

Ministry of Economic Affairs and Climate Policy
Directorate-General for Climate and Energy
The Hague
The Netherlands

Contents

General

Introduction
In order to reinforce security of natural gas supply in the European Union, Regulation (EU) no. 2017/1938 of the European Parliament and the Council (hereinafter referred to as the Regulation) entered into force on 1 November 2017, replacing Regulation (EU) no. 994/2010 of 20 October 2010 concerning measures to safeguard security of gas supply.

The Regulation introduces measures that require Member States to ensure that action is undertaken to prevent potential disruptions to the gas supply and, if a disruption should occur, to mitigate the impact, especially for protected customers.

The Ministry of Economic Affairs and Climate Policy of the Netherlands has been appointed as the national Competent Authority in accordance with Article 3 of the Regulation. The Dutch Gas Act provides that the Minister can (partly) delegate certain tasks of the Competent Authority to the national gas Transmission System Operator (TSO) Gasunie Transport Services (GTS). This particularly relates to the preparation of the Risk Assessment and the Preventive Action Plan.

The Preventive Action Plan 2023 is an update of earlier Preventive Action Plans drafted in 2019 the current regulation and before that under Regulation (EU) no. 994/2010, contains new facts and figures and is brought in line with requirements set out in the Regulation as well as with recent decisions on gas production from the Groningen field. Where relevant, changes in comparison to previous Preventive Action Plans have occurred, the analyses have been updated.

Before adopting the Preventive Action Plan at national level, a draft of this Plan was shared with the Member States of the risk groups in which the Netherlands participates as well as with the European Commission, with a view to ensuring that this plan and the measures it contains are consistent with the Preventive Action Plan and the Emergency Plan of other Member States and that it complies with the Regulation. The Netherlands is participating in all the risk groups on North Sea gas supply (L-gas, Denmark and the merged risk groups United Kingdom and Norway), and two risk groups on eastern gas supply (Belarus and Baltic Sea). As required by Article 8(2) of the Regulation the Dutch National Regulatory Authority, the Authority for Consumers & Markets (ACM), as well as other Dutch stakeholders have also been consulted during the preparation of this Preventive Action Plan.

This Plan refers to units of gas in both volume (Nm^3) and energy (Wh), depending on the source of the data. Please note that 1 billion m^3 (bcm) of Groningen equivalent gas, roughly equals 10 TWh.

Foreseen changes
Security of supply was more or less self-evident in the Netherlands for a long time. There was sufficient supply of gas from imports and small fields and the Netherlands always had the Groningen field available. This situation has changed drastically recently due to the loss of Russian supply and the foreseen closure of the Groningen field by 1 October 2024[1]. This means that security of supply is no longer a given and that it is now time to reform security of supply and its assurance. It has therefore been decided to add relevant SoS elements to a specific new Dutch Gas Security of Supply Law. This law should also provide the legal basis to identify solidarity protected customers and deal with other gas security of supply elements. If the legislative procedure follows the planned procedure, it can be adopted and enter into force by 1 July 2025 at the earliest. These could lead to a revision of relevant chapters in this document.

[1] Insert reference to amendment of the Gas Act as proposed by EZK?

Contents and Outline
The primary focus of this Preventive Action Plan is on the risk for the entire gas system and builds on the 2023 Risk Assessment. In this Risk Assessment, the changed situation with regard to gas flows in Europe after the Russian invasion in Ukraine was taken into account as this has an impact on the supply of high calorific gas (H-gas) to the Netherlands. This H-gas is among others needed to supply low calorific gas (L-gas) to consumers in the Netherlands and neighbouring countries, given the decision of the Dutch Cabinet to end the gas production of the Groningen field by 1 October 2024 because of the earthquakes and their impact on the inhabitants of the Groningen area. The consequence of this decision is that there no natural G-gas sources in the Netherlands. All G/L- gas has to be produced by adding nitrogen to H-gas.

In line with articles 8 and 9 and Annex VI of the Regulation the content of this Preventive Action Plan was determined. As such the Plan contains:

(a) a description of the regional gas system of each of the risk groups in which the Netherlands participates, as well as a description of the Dutch gas system; = **chapter 1**

(b) the results of the national risk assessment of well as the common risk assessments of the risk groups in which the Netherlands participates as laid down in Article 7; **= chapter 2**

(c) the measures, volumes, capacities and the timing needed to fulfil the infrastructure and supply standards, as laid down in Articles 5 and 6, including where applicable, the extent to which demand-side measures can sufficiently compensate, in a timely manner, for a supply disruption as referred to in Article 5(1) and 5(2); **= chapter 3**

(d) the compliance with the supply standard and a description of the Dutch supply standard, including the definition of protected customers and their gas consumption as referred to in article 9(1(b)) and 9(1(c)); = **chapter 4**

(e) obligations imposed on natural gas undertakings and other relevant bodies, including for the safe operation of the gas system, as referred to in article 9(1(d)); **= chapter 5**

(f) the other preventive measures, such as those relating to the need to enhance interconnections between neighbouring Member States and the possibility to diversify gas routes and sources of supply, if appropriate, to address the risks identified in order to maintain gas supply to all customers as far as possible, as referred to in article 9(1e)); = **chapter 6**

(g) information on specific measures to reduce the demand for gas from the Groningen field as well as on measures to improve interconnections with other Member States as referred to in article 9(1(j)); **= chapter 7**

(h) information on all public service obligations that relate to security of gas supply as referred to in article 9(1(k)); **= chapter 8**

(i) the stakeholder consultation as laid down in Article 8(2); = **chapter 9**

(j) the general mechanisms to be used for cooperation with other Member States for preparing and implementing joint Preventive Action Plans and joint Emergency Plans, as referred to in Article 9(1(i)), where applicable; = **chapter 10**

Chapter 11 contains part of the regional chapter for the Common L-gas risk group which is coordinated by the Netherlands.

Annex 1 provides an overview of European and national regulations related to security of supply aspects.

Annex 2 provides the regional chapters for the other risk groups in which the Netherlands participates, as referred to in article 8(3)

Information on the economic impact, effectiveness and efficiency of the measures contained in the plan (article 9(1(f)), a description of the effects of the measures contained in the plan on the functioning of the internal energy market as well as national markets (article 9(1(g)) and a description of the impact of the measures on the environment and on customers (article 9(1(h)), is included where appropriate.

1. Description of the gas system

This chapter discusses the relevant national and regional circumstances, as prescribed in Annex VI. The paragraphs include information about the role of gas in the energy mix, the role of gas in electricity production and for heating purposes as well as details on national production, storage facilities, market size and actual flows. Furthermore the network configuration, the safety of the network and the potential for physical gas flows in both directions are detailed.

1.1. Description of the regional gas systems (risk groups)

1.1.1 North Sea gas supply risk groups

1.1.1.1 Norway and United Kingdom

Following Brexit the Norway and United Kingdom risk groups have been merged with France as coordinator. Members of the group are Belgium, Denmark, Germany, Ireland, Spain, France, Italy, Luxembourg, Netherlands, Portugal and Sweden.

1.1.1.2 Low-calorific gas

Members of the L-gas risk group are Belgium, France, Germany and the Netherlands.
I Netherlands Ministry of Economic Affairs and Climate Policy coordinates the L-gas risk group.

Gas produced from the Dutch Groningen field is called G-gas. Low calorific gas (L-gas) is a combination of gas originating from the Groningen field, blended with high calorific gas (H-gas), or H-gas blended with nitrogen. L-gas is produced in the Netherlands and to a lesser extent in Germany. L-gas is consumed in Germany, Belgium, France and the Netherlands. The current market demand for all these L-gas consuming countries is shown in the overview below (Figure 1, based on 2022 data).

Figure 1

The Netherlands is the largest consumer and main supplier of L-gas. Germany, the second largest market, does also have L-gas production but this is insufficient to meet its domestic demand. Demand in Belgium and France is almost entirely supplied by imports from the Netherlands (small quality conversion facilities are available in Belgium and Germany).

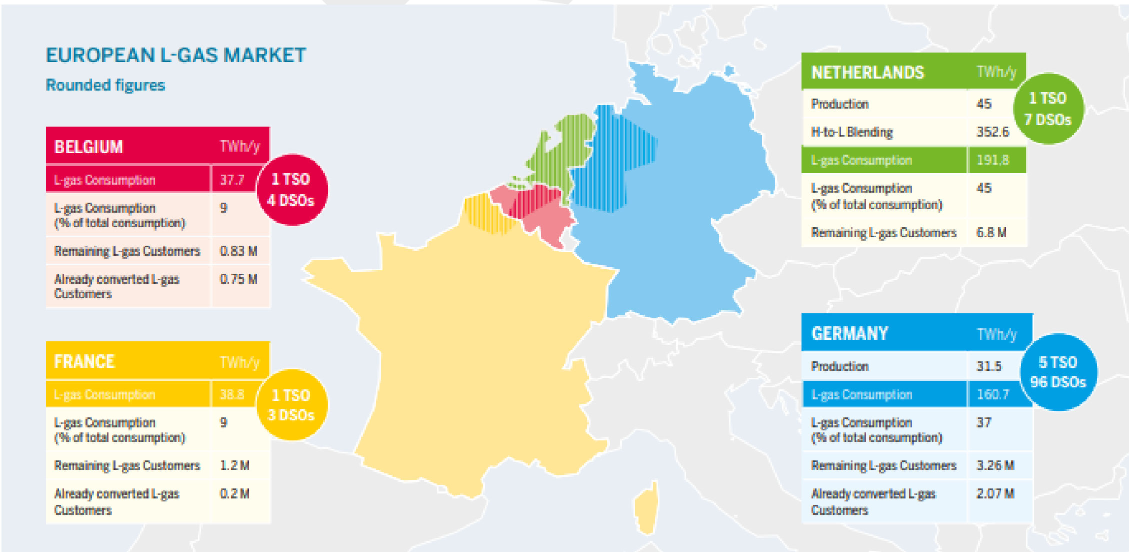

Figure 1: Overview of the L-gas market. Source: Gas Regional Investment Plan North West 2022

Historically, the main production of L-gas was located in the Netherlands. As of October 1 2023, the gas production from the Groningen field has come to a stop, marking a historic moment. In consultation with the members of the L-gas risk group, L-gas demand has been brought down. Continued efforts to reduce L-gas down are set upon for the upcoming years.

Figure 2 provides an overview of all the underground gas storage facilities in the L-gas gas region. Most of the storage capacity is situated in the Netherlands and Germany. The storages at Epe are located on German territory, but these facilities are also connected to the Dutch gas transmission network. Belgium does not have L-gas storage capacity. In addition to the technical capacities, the figure also shows the reduced withdrawal capacity at a 30% filling level, as required by the regulation.

Facility	Country	Storage capacity (TWh)	Maximum withdrawal (GWh/d)	
			100% full	30% full
EnergyStock	NL	3	252	252
Norg (Langelo)	NL	59	742	698
Alkmaar	NL	5	357	357
Epe Nuon	NL/DE	3	117	117
Epe Eneco	NL	1	95	41
Epe RWE Gas Storage West GmbH	NL/DE	3	119	119
Peakshaver	NL	1	199	199
Grijpskerk	NL	12	620	0
RWE GSW Epe L-gas	DE	1.7	99	99
EWE zone L	DE	2.3	118	0
Uniper ES Epe L-gas	DE	4.3	120	0
Empelde	DE	2.3	73	73
Gournay	FR	13	215	215
Total		110.6	3126	2170

Figure 2: L-gas underground gas storage facilities, source data supplied by Member States

Physically, the L-gas networks are separated from the H-gas networks, as L-gas and H-gas differ in gas quality. The two separated networks are connected through blending stations in the Netherlands and in Belgium. These can blend the different gasses and/or use nitrogen to produce the required Wobbe-index for low calorific gas.
Figure 3 gives an overview of all the quality conversion facilities in the L-gas region.

Facility	Country	Design	Status
Ommen	NL	Baseload	Operational
Wieringermeer	NL	Baseload	Operational
Pernis	NL	Back-up	Operational
Zuidbroek I	NL	Baseload	Operational
Heiligerlee (cavern)	NL	Back-up	Operational
Zuidbroek II	NL	Baseload	Operational
Rehden	DE	Peak	Operational
Broichweiden	DE	Peak	Planned
Loenhout	BE	Peak	Mothballed
Lillo	BE	Peak	Operational

Figure 3: Quality conversion facilities in the L-gas region, source data supplied by Member States

Gas fired power generation traditionally played an important role in the supply of electricity in the Netherlands whereby in the past decade a shift has been made from L-gas fired power generation to more H-gas fired power generation. However with more investment in renewable energy, the role of gas fired generation is transitioning towards a source of flexibility instead of baseload generation.

There is however no specific information available about the use of low calorific gas in the power sector, neither for the Netherlands, nor for Germany. This is to a large extent due to the large number of combined heat and power installations in for instance the horticultural sector.

The role of L-gas for electricity generation in France is negligible. Since 2014, there are no more power plants connected to the L-gas network in Belgium[2].

1.1.1.3 Denmark

Members of the Denmark risk group are Denmark, Germany, Luxembourg, Netherlands, Sweden. The group is coordinated by Denmark.

1.1.2 Eastern gas supply risk groups

1.1.2.1 Belarus

Members of the Belarus risk group are Belgium, Czech Republic, Germany, Estonia, Latvia, Lithuania, Luxembourg, Netherlands, Poland and Slovakia. The group is coordinated by Poland.

1.1.2.2 Baltic Sea

Members of the Baltic Sea risk group are Belgium, Czech Republic, Denmark, Germany, France, Luxembourg, Netherlands, Austria, Slovakia and Sweden. The group is coordinated by Germany.

1.2 Description of the Dutch gas system

1.2.1 Configuration of national grid

The total length of the Dutch national grid is 135,000 km, from which 11,000 km is high pressure pipelines, operated by GTS. The high pressure gas network is shown on the map below, in figure 4. The Dutch high pressure network is directly connected to Belgium, Germany, Norway and the United Kingdom. Via 1,000 gas custody transfer stations gas is distributed to the Dutch domestic market, such as large industries, power plants and local distribution companies. The Dutch high pressure network consists of two systems for H- and L-gas respectively. These systems are connected with each other via blending stations where H-gas is converted to L-gas using nitrogen (quality conversion), the conversion capacity is limited by the available N2 capacity (see chapter 1.2.6). The conversion of L-gas to H-gas (reverse quality

[2] Data for role of gas in electricity generation is incomplete. France provided a figure for cogeneration, Belgium provided figures of zero while German figures are missing.

conversion) can only be carried out within the strict quality boundaries of H-gas, in practice there is only limited reverse quality capacity available.

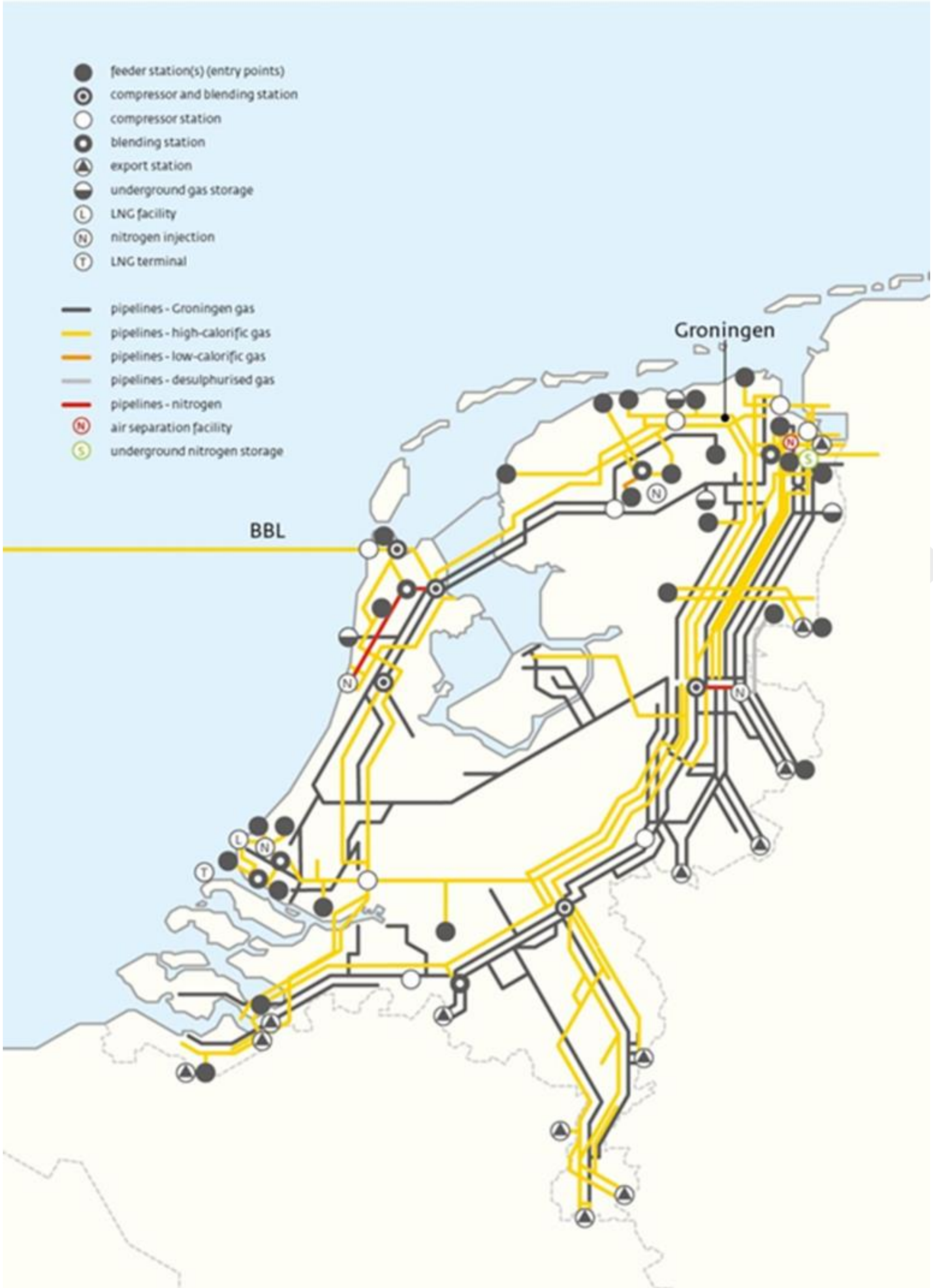

Figure 4: The high pressure gas network in the Netherlands. Source GTS

1.2.2 Configuration of regional grids

In the Netherlands there is a total of 124,000 km of gas pipelines in the regional grids.[3] At the time of writing there were 6 local distribution companies (DSOs) for gas in the Netherlands. The DSOs only transport L-gas. On the map, Figure 5, the service areas of the different distribution companies are displayed:

[3] Netbeheer Nederland, http://www.netbeheernederland.nl/branchegegevens/infrastructuur/

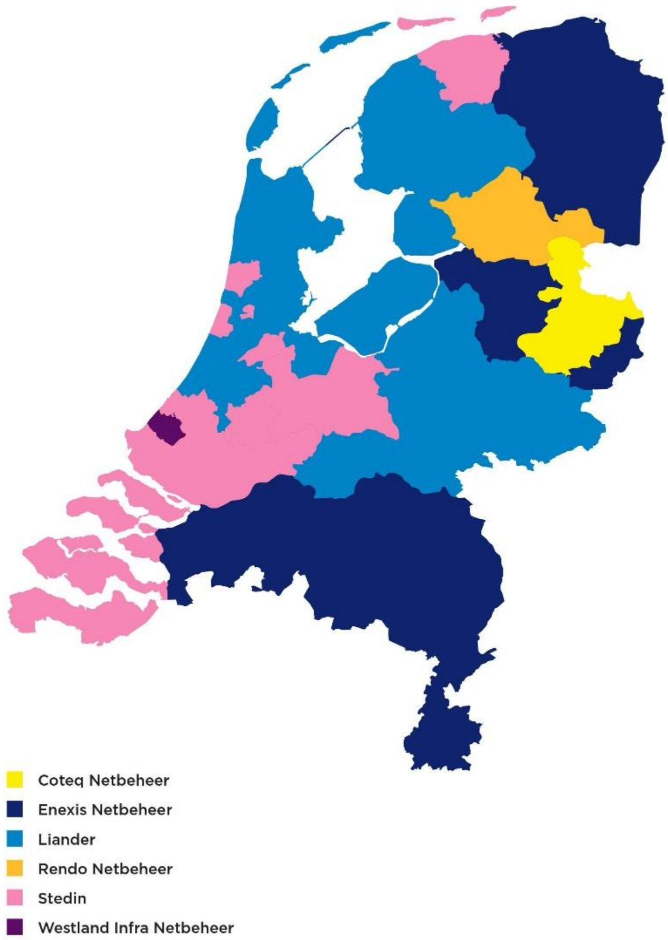

Figure 5: Service areas of the Dutch Local Distribution Companies for L-Gas in 2022. Source: Netbeheer Nederland

1.2.3 Dutch gas market size

Gas is an important energy carrier in the Netherlands. A good illustration of the size of the national Dutch gas demand is the fact that peak4 demand for gas is almost 10 times as large as the capacity of peak demand of electricity. The Dutch network of gas pipelines, storage facilities and an LNG terminal can supply 10 times as much energy to the domestic market than the existing Dutch electricity grid. This is illustrated in Figure 6, where the gas usage is compared to the electricity usage.

[4] In this report ¨peak¨ is described as the scenario where temperature is -17 degree, this is compliant with the Dutch regulation (Besluit leveringszekerheid)

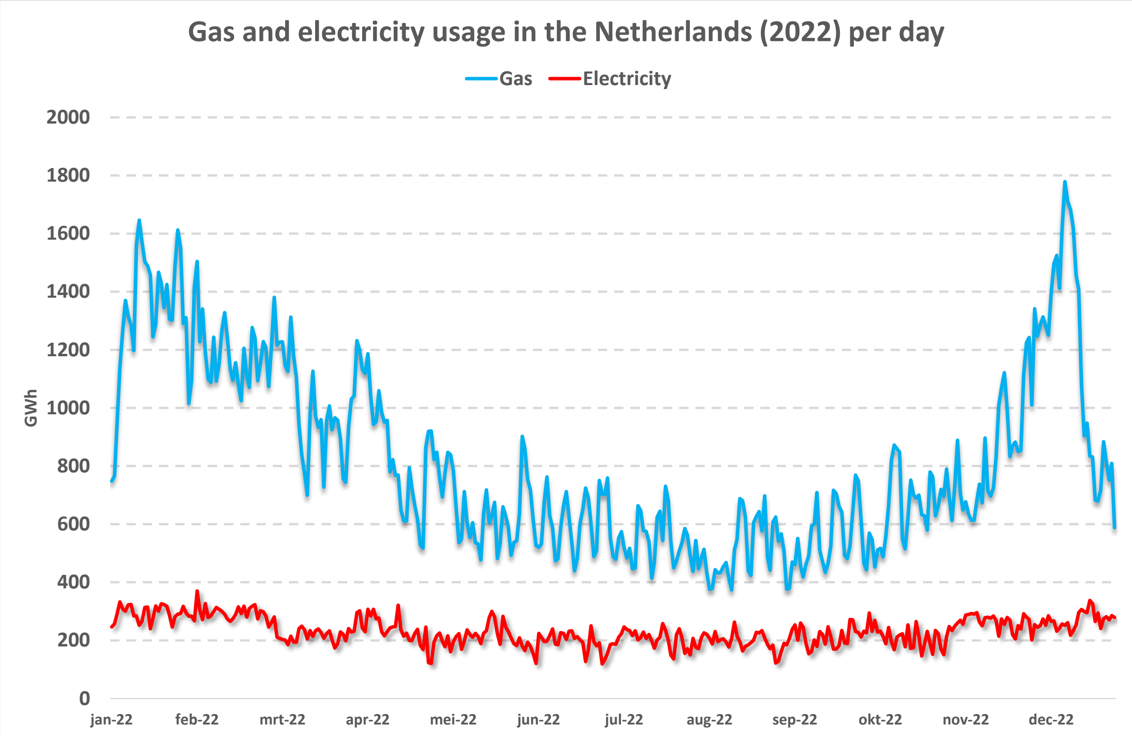

Figure 6: Gas and electricity usage in the Netherlands in 2022. Source: GTS, TenneT

In 2022 GTS transported about 784 TWh. The annual Dutch gas consumption in 2022 of 297 TWh was less than half of the total volume of gas that is transported through the country. This is due to export of indigenous gas and the role of the Netherlands as a transit country. Consumption was also around 80 TWh less than the 2019-2021 average. Depending on climatic conditions, the share of L-gas in the domestic gas demand varies from year to year. In 2022, the L-gas demand was 177 TWh, roughly 60% of the total gas demand.

	2020		2021		2022	
	Yearly	Peak	Yearly	Peak	Yearly	Peak
	TWh	GWh/d	TWh	GWh/d	TWh	GWh/d
Build environment	100	2262	113	2225	85	2213
Industry and power generation	118	796	120	836	92	745
Total	218	3058	233	3061	177	2958

Figure 7: Historic L-gas demand in the Netherlands. Source: GTS

	2020		2021		2022	
	Yearly	Peak	Yearly	Peak	Yearly	Peak
	TWh	GWh/d	TWh	GWh/d	TWh	GWh/d
Industry and power generation	167	604	150	727	122	601

Figure 8: Historic H-gas demand in the Netherlands. Source: GTS

On average the national gas demand slightly decreases, domestic production is in strong decline (see paragraph 1.2.5.2). As a result more volumes have to be imported. Infrastructure has been and will be adjusted to facilitate this.

1.2.4 Sources of gas

1.2.4.1 Gas flows through the Netherlands

The sources of the gas that flows through the Netherlands are indigenous European Union production, LNG and Norwegian gas. Until recently, Russian supply came via Germany to the Netherlands. The figures below show the gas flow from and to neighbouring countries and the yearly utilization rates of the infrastructure that were observed in 2022.

Actual cross-border flows in TWh in 2022				
		L-gas	H-gas	Total
Belgium				
	To Belgium	58	18	76
	From Belgium	0	145	145
Germany				
	To Germany	100	159	260
	From Germany	0	28	28
Norway				
	To Norway	0	0	0
	From Norway	0	129	129
United Kingdom				
	To United Kingdom	0	1	1
	From United Kingdom	0	40	40
Gate & EET[5]				
	To Gate & EET	0	0	0
	From Gate & EET	0	176	176

Figure 9: Actual cross-border flows in 2022. Source: GTS[6]

Change in direction of gas flows in 2022
The decrease of Russian gas supply has caused a reversal of international gas flows. As a result, gas flows are increasingly running from west to east and from south to north across Europe as LNG is partly replacing Russian gas supplies. This also encompasses additional gas flows from the UK via the BBL interconnector and via Zelzate towards the Netherlands.

Drop in demand
Gas shortages led to very high energy prices which have caused a drop in gas demand. Gas demand in the Netherlands for industries, power stations, and regional transmission system operators was down by approximately 20-25% in total on a year on year basis (dropped from on average 371 TWh to 297 TWh). Transport volumes were low because of the higher-than-normal temperatures, the high gas prices, and the conversion of the L-gas market outside the Netherlands. The drop in demand on the consumer side is not reflected in transport figures on a one-on-one basis because transport volumes to storage facilities and exports to Germany were up. Exports to Germany peaked in the second half of 2022 after Russian supply to North West Europe ceased completely.

Negative impact on demand/supply balance (TWh) 2022 compared to average 2019-2021	
Decrease of import from Norway	-88
Decrease of import from Germany	-117
Increase of export to Germany	-166
	-371
Positive impact on demand/supply balance (TWh)	

[5] EemsEnergyTerminal (EET)
[6] The actual flows do not include the flows related to cross-border connections to German storages.

Entry GATE	+88
Import from Belgium (Zelzate)	+88
Entry EET*	+11
Import from UK via BBL	+39
	226
* EET started sept. 2022, Expectation on yearly basis will be around 80 TWh	

Figure 10: Impact of supply demand balance due to the gas crisis. Source: GTS

1.2.4.2 Key infrastructure relevant for the security of gas supply

Identification of key infrastructure is based on the relative size and share in the supply mix. The following infrastructure is considered to be of great importance to the security of gas supply:

- The gas import station at Emden for importing Norwegian gas, being the largest import terminal and the largest single infrastructure in the Netherlands. Furthermore the import facilities at Zelzate (Belgium) and via BBL from the UK are of great importance.
- The LNG terminals in Rotterdam (GATE) and Eemshaven (EET) are key infrastructures for the import of LNG.
- The Dutch gas production from on-shore and off-shore gas fields.
- The underground seasonal gas storages at Norg, Bergermeer, Grijpskerk and Alkmaar. Norg is the single largest infrastructure in the L-gas region and an important source of flexibility for the protected customers in the Netherlands.
- The blending stations at Wieringermeer, Ommen and Zuidbroek, being the sources of quality conversion to supply the protected customers in the Netherlands.

All these facilities are key infrastructure for security of supply and necessary to overcome the lack of Russian gas and the resulting flow patterns and to facilitate the phase out of the Groningen field.
Due to their importance for the security of supply, the effect of disruption of these facilities is investigated as part of the national risk assessment.
In addition to the mentioned facilities, the compressor stations could also be considered key infrastructures that enable gas transmission in the Netherlands. It should be noted that all of these stations are designed with redundant capacity (according to N+1 philosophy).

1.2.4.3 TTF, the Dutch gas hub

In essence the Dutch gas hub, the TTF (Title Transfer Facility), is a virtual point in the network of GTS where the ownership of gas (the title) is transferred from shipper A (representing the selling party) to shipper B (representing the buying party). The major virtual gas trading platforms in the European Union consider the TTF market area as price setting area, supporting among others gas spot and forward/futures trade. Trade on the TTF continued to grow steadily from its start in 2003 till March 2022. Although volume traded decreased in April 2022, TTF maintains its leading position in Europe with a market share above 75%. In December 2022 163 traders registered with GTS were actively trading, compared to 147 in December 2017. The volume of gas traded on the TTF in 2022 was 38,356 TWh, compared to 20,962 TWh in 2017.
Although there is a clear physical distinction between L-gas and H-gas there is no need for shippers to be in balance in both qualities separately. Gas on the TTF is traded in energy units (kWh) and not in a specific quality. The entry points and exit points of the GTS system have a designated quality range labelled L-gas or H-gas. Operators of gas production grids and storages have to comply with this quality range when feeding into the system and GTS will arrange for the right quality for the exits.

Figure 11 shows the growth in the number of parties on the TTF, the development in traded volumes and the net volume between calendar year 2017 and calendar year 2022. The very high liquidity of TTF helps to lower costs for consumers and provides confidence for suppliers and investors. TTF showed great resilience when energy prices were very volatile and high in

2022. On average TTF Day-ahead End of Day prices were 123.0 €/MWh in 2022 (min 23.85 €/MWh, max 307.7 €/MWh).

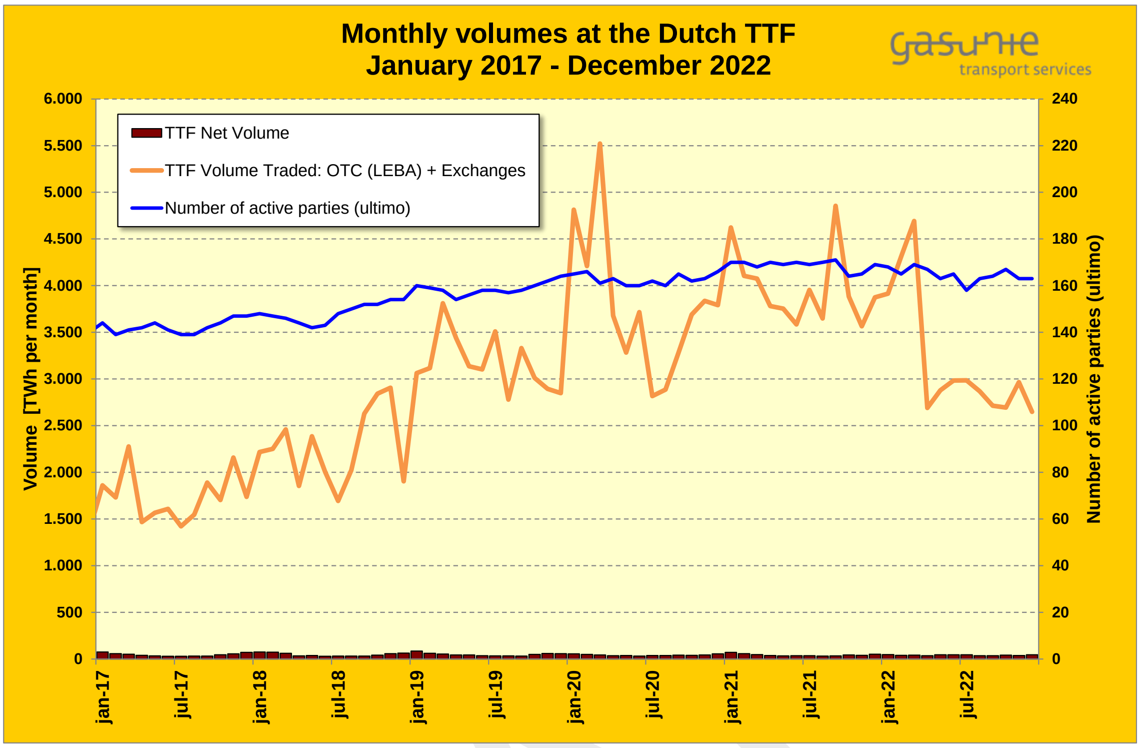

Figure 11: Monthly volumes traded at the TTF 2017-2022.

1.2.5 Gas production in the Netherlands

1.2.5.1 History of production

In 1959 one of the world's largest gas fields was discovered in the Netherlands, the Groningen gas field, located in Groningen province in the northeastern part of the Netherlands. The Groningen gas field is owned and operated by the Nederlandse Aardolie Maatschappij BV (NAM), a joint venture between Royal Dutch Shell and ExxonMobil with each company owning a 50% share. The Groningen field produces gas that falls within the L-gas Wobbe range.

The Groningen field has been producing natural gas for more than 60 years. It had an estimated total production volume of 27,300 TWh of which ~77% is produced. The government of the Netherlands announced in March 2018 its decision to terminate natural gas production from the Groningen field as soon as possible, in order to guarantee safety in the area of Groningen against the risk of earthquakes resulting from natural gas production. From the start of the GY 2022/23, the Groningen field is only needed in cases of extremely low temperatures, unexpected (out of spec) gas qualities, transportation limitations, a shortage of H-gas and in case of a severe disruption elsewhere in the system. To be able to guarantee production in those circumstances the field will operate on minimum flow during the entire gas year 2022/2023 to ensure that additional production is possible when necessary[7].

To achieve the goal of terminating production from the Groningen field as soon as possible, measures were taken. Some of them are already executed, like enabling the gas storage Norg to be filled with pseudo G-gas, exporting pseudo G-gas via Oude Statenzijl to Germany and GTS buying extra nitrogen to extend the efficiency of the existing nitrogen conversion facility Wieringermeer. Some of the measures are not yet operational, such as the realisation of the new nitrogen plant Zuidbroek II. This plant is expected to be operational in gas year 2023/2024.[8] Furthermore, the legislative framework has been adapted in order to limit future L-gas consumption. The Dutch Gas Act has already been adapted to prevent future L-gas

[7] L-Gas Market Conversion Review – Winter briefing 2023
[8] The exact date of commissioning will be communicated via the official channels (REMIT messages)

consumption growth by prohibiting the connection of newly built houses and buildings to the gas grid. The new legislation concerning the conversion of industrial customers (adopted on June 20, 2020) specifies that industrial customers that consumed more than 100 million cubic meters of L-gas annually for at least two years in GY 2016/17, 2017/18 or 2019/20 are not allowed to use L-gas anymore after October 2022. Based on this, nine large industrial customers are and will be converted from L-gas to H-gas.

Possibilities to accelerate the market conversion in Germany, Belgium and France have also been investigated. By gas year 2029/30, exports of L-gas to these countries combined will be reduced to nearly zero. Notably, the optimisation of the conversion planning in Belgium allowed for higher conversions in the gas years 2022/23 and 2023/24, ensuring the reduction of Belgium's L-gas imports from the Netherlands to 0 by gas year 2024/25 instead of gas year 2029/30.

In addition to the Groningen field, the Netherlands extracts gas from smaller fields since 1970. Since then, over 495 small gas fields have already been discovered in the Netherlands, of which 221 are producing at the time of writing. The smaller fields predominantly produce H-gas.

1.2.5.2. Forecasted indigenous production

The Dutch Ministry of Economic Affairs and Climate Policy has announced in a decision dated 31 March 2023 that it aims to close down the Groningen field in 2023 or 2024 at the latest. The draft decision for the allowed production from the Groningen field for gas year 2023/2024 was published in June 2023[9]. In this, the intention was stated to stop production from the Groningen field in gas year 2023/24, permitting only production in very exceptional circumstances.

Below, the expected production from Dutch small fields until at least 2035 is provided:

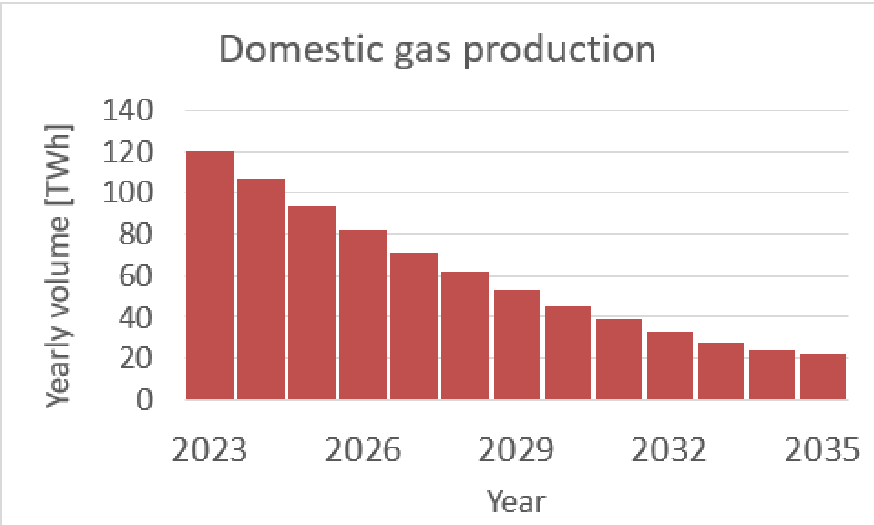

Figure 12: Estimated production of Dutch small fields. Source: GTS, own analysis based on information provided by gas producers.

1.2.6 Quality conversion facilities

In addition to the G-gas production from the Groningen field, GTS has the capability to perform quality conversion. Currently, GTS operates five facilities to dilute H-gas with nitrogen to make L-gas[10]. The combined nitrogen production capacity is at the moment 707,000 m^3/h. Preparation for a sixth facility (Zuidbroek II) is currently under way, adding an extra capacity of 180.000 m^3/h to ensure that enough L-gas can be produced when production from the Groningen field is stopped.

[9] https://open.overheid.nl/documenten/ronl-60499260c88debc6c1e27f708640b9f48afe714b/pdf

[10] One cubic meter of nitrogen can produce between 7 and 8 cubic meters of L-gas, depending on the Wobbe index of the H-gas source.

Facility		Status	Capacity N2 (m^3/h)	Capacity pseudo-G* (GWh/d)
Ommen	Baseload	Operational	146,000	291
Wieringermeer	Baseload	Operational	295,000	588
Zuidbroek I	Baseload	Operational	16,000	32
Pernis	Back-up	Operational	60,000	120
Heiligerlee (cavern)	Back-up	Operational	190,000	379
Zuidbroek II	Baseload	Operational	180,000	359

* Approximation, capacity depends on Wobbe value of H-gas.

Figure 13: Quality conversion facilities. Source GTS

1.2.7 Gas storage in the Netherlands

Indigenous gas production played an important role in compensating for fluctuations in North West European market demand. The decline in gas production in North West Europe is causing a decrease in the availability of this natural flexibility. Storage facilities are playing an increasingly greater part in order to compensate for this declining production flexibility. To this end, it is important to make a distinction between storage facilities that can provide supplies for summer-winter variations and those that can absorb relatively short peaks in the gas demand. Depleted gas fields (DGF) are extremely suitable for absorbing seasonal fluctuations or to satisfy peak demand. Salt caverns (SC) are often used for shorter peaks, but can, when having a large storage volume, also be used to balance out seasonal supply and demand.

In Figure 14, the storages in the Netherlandsare listed. The storage operators provided the 100% data publicly to GIE and the 30% data to GTS.[11]

Facility/ Location	Type	Operator	Working gas TWh	Withdrawal 100% GWh/day	Withdrawal 30% GWh/day	Injection GWh/day
EnergyStock	SC	EnergyStock BV	3	252	252	310
Grijpskerk[12]	DGF	NAM	12	620	0	154
Norg	DGF	NAM	59	742	689	281[13]
Alkmaar	DGF	TAQA Energy BV	5	357	357	40
Bergermeer	DGF	TAQA Energy BV	48	469	446	448

Figure 14: Storage facilities in the Netherlands. Source: https://agsi.gie.eu/#/ (Norg, Alkmaar, Grijpskerk and EnergyStock store L-gas, Bergermeer stores H-gas).

Besides access to storages located on Dutch territory, the Dutch gas network has access to German storage facilities. The figure below shows the capacities at Interconnection Points connecting these storages and the GTS grid.

The L-gas cluster is dedicated and only suitable for the Dutch grid. The H-gas storages in Germany are mostly connected to the Dutch and German grid and serve the TTF market area as well as the market area.

[11] Public storage data can be found at https://agsi.gie.eu/#/

[12] After approval by the Dutch Ministry of Economic Affairs and Climate Policy, NAM has decided on April 1, 2022 to convert the storage from a H-gas storage to a L-gas storage.

[13] Since storage Norg is filled with pseudo G-gas and this gas cannot be transported via the Groningen production system, this is the injection capacity of Norg at the connection point with the GTS-network.

Location	NWP	Entry capacity (GWh/day)	Exit capacity (GWh/day)
Cluster Enschede/Epe storages (L)	Cluster	331	211
Cluster Oude Statenzijl storages (H)	Cluster	840	386

Figure 15: Capacities at Interconnection Points connecting German storages to the GTS grid. Source: GTS

The storages connected to the GTS network have two crucial functions from a security of supply-perspective. First, storages are necessary to ensure that LNG imports in summer can be stored for usage in the winter. Second, in the winter, storages are needed to provide peak supply and the winter volume.

1.2.8 LNG in the Netherlands

On the Maasvlakte in Rotterdam, Gate terminal has built the first H-gas LNG import terminal in the Netherlands, which is operational since 2011. The terminal consists of three storage tanks, two jetties, small scale LNG, and a process area where the LNG is being regassified. Annual throughput capacity has been increased from 130 TWh to 166 TWh in the summer of 2022, and will be further increased to approximately 220 TWh in the future, by adding an additional tank

In response to gas supply insecurities and the EU requirement to be less dependent on Russian gas, Gasunie (in cooperation with the Dutch government) has contracted a new floating LNG terminal which is mourned in the Eemshaven area, called the EemsEnergyTerminal (EET). The terminal consists of two Floating Storage Regasification Units. EET's ambition is to be able to handle 80-90 TWh of natural gas before the end of 2023, and then to grow to 90-100 TWh.[14] The current throughput capacity of the terminal is around 50-60 TWh on annual basis. The terminal has been operational since 15 September 2022 and is operating at higher capacity since March 2023. The expansion of Gate terminal and the development of EET has resulted in an increase of the national LNG import capacity to around 250 TWh annually.

1.2.9 Role of gas in power generation

Gas fired power generation plays an important role in the supply of electricity in the Netherlands. This is illustrated in Figure 16 & Figure 17, which show the installed power generation capacities and dispatch of the various sources.[15] Between 2015 and 2020 the market share of gas fired generation increased from 40% to almost 60% of domestic production, primarily due to a reduction in coal fired generation. Since 2020 the dispatch of gas fired power stations has decreased again to approximately the 2015 level. This is primarily driven by the uptake of renewables and the recent increase in gas prices. Since 2015, gas fired installed capacity remained rather stable, however some of the capacity has been ¨mothballed¨. With the projected increase of variable solar and wind generation, gas fired power stations are expected to become increasingly a source of flexibility.

[14] https://www.eemsenergyterminal.nl/en/latest-news/eemsenergyterminal-at-full-production
[15] Net electricity production taken from CBS (https://opendata.cbs.nl/#/CBS/nl/dataset/84575NED/table) Generation capacities taken from KEV 2022 (https://www.pbl.nl/publicaties/klimaat-en-energieverkenning-2022)

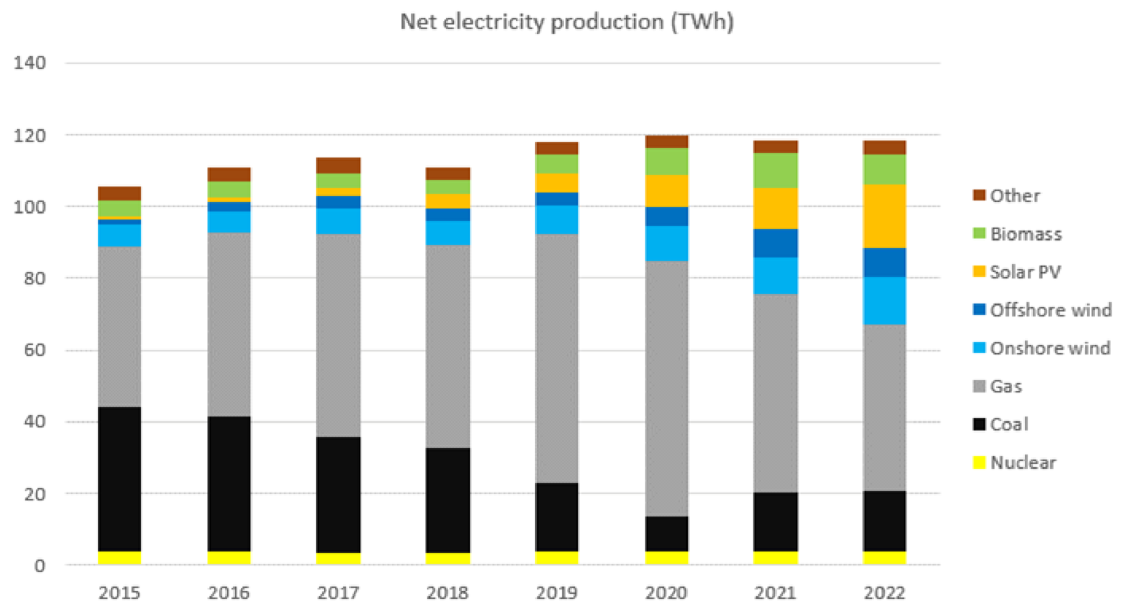

Figure 16: Net electricity production (TWh).

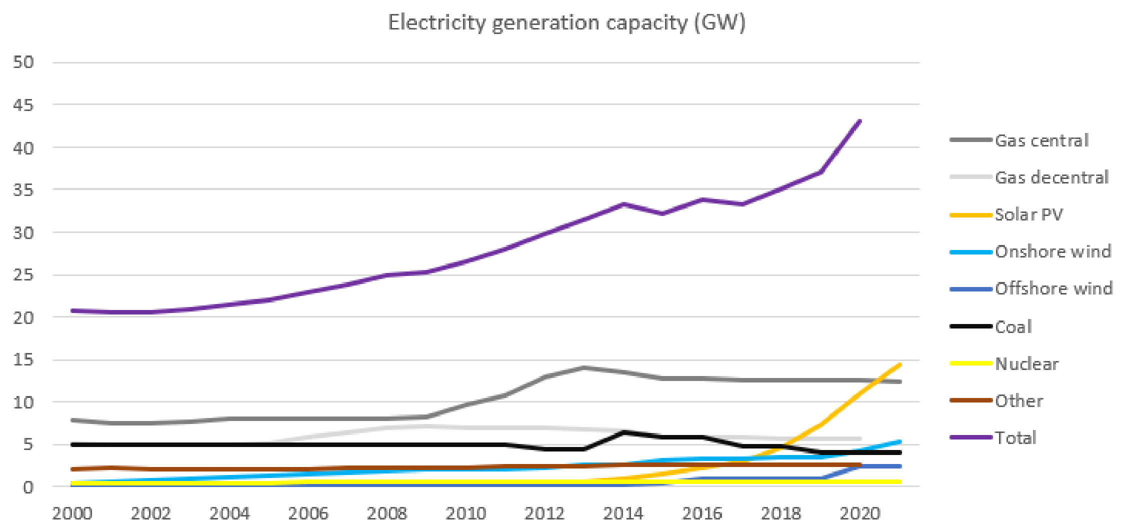

Figure 17: Electricity generation capacity (GW).

2. Summary of the common and national risk assessment

2.1 Common risk assessments

2.1.1 North Sea gas supply risk groups

2.1.1.1 Norway and United Kingdom

The conclusion from the risk assessment is that the reduction in Russian gas imports to the European Union has reduced the flexibility for gas supply in the risk group. Nevertheless, it is still possible to cover gas demand in the risk group in case of disruption of a major segment of infrastructure supplying Norwegian gas. Lower consumption of gas and new gas infrastructures should be instrumental in increasing flexibility in the group. No infrastructural issues were identified based on the N-1 calculation for the group.

2.1.1.2 Low-calorific gas

The analysis presented in L-gas Risk Assessment demonstrates that the L-gas supplies may be considered reliable for the foreseeable future. L-gas produced in the Netherlands is the largest source of L-gas in L-gas region. Therefore, the situation in the Netherlands is most relevant for this risk assessment. There have been recent political decisions in the Netherlands that gas extraction from the Groningen gas field will be reduced (see 1.2.5.2.). However, the effect of decreased L-gas production from the Groningen field on security of gas supply in other (neighboring) EU Member States has always been part of the assessment on the allowed production from the Groningen field and will be part of future assessments on the allowed production.

Calculations of the N-1 formula show that the L-gas transmission system meets the requirement of the infrastructure standard for the entire L-gas region (see also chapter 3). As for individual countries, in a scenario which combines the failure of major infrastructure with peak demand, France and Belgium have an N-1 ratio below the infrastructure standard. However, based on historical data, the probability of such a scenario (a disruption in combination with low temperature) is very low and the N-1 percentage is slightly increasing due to declining gas demand. Disruption scenarios for demand situations such as the two coldest weeks of the last 20 years and peak demand as well as the disruption of UGS Norg show these can be handled in the L-gas area.

More in detail the following scenarios have been assessed (elaborated further in chapter 3):

- Disruption of UGS Norg for a two week period and on a peak day (a day with an effective temperature of minus 17 ^{0}C).
- Disruption of the blending station Wieringermeer for a two week period and on a peak day.
- Disruption of the largest cluster of the Groningen field for a two week period and on a peak day.

Furthermore, there have been no particular political, social, technological and economic risks identified. The seismic activity in the Dutch Groningen region has had effects on political decisions to reduce the L-gas production from the Groningen field in the coming decade. However, as has been stated earlier, potential effects on the security of supply in Belgium, France and Germany shall and will be part of assessments on the allowed production from the Groningen field, as has been the case in earlier assessments.

2.1.1.3 Denmark

Risk Group “Denmark” consists of six interconnected countries: Denmark, Sweden, Germany, Poland, Luxembourg and The Netherlands. Even though there is some gas-production in these Member States, primarily in the Netherlands and Denmark, the Risk Group is as the major part of the European Union, extremely dependent on gas imports. Historically this import has come primarily from Russia.
The common risk assessment is made with calculations on scenarios for both a technical and a volume incident:

- The calculation of the technical incident is based on the infrastructure standard (N-1). The result of the calculation for the risk group is 196.3%, being well beyond the required 100%.
- The volume incident calculation is based on a S-1 incident; being a complete halt of the largest supply source to the region – Russia). The conclusions of this assessment shows a need for regional demand reduction of at least 5-15% (compared to the Commission's Joint Research Center' expectations) to avoid curtailment in the MS of the group. The range depends on if the gas storages must be emptied to maintain security of supply in the short term, or must be kept at a certain level to secure the long-term security of supply.
- Furthermore, the assessment also concludes that there is a need for cooperation and solidarity between Member States to avoid further curtailments.

2.1.2 Eastern gas supply risk groups

2.1.2.1 Belarus

The conclusion of the work in Risk Group Belarus is based on a best case and worst-case analysis. In the best-case, there is no restriction of the use of storage gas, and all storage gas can thus be used in 2023. There will be no need for curtailment, assuming continuous normal demand. In the worst case, with a lack of cooperation between MS in exchanging gas across borders and a reduced accessibility to storage gas, there will in 2023, be a need to reduce demand in the risk group significantly by up to 336 TWh.
No infrastructural issues were identified based on the N-1 calculation for the risk group.

2.1.2.2 Baltic Sea

The conclusion on the work in the Risk Group Baltic Sea is based on a best case and worst-case analysis. In the best-case, there is no restrictions on use of storage gas, and all storage gas can thus be used in 2023. Assuming continuous normal demand it will cause either limited curtailment, up to 112 TWh, or no interruption of gas customers at all. In the worst case, with a lack of cooperation between MS and a reduced accessibility to storage gas, there will in 2023, be a need for large reductions in the group of up to 437 TWh. There will most likely be need for reductions among non-protected gas customers.
No infrastructural issues were identified based on the N-1 calculation for the risk group.

2.2 National risk assessment

The Dutch society is heavily dependent on gas and since a couple of years the Netherlands is reliant on other countries for its gas supplies due to its decision to end the production form the large Groningen gas field as soon as possible. This is a major change compared to the previous risk assessment, nevertheless there is still some substantial national production from gas fields on and off shore.
Another major change is the change in the flow patterns of gas in Northwest Europe following the invasion of Ukraine by Russia. Since mid-2022 no Russian gas is coming to Germany anymore. In order to compensate for this, several measures have been taken in the Netherlands, on the supply side as well as on the demand side. The LNG import capacity has been doubled from 117 to 234 TWh/year, electricity by coal powered powerplants has been increased and a campaign has been started to promote energy savings by both households and industries. Moreover imports from Belgium and the United Kingdom have been increased.
For the coming years the gas security of supply is most likely to remain unstable given the (geo)political situation. Actions and additional measures, not only at national but also at EU level and in cooperation with (potential) gas producing companies and countries will remain necessary.
All this has an impact on the N-1 infrastructure standard. If only the technical/infrastructural capacities and demand under peak circumstances are taken into account the N-1 value is over 230%. If, as required by Regulation (EU) 2017/1938, import and domestic demand are based on realistic expectations at peak circumstances, the N-1 value is still more than 145%.
However, if also the exports to neighbouring countries, in particular Germany, are taken into account and which have been increased considerably in the past year, the N-1 value fluctuates between 70% and little more than 90%.
This 2023 Risk Assessment does not result in a finding which would support the introduction of bi-directional capacity on cross-border points which are not yet bidirectional. This

assessment is supported by national assessments of the network and reflected by the absence of expressed market interest, as is registered in accordance with Regulation (EC) 715/2009 Annex 1 article 3.3(1).
Besides still some substantial national production and adequate infrastructure, security of supply in the Netherlands is delivered through an effective gas market. Commercial incentives on shippers/suppliers are vital to provide sufficient gas to customers. The Dutch virtual gas hub TTF is by far the most liquid gas hub in Europe. This highly effective gas market is supported by a legal framework which safeguards fair and equal access to the market as well as security of supply. It should nevertheless not be forgotten that although infrastructure is available, it is in the end up to shippers and traders to supply gas to where and when it is needed in the right amount.
This risk assessment does not identify any new major risk other than the chance of a malicious act. Nevertheless the gas supply situation in general has become more unstable and unsure which may require additional preventive and/or emergency measures to avoid or cope with a supply disruption. This to for instance to ensure a timely and adequate filling of the storages and to deal with the extremely high utilization of some parts of the transport network and potential congestion. These measures will be dealt with in the to be updated Preventive Action Plan and Emergency Plan which will be published later this year.

2.3 Summary of identified risks

In this section the most important risks of gas distribution in the Netherlands identified in the Risk Assessment 2023 are described as well as the risk factors at several instances, which could make that risk materialise, their likelihood and consequences. This list of risk factors is non-exhaustive.

Political
The invasion of Ukraine by Russia has led to major changes in the Northwest European gas supply and thus to gas supply in the Netherlands. Since mid-2022 no Russian gas is coming to Germany anymore. In order to compensate for this, several measures have been taken in the Netherlands, on the supply side as well as on the demand side.

Technical
The technical risks of failure to transport gas are related to failure of the transport system itself. For every identified unwanted top event the associated threats are analysed. Some threats can appear in more than one top event. The associated frequencies may be different for different top events or for similar top events in different asset categories. The most important threats are, dependent on the asset categories.

Commercial/Financial
The volume of gas traded on the virtual gas trading platform Title Transfer Facility (TTF) was more than three times the volume of all other continental exchanges put together, making it the most liquid continental hub. One of the factors behind the evolution of liquidity at the TTF in recent years was the decision to socialize quality conversion between the H-gas and L-gas network, creating a single traded market. The very high liquidity of TTF provides confidence for suppliers and investors. Seeing the liquidity of the TTF there are no particular commercial or financial risks identified.

Social
Although the social risks seem to be limited the past period has shown that (perceived) shortages of gas can lead to (extremely) high prices which have a negative impact on the purchasing power of individuals and on the economy activity of companies. This in turn may lead to social unrest, for instance because of a loss of jobs and income and increased energy poverty.

Natural
There has been a 3.4 Richter Scale earthquake in Zeerijp, Groningen region in January 2018. This has been the most severe gas production-induced earthquake since 2013. The Dutch State Supervision of Mines recently advised the Dutch Minister of Economic Affairs and Climate Policy to end the gas production for the safety of the inhabitants of Groningen.
As such, the seismic activity in the Dutch Groningen region has had effects on the political decision to end the L-gas production from the Groningen field as soon as possible. Nevertheless, as said earlier, the security of gas supply in neighbouring countries has always been part of the assessment on allowed L-gas production and will be part of the future assessments of the L-gas situation.

Malicious acts
The explosions that have led to the partial destruction of the Nord Stream pipelines have clearly showed the vulnerability of gas infrastructures for malicious acts. Not only pipelines but also LNG-facilities, gas storages and, in the Netherlands, the conversion facilities, can become victim of such acts. Therefor the discussion with the owners/operators of these infrastructure about the measures that can be taken to reduce both the chance of a malicious act and its potential impact has been intensified.
Given the Dutch off shore gas infrastructure also the coast guard and the navy are involved in these discussions, just like the national security services

3. Infrastructure standard

3.1 Introduction

Article 5 of the Regulation sets minimum requirements in respect of the infrastructure. The infrastructure of every member state must be capable of coping with the disruption of its single largest gas infrastructure (the so-called N-1 indicator), even during a day of exceptionally high gas demand. The calculation set out in the next paragraphs uses the following formula:

3.2 Parameters and sources of the N-1 formula

The Regulation describes how the parameters of the formula should be calculated. This paragraph describes for the Netherlands how the values of the different parameters are determined.

2022 has been chosen as the reference year. The parameters make no distinction between low-calorific gas (L-gas) and high-calorific gas (H-gas).

3.2.1 Demand side parameter

D_{max} — the total daily gas demand (in GWh per day) of the calculated area during a day of exceptionally high gas demand occurring with a statistical probability of once in 20 years (national legislation requires a more conservative reference temp of -17).

GTS annually recalculates the total expected daily gas demand in the Netherlands for the coming years. For the N-1 calculation, the peak demand figures of the Klimaat- en energieverkenning 2022[16] scenario as provided for 2024 of the GTS Investment Plan 2022[17] were calculated. Demand-side measures are not applied in the Netherlands and are therefore not included in the D_{max} calculation.

3.2.2 Supply side parameters

EP_m — the technical capacity of entry points (in GWh per day) other than production, LNG and storage facilities covered by P m, S m and LNG m: the sum of the technical capacity of all border entry points capable of supplying gas to the calculated area.

The Dutch transport network is directly connected to four countries, Belgium, Germany, Norway and the United Kingdom. Except for the connection with Norway, the other H-gas connections are bi-directional. The connection with the United Kingdom can be operated bi-directly since mid-2019. The direction of the flow can be changed based on market demand.

The table below gives an overview of the maximum border capacity in GWh/d in 2023. The entry capacities for the N-1 calculation are considered after applying the so called lesser rule to the available transport capacities on both sides of the border. The result of the lesser rule calculations is presented in the table below.

[16] https://www.pbl.nl/en/publications/climate-and-energy-outlook-of-the-netherlands-2022
[17] https://www.gasunietransportservices.nl/en/gasmarket/investment-plan/investment-plan-2022

Entry point [GWh/d]	GTS capacity	NNO capacity	Lesser rule capacity
Emden EPT (Gassco)	878	878	878
VIP THE-H	511	582	511
VIP BENE-H	428	428	428
BBL company	168	168	168
Total			1.986

Figure 18: Overview of maximum border capacity in GWh/d.

According to Regulation 2017/1938 Article 5(4a) bi-directional capacity is not required for (cross border) connections to gas production facilities. This applies to the L-gas system, as it connects several countries to the L-gas production locations in the Netherlands and Germany. As a consequence, no bi-directional capacity is offered for L-gas interconnections with Belgium and Germany.

Furthermore, an exemption has been given under Regulation 994/2010 for the following H-gas interconnection:

- The interconnection at Vlieghuis as this is a dedicated pipeline to a power plant.

This exemption will have to be reviewed under the current Regulation.

S_m — maximal technical storage deliverability (GWh per day): the sum of the maximal technical daily withdrawal capacity of all storage facilities which can be delivered to the entry points of the calculated area, taking into account their respective physical characteristics.

The number of storages capacity used as input for the N-1 formula is higher than the number listed in the overview of Dutch storages, because the Netherlands has also direct access to storages in Germany. **Fout! Verwijzingsbron niet gevonden.** It shows the capacities of all UGS in the beginning (100% full) and near the end (30% full) of the heating season.

Storage facility (GWh/d)	Capacity (100% full)	Capacity (30% full)
EnergyStock	252	431
Norg	742	702
Grijpskerk	620	225
Alkmaar	357	357
Bergermeer	469	446
Epe storages	331	277
Peakshaver	199	199
Oude Statenzijl storages	840	840
Total	3.810	3.477

Figure 19: Overview of storage facilities in GWh/d.

P_m — maximal technical production capability (in GWh per day) means the sum of the maximal technical daily production capability of all gas production facilities which can be delivered to the entry points in the calculated area.

This parameter comprises of the Groningen field and the other gas fields on the Dutch continental plateau (small fields). Under peak demand and/or emergency situations the maximum production capacity from the Groningen field is used. Therefore the production capacity for 2023 as projected in the GTS Investment Plan 2022-2032 is the input for this variable. However, on 31 March 2023, the State Secretary for Mining decided to close 6 of the 11 production clusters of the Groningen field, the consequence is that only in very special circumstances these clusters can be taken into production again.

Besides the Groningen field, in The Netherlands a large number of small fields are active, the total production capacity of these fields is take into account.

Entry point	Capacity [GWh/d]
Groningen field (11 clusters)[18]	1,032
Small fields	294
Total	1,326

Figure 20: Overview Dutch production in GWh/d.

LNG_m — maximal technical LNG facility capacity (in GWh per day): the sum of the maximal possible technical daily send-out capacities at all LNG facilities in the calculated area, taking into account critical elements like offloading, ancillary services, temporary storage and re-gasification of LNG as well as technical send-out capacity to the system.

The Netherlands has the potential to supply gas to the market via two LNG terminals, the GATE terminal on the Maasvlakte in Rotterdam and the Eemshaven Energy Terminal (EET).

LNG terminal	Capacity [GWh/d]
Gate	504
EET	360
Total	864

Figure 21: Overview of LNG terminals in GWh/d.

I_m — technical capacity of the single largest gas infrastructure (in GWh per day) with the highest capacity to supply the calculated area. When several gas infrastructures are connected to a common upstream or downstream gas infrastructure and cannot be separately operated, they shall be considered as one single gas infrastructure.

Up until 2015, the Norg storage facility was the single largest gas infrastructure in the Netherlands. However in 2016, the two Emden import terminals were merged into one

[18] It is the intention of the Dutch government that no use is made of this capacity after 1 October 2023, unless exceptional circumstances warrant this.

commercial entity, effectively (technically) becoming the new single gas infrastructure with the largest capacity.

3.3 Setup of the N-1 calculations

The current situation differs compared to the previous version of this preventive action plan because of the Russian invasion of Ukraine and the resulting consequences for the supply of gas to Europe. This situation has led to a different setup of this chapter of calculating the N-1 results. The calculation has been built up in two analyses, which are:

I. Analysis where entry, import and domestic demand are based on realistic expectations at peak circumstances

   This analysis is fully compliant with article 5.

II. Analysis where entry, import, *export* and domestic demand are based on realistic expectations at peak circumstances

   In this analysis the assumptions above are further adapted to realistic circumstances by adding the export to neighbouring countries to the "D real" parameter. This is the best estimate of the actual security of supply situation, as the Netherlands is the only L-gas supplier for Germany, Belgium and France and has always been an important transit country for H-gas. Especially in the current situation where Germany is not supplied anymore by Russian gas and not yet by significant direct LNG supplies, Germany is fully reliant on imports from Norway, Belgium and the Netherlands. The results are calculated for two scenarios with varying parameters to reflect the uncertainties. The first (high) scenario is a combination of high supply and low demand, the second (low) scenario is a combination of low supply and high demand, resulting in a bandwidth. The resulting bandwidth is calculated for both the 100% and 30% underground gas storage (UGS) deliverability.

The parameters for which the situation is unclear and the chosen levels are:

Parameter	Belonging to…	Highest outcome formula [GWh/d]	Lowest outcome formula [GWh/d]
Groningen field	P_{real}	469	0
Oude Statenzijl caverns	S_{real}	420	0
Domestic and L-gas export market	D_{real}	3,525	4,147

Figure 22: Overview of parameters in GWh/d.

Results of the outcome for the two analyses of the N-1 formula:

	100% UGS deliverability	Reduced UGS deliverability (30% full)
Analysis I	146%	130%
Analysis II	69% - 93%	60% - 83%

Figure 23: Overview of N-1 formula results in GWh/d.

The most important characteristics of the two analyses are:

Analysis I

- Groningen 5 clusters operational
- Supply based on realistic assumptions

Analysis II

- Supply based on realistic assumptions, export added
- Three parameters varied between two levels:
    - Groningen 0 or 5 clusters operational
    - Import German caverns via Oude Statenzijl 0% or 50% of max capacity
    - L-gas market 90% or 100% of KEV/Taskforce values

See Annex III for a complete and detailed overview of the calculations.

3.4 Bidirectional capacities

Bidirectional capacities:

Entry point [GWh/d]	Connection with	GTS capacity	NNO capacity	Lesser rule capacity
Emden EPT (Gassco)	Norway	878	878	878
VIP THE-H	Germany	511	582	511
VIP BENE-H	Belgium	428	428	428
BBL company	United Kingdom	168	168	168
Total				1.986

Figure 24: Overview of maximum border capacity in GWh/d

In comparison with the previous Preventive Action Plan the BBL connection with the UK is added to the list above because for this connection bidirectional physical capacity is now available.

According to Article 5(4a) of the regulation bi-directional capacity is not required for (cross border) connections to gas production facilities. This applies to the whole L-gas system, as it connects several countries to the L-gas production locations in the Netherlands and Germany. As a consequence, no bi-directional capacity is offered for L-gas interconnections with Belgium and Germany.

4. Compliance with the supply standard

The share of long term commodity contracts in the Dutch gas market is very low. Therefore security of supply in the Netherlands must be arranged through an effective gas market with sufficient gas supply.
Now the Groningen field is only available as a back-up in case of capacity problems, the Netherlands is mostly dependant on the import of gas for their security of supply.
Commercial incentives on shippers/suppliers are vital to provide sufficient gas to customers. Although the Dutch virtual gas hub TTF is the most liquid gas hub on the European continent for years, it could not prevent a gas shortage after the Russian gas supply to NW-Europe stopped. This means that security of supply in the Netherlands without the Groningenfield is not a given anymore.

Security of gas supply to the protected customers in the Netherlands is organised via Public Service Obligations. Legislation, such as the Dutch Gas Act and the 'Decision in Relation to Security of Supply Pursuant to the Gas Act', stipulates the content and scope of these Public Service Obligations. Chapter 8 elaborates in detail on these Public Service Obligations.

4.1 Definition of protected customers[19]

Protected customers in the Netherlands are explicitly defined in the Dutch Gas Act as: customers who have a connection to a network with a total maximum capacity not exceeding $40m^3$ per hour. In article 2(5) of the Regulation it is stipulated that, besides households, small and medium-sized enterprises (SMEs) that are connected to a gas distribution network, and essential social services that are connected to either a gas distribution or a transmission network can be considered as protected customers, but only in so far as they jointly don't represent more than 20% of the total annual final gas consumption. The Dutch Gas Act includes these customers in its definition of protected customers as long as they have a connection to a network with a capacity not exceeding $40m^3$ per hour.
This means that SMEs and essential social services with a connection larger then 40m3 per hour are not considered as protected customers in the Netherlands.
But this also means that a branch office of a large company (for instance a financial institution) with a connection to a network with a capacity not exceeding $40m^3$ per hour, is considered as a protected customer in the Netherlands.
In the Dutch gas system it is not possible to differentiate between different groups of customers as prescribed by the regulation.
In the Netherlands district heating installations are not considered as protected customers.

Protected customers, in the Netherlands called small consumers, are subdivided into two legally defined categories:

1. G1A customers with a connection of <40 m^3/h and a yearly offtake of **<**5,000 m^3
2. G2A customers with a connection of <40 m^3/h and a yearly offtake of **>**5,000 m^3

The group of G1A customers consists of households and their total overall consumption varies between 8 and 12 bcm per year, depending on the weather (temperature).
The groups described in Article 2(5)(a) and (b) of the Regulation fall to a large extent within category G2A, this with the limitations set out above. Besides companies (mainly SMEs) and essential social services this category comprises also of households with a high gas demand (>5,000 m^3). GTS publishes every year the offtakes of the legally defined small user categories in the Netherlands[20]. Figure 25 shows that the yearly offtake of category G2A was 1.37 bcm in 2022. The total of domestic offtake was in 2022 30.54 bcm, therefore the yearly offtake of

[19] Following article 6(1) of the regulation, the information in this paragraph was notified to the Commission in the beginning of February 2018.
[20] Publication Gasbalans 2017: https://www.gasunietransportservices.nl/uploads/fckconnector/d0dbaddd-b88f-5e37-8dc9-c44172b280b8/3022012506/gasbalans2017.xlsx?lang=nl

category G2A was 4.50% of the total domestic offtake in 2022. Over the past years this percentage has always been around 4-6%.

Year	Off take G2A in bcm	Total domestic off take (industry + distribution) in bcm	G2A as % of total
2010	2.98	48.24	6.17%
2011	2.26	42.42	5.33%
2012	2.43	40.49	6.01%
2013	2.54	41.51	6.12%
2014	1.85	35.89	5.16%
2015	1.97	35.77	5.51%
2016	2.00	37.53	5.33%
2017	1.96	38.32	5.13%
2018	1.94	38.97	4.98%
2019	1.86	39.81	4.67%
2020	1.71	38.98	4.39%
2021	1.81	38.72	4.68%
2022	1.37	30.54	4.50%

Figure 25: SMEs and essential social services (G2A) as % of domestic market. Source GTS

This calculation verifies that the definition of protected customers in the Dutch Gas act is compliant with the ranges stipulated in article 2(5) of the Regulation. The conclusion is that even if we were to assume that the entire category G2A consists out of SMEs and essential social services (which it doesn't as also household are included in this category) the percentage of total domestic offtake of the category would still be well below the threshold of 20% that is stated in the Regulation.

4.2 Supply to protected customers based on three pillars (public service obligations)
The Netherlands has a clear methodology (legal obligations) for controlling and enforcing the implementation of the supply standard. The Dutch government has set clear standards for the security of supply of protected customers. These standards are based on an extreme cold temperature of –17oC which occurs with a statistical probability of once in 50 years. In this respect, it should be noted that Dutch protected customers are in majority supplied with locally produced L-gas. The main tasks related to safeguarding the security of supply are assigned to the TSO GTS as a public service obligation. These comprise of the three "pillars" as detailed in chapter 8:

1. Peak supply a responsibility of GTS (between -9 and -17 degrees C)
2. A licensing system for suppliers of protected customers
3. GTS to take action in case of bankruptcy of a supplier

4.3 Increased 1:50 infrastructure standard in the Netherlands
Article 6 of the Regulation sets minimum requirements in respect of the supply standard. In the Netherlands, standards for the infrastructure and security of supply have been laid down via the 'Gas Act' and since 2004 in the 'Decision Security of Supply Gas Act'.[21] The Dutch standard is stricter than the minimum standard laid down in Regulation 2017/1938. Other member states also apply stricter standards. The existing Dutch standard for infrastructure is related to a situation corresponding to a probability of once in every 50 years, occurring in the central Dutch city of De Bilt.

The 1:50 infrastructure standard in The Netherlands is justified as follows. The volume contracted by GTS for peak supply is about 95 million cubic meters. This volume follows from the existing Dutch security of supply standard, laid down in the Dutch Gas Act and in the

[21] The order in Council of 13 April 2004, laying down regulations regarding provisions in connection with security of supply (Decision Security of Supply the Gas Act)

Decision Security of Supply Gas Act. This Decision stipulates that GTS should take all necessary measures that will allow suppliers to protected customers to satisfy the peak gas demand (volume and capacity) of their customers in the event of exceptionally high gas demand occurring with a statistical probability of once in 50 years. The Netherlands believes that this standard is justified given the fact that such an event did occur in 1987, which is only 30 years ago and taking into account the very high percentage of households (95%) that depends on natural gas when it comes to heating.

The amount of 95 mcm is 0.1% of the amount of gas transported by GTS annually. Lowering the standard to a winter that occurs with a statistical probability of once in every 20 years would reduce the amount of gas needed for peak supply with 2% of 95 mcm to 93.1 mcm. This 1.9 mcm reduction is 0.0025% of the amount of gas transported by GTS annually (this amount is so low because it is the peak of the amount needed for peak supply).

The amount of 95 mcm required for peak supply is contracted in a market-based way, namely through an auction process which is transparent and which is monitored by ACM, the Dutch National Regulatory Authority. The contracted amount related to peak supply may only be claimed by GTS on the day the official weather forecasts predicts an effective daily temperature for the next day in the city of De Bilt of -9˚C or lower. If this is not the case, the capacity and volume are available to the market. It should further be noted that Dutch protected customers are supplied with L-gas which is almost 100% locally produced.

Given what is described above, the supply standard does not negatively impact the cross-border access to Dutch infrastructure in accordance with Regulation (EC) No 715/2009.

Furthermore, the amount which is contracted by GTS does not unduly distort competition, nor does it limits the effective functioning of the internal gas market. The involved volumes are so low that they do not endanger the security of supply of other Member States or of the Union as a whole. Furthermore, the higher Dutch supply standard does not unduly restrict the flow of gas within the internal market at any time, notably the flow of gas to the affected markets, nor is it likely to endanger the gas supply situation in another Member State.

The Netherlands observes that it is fully able to satisfy the demand of all its customers, including its export customers, under all scenarios. It would therefore not make a difference if the Dutch supply standard would be reduced temporarily, also in the light of the small volumes associated with such a reduction. Furthermore, the Dutch protected customers are primarily supplied with domestically-produced L-gas. Since this gas has a different calorific value than the gas used in most parts of the European Union it would not be of use to any Member State outside of the L-gas region in the event of a crisis. The higher Dutch supply standard therefore does not impact negatively on the ability of any other Member State to supply its protected customers in the event of a national, regional or Union emergency.

Year	Month	Day	Wind	Temperature
1987	1	14	6,7	-17,67
1978	12	31	6,2	-15,73
1987	1	15	8,2	-14,77
1985	1	7	4,1	-14,53
1997	1	1	4	-14,07
1997	1	2	2,2	-14,07
1979	1	5	2,1	-13,80
1963	1	19	7,7	-13,73
1987	1	11	3,6	-13,70
1996	12	31	6	-13,70
1996	1	26	6,7	-13,67
2012	2	4	1,5	-13,10
1979	1	2	4,1	-12,93
1996	1	25	7,7	-12,93
1968	1	13	3,6	-12,70
1991	2	6	6,2	-12,63
1963	1	10	2,1	-12,60
1963	1	17	2,1	-12,60
1963	1	18	3,1	-12,57
1985	1	15	3,6	-12,50
1987	1	12	2,6	-12,43
1987	1	13	4,6	-12,37
1963	1	1	5,7	-12,10
1979	1	1	1,5	-12,10
1979	1	6	1,5	-12,00
1969	12	31	6,7	-11,97
1976	1	30	6,2	-11,93

Figure 26: Overview of lowest temperatures in De Bilt since 1987, source KNMI.

Figure 26 shows the lowest average daily temperatures recorded in De Bilt since 1961 by the Royal Netherlands Meteorological Institute (KNMI). It shows that on the 14th January 1987 the average daily temperature in De Bilt was -17.7°C. The stricter supply standard in the Netherlands relates to the recordings of this day as the temperature of -17°C corresponds to the lowest temperature in De Bilt with a probability of once in every 50 years. A recent KNMI analysis[22] shows that the probability of such an extreme cold day will be the same for the next decades. Besides the fact that the -17°C assumption has a basis in reality, a stricter supply standard is deemed necessary as gas plays a crucial role in energy supply in the Netherlands where 95% of the homes depends on gas for space heating. Implementation of a more relaxed standard (= applying the 1:20 standard) will result in the inability to supply a population greater than that of Amsterdam if a 1:50 occurrence takes place.

The European statistical standard of 1:20 years can be translated for the Netherlands into a temperature of -15.5°C (a national average effective daily temperature of -15.5°C prevails on the coldest day in a period of 7 or 30 days in the Netherlands). The existing Dutch standard for infrastructure and security of supply under peak circumstances is related to a situation occurring when there is an average daily temperature of -17°C, corresponding to a probability of once every 50 years.

Where extreme temperatures are concerned, the European supply standard is restricted to a 7-day peak period and to any period of 30 days of exceptionally high gas demand. In the Netherlands this is met by the Dutch standard which is based on a 1:50 winter and the associated daily temperature distribution. This determines the temperature and demand limits of the 7 and 30 days periods mentioned above.

[22] http://www.knmi.nl/cms/content/104358/koudegolven_van_de_toekomst

In the event of a disruption of the single largest gas infrastructure under average winter conditions, the European minimum supply standard mentions a period of thirty days. There is no mention of 'peak circumstances.' In the Netherlands, this type of situation is met by the standard requirements expected of suppliers to small consumers. These requirements focus on the obligation to supply gas and on the organisational, financial and technical qualities of the suppliers.[23].

4.4 Upcoming developments

Although the system set out above has worked quite well, especially by using the big Groningen field , the situation has now changed because of the foreseen closure of the Groningen field by 1st of October 2024 and the lack of Russian gas. Therefore the Netherlands is now studying all three pillars of the gas supply norm of the Regulation in order to determine a new successful approach.

In addition, as set out under 4.1, the Dutch definition of protected customers is not fully compliant with the Regulation.
It has therefore been decided to remedy this situation by drafting a Gas Security of Supply Law. This law should also provide the legal basis to identify solidarity protected customers and deal with other gas security of supply elements. If the legislative procedure follows the planned procedure, it can be adopted and enter into force by 1 July 2025 at the earliest.

[23] Article 43 and following of the Gas Act.

5. Preventive measures

This chapter provides a summary of some of the preventive actions executed by the Dutch transmission system operator in order to ensure the security of gas supply. These measures were taken into account during the risk assessment. Furthermore, a not exhaustive list of gas saving measures, subsidies and obligations is presented.

5.1 Quality performance indicators

In order to be able to monitor the safety and reliability of the Dutch high pressure grid and, where necessary, to make adjustments, a number of quality performance indicators have been developed. Realistic standards or target values (signal values) are associated with these performance indicators in order to be able to test the results achieved against the objectives. The performance indicators, with their associated signal values, thus form a cohesive system of quality indicators.

The published indicators include among others:

- number of interruptions,
- average time to safeguard the failure,
- number of accidents reported to the Dutch Safety Board,
- number of leaks in the transmission system,
- number of leaks in connections.

5.2 Integrity measures

A number of preventive measures are taken to keep pipelines in good condition. Pipelines are, for example, coated and cathodically protected against corrosion and have to undergo regular sight inspections (for example a helicopter flight inspection of the grid every three weeks). The integrity of the transport system is monitored with the help of a continual inspection programme. Pigging operations have been performed for many years now.

5.3 External safety of pipelines

On 1 January 2011, the new Decree on the External Safety of Pipelines (Besluit Externe Veiligheid Buisleidingen (BEVB)) and associated regulations came into force in the Netherlands. This decree stipulates that pipelines carrying hazardous substances, including natural gas pipelines, must be marked on zoning plans, including the corresponding strip of land affected and there must be a system for obtaining construction permits in that strip of land in order to protect the pipeline and the energy supply.

5.4 Planned excavation reporting

Excavation work is still the main cause of damage to the underground pipeline network. Since 1 July 2008, the Act on Information Exchange for Underground Networks (Wet Informatie uitwisseling Ondergrondse Netten (WION)) has come into force in the Netherlands. Excavators are obliged to report planned excavation work. This Act also comprises precautionary measures for the relevant networks, such as marking the pipeline at the place where the proposed work is planned and supervision during the work.

5.5 Incidents reporting

Dutch pipeline transport companies are obliged to register their pipeline incidents via VELIN. Information is available on www.VELIN.nl. European gas transport companies have to register their pipeline incidents in a similar way. Information is available via http://www.egig.eu.

5.6 External safety obligations

The high pressure transport installations and other installations fulfil specific requirements laid down by legislation and regulations with regard to external safety. Large locations are also subject to reporting obligations within the scope of the Decree on the Risks of Serious Accidents (Besluit Risico's Zware Ongevallen (BRZO)) and/or Supplementary Risk Inventory and Evaluation (Aanvullende Risico Inventarisatie en Evaluatie (ARIE)).

Since 1999, the so-called Seveso II Directive has been in force within the European Union, and it has been implemented in the Netherlands by the 1999 Major Accident Decree (BRZO '99). One of the obligations that has been imposed on organisations falling within the scope of the Decree is to draft a Serious Accident Prevention Policy (PBZO). This PBZO document specifies how to prevent different types of serious accidents.

5.7 Investment measures to improve security of supply

Since the preventive action plan 2017 several investments have been completed in order to improve the security of supply. Investments in L-gas infrastructure (and nitrogen) ensure that there is sufficient L-gas. Investments in cross border infrastructure diversify the gas supply.

The GTS addendum to the Investment Plan 2022[24] laid down a number of investments measures that improve the interconnection with other Member States and further diversify gas sourcing in the Netherlands:

1. Adjustment of compression due to changed gas flows;
2. Connection requests and investments for feed-in of Liquefied Natural Gas (LNG)
3. a takeover of a NAM pipeline so that the full send-out capacity of the Grijpskerk gas storage facility (which has been converted from H- to G-gas) can be used.

These and other measures are discussed in more detail in chapter 7.

5.8 Measures under consideration/development

Following the Ukraine crisis and new EU (emergency) regulations after the outbreak of this crisis, additional measures have been taken in the Netherlands, just as in other Member States, to strengthen the gas security situation. At the same it was recognised that the Dutch gas legislation was not fully capable to deal with all the measures and that martial law would have to called upon to execute some of the measures if needed. Furthermore, it was recognised that the storage measures adopted under Regulation (EU) 2022/1032 required a legal basis, this also because the Dutch intents to prolong these measures after their current end date of December 2025.

In order to overcome this situation and to be prepared for any future gas crisis it has been decided to draft a Gas Security of Supply Law (see also par. 4.4). This law should:

- create a legal to implement measures stemming from future EU gas emergency regulation;
- provide a legal basis for gas storage obligations, including filling trajectories and filling targets;
- provide a legal basis for the conclusion of gas solidarity agreements with Member States with whom the Dutch gas transmission is connected, either directly or via a third country.

If the legislative procedure follows the planned procedure, it can be adopted and enter into force by 1 July 2025 at the earliest.

5.9 Other preventive measures

When the early warning crisis level was announced a set of preventive measures came in effect to reduce the Dutch dependence on Russian gas. In the first place by focussing on the reduction of natural gas consumption and accelerating the energy transition. First the preventive measures that are taken specifically to control the early warning crisis level. Next, measures to accelerate the energy transition are presented.

Early warning stage

[24] https://www.gasunietransportservices.nl/uploads/fckconnector/67a7791e-9754-5341-b853-18026c541786/3373913869/Investment%20Plan%202022%20-%20draft%20addendum.pdf?lang=en

On June 20th 2022, the early warning crisis level was announced. Accompanying the announcement were a set of preventive measures with the aim to reduce the consumption of gas.

Energy saving campaign
The Netherlands has followed up on this through the gas savings campaign "Zet ook de knop om", launched on the 4th of July 2022. With this campaign both citizens and industry are made aware of their energy consumption and are urged to reduce their energy use even in the summer. For instance, in the winter 2022-2023 a nationwide call was made to lower the thermostat in office buildings as well as family homes. Part of this campaign for enterprises was a tool for SME's with which they can see directly which energy savings or sustainability measures they can employ and which subsidy schemes are available. Furthermore the energy saving obligation for enterprises is refined and a national goal for energy saving will be implemented.

More electricity from coal
Because the risk of gas shortages has increased, the government has decided to withdraw production restrictions for coal-fired power stations from 2022 to 2024. This means that coal-fired power stations can produce at full power again, meaning that less gas is needed for the production of electricity by gas-fired power stations. This reduces the risk of gas shortages and can make it easier to fill gas storage facilities in the Netherlands and Europe. The aim is to fill the gas storage facilities in the Netherlands this year beyond what has been agreed at European level.

Accelerating the energy transition
Here a non-exhaustive list of measures taken by the government to accelerate the energy transition is presented. The Dutch government is constantly searching for new ways to promote and stimulate sustainable energy solutions.

National insulation programme
In 2023 the national programme for home insulation was approved[25]. From the estimated 40 bcm natural gas that is used in the Netherlands annually roughly 30% is used to heat homes and buildings, to provide warm water and to cook. Proper insulation of residences will contribute to the reduction of gas consumption, to the affordability of the energy bill, to achieve climate goals and to the necessary preparation to a fossil free alternative. The goal of the programme is to insulate 2.5 million residences until 2030, focussing mostly on the worst insulated houses (energy label E, F and G).

Energy saving obligations
Since 2023 there is an energy savings obligations for businesses and institutions. Businesses and institutions with an energy consumption more than 50.000 kWh electricity or 25.000 m^3 equivalent natural gas use are obliged to implement all energy saving measures with a payback period of 5 years or less.

Measures for enterprises
For enterprises there are several financial aid measures to help them become more sustainable and reduce their gas consumption[26]. For example, financial aid is available for the acquisition of a (hybrid) heat pump or other sustainable heating options. There are tax benefits for enterprises who invest in energy efficient techniques and sustainable energy. Financial aid can be obtained for entrepreneurs who acquire or lease a (new) fully electric company vehicle. The is financial compensation for enterprises that are producing more (durable) energy and implementing more CO2 reducing measures. These are measures that stimulate and promote the responsible use of energy and sustainable energy production.

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25 Kamerbrief Aanbieding Nationaal Isolatieprogramma | Kamerstuk | Rijksoverheid.nl

26 Energie besparen nu en straks (rvo.nl)

6. Other measures and obligations concerning safe operation of the gas system

6.1 General legal framework

Dutch gas undertakings are bound by the Dutch Gas Act, which stipulates amongst others the following tasks related to security of supply:

- To take measure for the safe operations of the system,
- To take measures relating to security of supply (including peak-period delivery and supplier of last resort deliveries),
- To provide quality conversion,
- To monitor the reliability, quality and safety of the system,
- To provide other network operators with information in order to allow for safe and efficient day-to-day transport.

The legal obligations related to the infrastructure and supply standard (measures relating to security of supply) were described in chapter 4.

6.2 Safe operations of the system

Quality and safety of the gas system are of utmost importance in and for the Netherlands. Article 10 of the Dutch Gas Act stipulates that system operators, gas storage companies and LNG companies are legally responsible for providing and maintaining a safe, efficient and reliable gas transmission network, storages and LNG facilities, in a way that respects the environment as much as possible. All parties are required to provide each other with sufficient information to ensure that transport, storage and LNG-operation can be executed secure and efficient.

6.3 Measures relating to security of supply including peak-period delivery and supplier of last resort deliveries

The legal obligations related to the infrastructure and supply standard (measures relating to security of supply) were described in chapter 4 and will be further elaborated in chapter 8.

6.4 Quality conversion

The ministerial decree on gas quality ("Regeling Gaskwaliteit"), which is in effect since 1 October 2014, specifies gas quality requirements per entry and exit point. Nevertheless, shippers can freely book and use capacity on any entry/exit point irrespective of the gas quality specified for the entry/exit points. The balance to be maintained by the shippers is measured in terms of energy, not in m^3 of gas.

To deliver gas with the correct quality is a legal responsibility of the physically delivering network operator (Dutch Gas Act, Articles 10(3d) and 10a(1n) and Article 11. For gas which is physically delivered to the national grid, this is the operator of the gas production grid or the upstream network or storage operator; for the physical delivery to power plants, industries, District System Operators and Neighbouring Network Operators, this is GTS.

Physically the national Dutch G/L-gas and H-gas networks are separated. The two networks which together form the national grid are connected through blending stations. At these blending stations the required gas quality (Wobbe-index) is produced in two different ways:

- Blending: Adding H-gas to G-gas without surpassing the upper Wobbe-limit of the L-gas specifications (enrichment). GTS is planning to use this option in the coming years to its full extent in order to enable a lower production level at the Groningen field.
- Nitrogen injection: When the required gas specification cannot be reached by blending alone, then the quality conversion facilities of GTS will add nitrogen to H-gas in order to achieve conversion into L-gas meeting the Wobbe-limits of the L-gas specifications.

6.5 Monitoring the reliability, quality and safety of the system

In accordance with the provisions in article 8 of the Dutch Gas Act all Dutch system operators (gas transmission and distribution) need to have an effective control system to monitor the reliability, quality and safety of the system. These provisions are detailed in the 'Ministerial Decree on Quality Aspects of Transmission System Operation.' The control system to manage the quality of the provided transport services also includes a section on safety indicators.

This obligation requires (since 2005, in the odd years) the publication by each Dutch transmission and distribution system operator of a so-called 'Quality and Capacity Document.' In this document each system operator has to:

- demonstrate it has an effective quality control system for its transport services and other services;
- describe the quality levels to which it aspires;
- describe which safety indicators are applied;
- demonstrate it has sufficient capacity to be able to meet total gas transport requirements;
- describe which investments, including replacement investments, are needed in order to maintain the quality and continue with the expansion of the gas transmission grid in order to meet total requirements for gas transport.

To testify they have an effective quality control system for their assets, all Dutch transmission and distribution system operators are certified according to the Dutch technical standard NTA 8120 on asset management, related to the NEN-ISO 55000 series, or are aiming at being certified soon. An important part of the quality control systems is the assessment of risks related to all activities of the system operators. By connecting the strategic objectives of the system operators to the identified risks, an optimal mode of operation for the system operators can be achieved.

In accordance with the provisions contained in Article 35a of the Gas Act and in the 'Ministerial Decree on Quality Aspects of Transmission System Operation,' system operators yearly have to publish a 'Report on Quality Indicators.' The report contains an analysis of the actual quality levels in the previous year, and the quality levels that the system operator aspires to, as described in the 'Quality and Capacity Document'.

The ACM with the assistance of the State Supervision on Mines (SodM) audits the 'Quality and Capacity' and the 'Report Quality Indicators' documents. All publications are publicly available on the websites of the system operators.

6.6 Providing other network operators with information in order to allow for safe and efficient day-to-day transport

GTS monitors the integrity of the transmission network through a system of measures designed to control risks. Continuous sharing of information with other network operators is an integral part of this. Transport security does not just depend on the design criteria for the infrastructure and the proper implementation of management and maintenance, but also on the way in which the transport system is controlled. The balance between these elements ensures efficiency and transport security.

In the event of any interruption in the supply, a round-the-clock on-call service ensures that problems are solved effectively, if necessary in close cooperation with other parties, like the Dutch government.

The form that the interruption in transmission (under an emergency situation) takes in specific cases is mainly determined by:

- the magnitude of the emergency,
- geographic location,
- the speed with which transmission can be restarted,
- the consequences of the interruption.

6.7 Balancing

The Dutch balancing system plays an important role in maintaining general system integrity. The transmission network must be in balance in order to let gas be transported safely and efficiently. 'In balance' means that the network remains within the allowable pressure limits because the volume of gas extracted from the network is in equilibrium with the volume injected into the network. The last change to the balancing regime was on 3rd June 2014 where the system was adapted to be compliant with the European Network Code on Balancing.

Under the Dutch balancing regime, network users are responsible for the volume of gas that they extract from or inject into the system. Network users are jointly responsible for maintaining the balance of the network. All network users have continuous insight into their own position. The overall balance position of the entire national network, or the total of the positions of all network users, can also be followed by everyone 24/7. This results in the transparency desired by all network users. As long as the position of the overall network remains within the allowable limits, the network will be in balance and none of the network users will be required to take action. The same will apply even if an individual network user is not in balance.

Network users can either use own (contracted) means, or buy or sell gas themselves on the TTF. If they fail to do so adequately and the imbalance rises to unacceptable levels, GTS will buy or sell the necessary amount of gas to mitigate the imbalance at the best price available on the exchange of ICE-ENDEX. The costs will be charged on a pro-rata basis to the causers of the imbalance. They pay the volume weighted average price of the products that GTS received or delivered on the exchange.

7. Infrastructure and projects

7.1 Completed measures since preventive action plan 2017

7.1.1 Nitrogen plant (Zuidbroek)

The construction of a new nitrogen plant with an expansion of an existing blending station became (partly) operational at the start of gas year 2023/2024[27]. The new nitrogen plant with a capacity of 180,000 m^3/h is able to produce a maximum of 97 TWh pseudo L-gas annually. The environmental impact of the new nitrogen plant has been investigated and no negative effects have been found.

7.1.2 Converting nine large L-gas consumers

The legislative framework has been adapted in order to limit future L-gas consumption. One adaption concerns the conversion of industrial gas consumers and was adopted on June 20, 2020. This legalization specifies that industrial gas consumers that consumed more than 100 million cubic meters of L-gas annually for at least two years in gas year 2016/2017, 2017/2018 or 2019/2020 are not allowed to use L-gas anymore after October 2022. This new law resulted in the executed and planned conversion of nine large L-gas consumers. In addition to this, it is prohibited for all industrial consumers of L-gas to withdraw more than 100 million cubic meters annually. Converting nine large L-gas consumers in the Netherlands to H-gas or other sources of energy already has and will further decrease the use of L-gas. A total of ~30 TWh volume reduction in L-gas demand is predicted when all nine large industrial consumers are converted. At the moment of writing, five of these nine users have stopped their offtake of L-gas and converted to other sources of energy. The remaining four industrial users have been and will be granted a temporary exemption from the ban by the Ministry of Economic Affairs and Climate Policy. This exemption holds until their planned conversion in the upcoming years.

7.1.3 Filling UGS Norg with pseudo L-gas

Building an additional nitrogen installation in Zuidbroek would also mean the possibility for the production of additional L-gas, even when there is not an all-year-round demand for it. By accomodating to fill UGS Norg with converted H-gas instead of directly with gas from the Groningen field, the nitrogen installation in Zuidbroek can be used more effectively and the required production from the Groningen field is reduced further.

7.1.4 Delivering pseudo L-gas on Oude Statenzijl

For the reason set out in the previous paragraph pseudo L-gas is now also delivered on the interconnection point Oude Statenzijl.

7.1.5 Balgzand to Bacton Pipeline Reverse Flow

The BBL pipeline connects the TTF (Dutch) market area with the NBP (British) market area. Until the end of 2019, the BBL was only able to physically transport gas from the Netherlands (Julianadorp) towards the United Kingdom (Bacton) with a capacity of 494 GWh/d. Since then, the BBL Company is able to operate the BBL pipeline bi-directionally, with a capacity of 168 GWh/d from the United Kingdom to the Netherlands. Currently, the operator of the BBL is investigating the possibility to provide a service to raise the capacity towards the Netherlands on best effort base.

7.1.6 Expansion of the LNG import capacity

In 2022, following the gas crises, the LNG feed-in capacity in the Netherlands was greatly expanded. This was the result of the realization of two initiatives.

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[27] The exact date of commissioning will be communicated via the official channels (REMIT messages)

Expansion of send-out capacity GATE terminal (GATE)
In September 2021, GATE had a send-out capacity of 17.5 GW (approximately 130 TWh per year). This was increased in a number of steps to 21 GW (approximately 160 TWh per year) by September 2022.

EemsEnergyTerminal (EET)
In 2022, and within six months, a new FRSU (Floating Storage and Regasification Unit) LNG terminal was developed in the Dutch Eemshaven. With this realization approximately 10 GW (approximately 80 TWh per year) of additional LNG feed-in capacity has been created.

7.2 Measures under preparation

7.2.1 Compression modifications to accommodate changed gas flows

Due to the changed gas flows, the Wijngaarden, Ravenstein and Scheemda compressor stations have become crucial for the flow of LNG that is fed into the Maasvlakte and for the import of gas via Zelzate. These compressor stations must now be able to operate with different flow directions to what they were originally designed for. GTS must therefore take a number of measures to effectively utilise these compressor stations.

7.2.2 Connection requests for LNG feed-in

GTS has received several connection requests from parties wishing to feed in LNG into the GTS' gas transport network. If the LNG projects underlying these connection requests are realised, GTS must, in accordance with its statutory duty, provide these parties with a connection to the national gas transport network. When the required measures to accommodate these requests are realized extra LNG can be fed into the GTS network.

7.2.3 Expansion of the Gate LNG Terminal, including entry capacity

Since 2016 the owners of Gate terminal B.V. (Gate) considered plans to expand the terminal's capacity. The expansion plans of GATE are based on market developments and consequently potential parties to re-gasify LNG at Gate. As of august 2023 Gate terminal construction of a 4th LNG tank has commenced. GTS has the statutory task to develop the network in the Netherlands. This network development is based on the market needs, in this case a request for more entry capacity. Economical assessment of such individual project will lead to setting appropriate contractual conditions to execute such investment. The LNG terminal leads to more diversification of gas (import) options.

7.2.4 Takeover of a NAM pipeline

In 2022, the conversion of Grijpskerk UGS from H-gas to L-gas started, and the UGS can now act as a back-up in the G-gas/L-gas market. The switch is part of the efforts being made to terminate production from the Groningen field. With the takeover of the NAM pipeline the full use of the disposal capacity of the UGS can be realized.

7.3 Measures under consideration

7.3.1 Expansion of LNG import capacity

The possibility to exploit new LNG-import facilities is currently being examined by different private parties. Continued effort is being made towards the investigation of a suitable location for the realization of an LNG-import terminal in Zeeland. A proposal to start a procedure of the "Rijkscoordinatieregeling" has been submitted to the ministry of economic affairs and climate. Another initiative is currently investigating the possibility to operate an offshore LNG-import facility in the North-Sea.

8. Public service obligations

In the Netherlands, the main tasks safeguarding the security of supply are assigned to the TSO GTS as a public service obligation. These comprise of the three "pillars" mentioned in paragraph 4.2, and which are detailed below:

8.1 Pillar I: Peak supply a responsibility of GTS
According to the Dutch Gas Act, suppliers of household customers must have sufficient resources to deal with the maximum demand associated with a day where the average effective temperature is -9ºC. The obligation for security of supply (peak supply) is allocated to GTS.

On the basis of the 'Decision Security of Supply Gas Act', GTS is legally responsible to annually contract (transparent, non-discriminatory and marked based) both the capacity and the volumes that are necessary in order to be able to supply the additional amount of gas to the small consumers market in the Netherlands when average daily effective temperatures are between -9ºC and -17ºC (so called peak supply).

The contracts related to peak supply may only be claimed by GTS on the day when official weather forecasts predict an effective daily temperature for the next day in the city of De Bilt with a maximum of -9ºC. When there is no effective -9ºC or lower situation, the capacity and volume can be used by the market. It should be noted that Dutch protected customers are supplied in majority with locally produced gas.

Under the -9ºC/–17ºC conditions end-suppliers pay for the required capacity and volume they get delivered from GTS and together with the capacity and volume the suppliers already contracted up to -9ºC the protected customers can be supplied. The ACM monitors this process.

In the Dutch balancing regime it is not possible to wait for the end of the gas day to allocate the peak supply amounts. As shippers are responsible for balancing their portfolio, it is necessary to allocate the amount of gas delivered by GTS near real time and to adjust the portfolios accordingly. Therefore, the allocation rule is: if during an hour in a portfolio, the sum of all allocations for household customers exceeds the capacity for that portfolio associated with a -9ºC day, the excess volume will be allocated to the shippers as a peak supply delivery by GTS. The capacity associated with a -9ºC day is equal to the exit capacity that is invoiced in winter (December/January/February).

As peak supply is related to the weather pattern during a day and its resulting demand. This means that actual peak supply is only delivered during a few hours a day (morning/evening peak). This implies that peak supply can be delivered during several days.

Calculations show that the additional cost for the stricter standard than the minimum security of supply standard are relatively small. As stated in 4.3. the volume reserved by GTS for peak supply in a 1:50 situation is about 95 mcm. This is 0.1% of the amount of gas annually transported by GTS. Lowering the standard to a 1:20 would reduce this volume demand with 2% of 95 mcm. This is 1.9 mcm (G-gas) which is 0.0025% of the amount of gas annually transported by GTS. This amount is so low because it is the peak of the peak demand.

Also the reserved transport capacity that can be made available to the market if the standard should be lowered to a 1:20 situation is very limited since the capacity applied for this purpose was created specifically for this. The reserved exit capacity is exit capacity on exit-points to regional distribution networks.

The ACM monitors this legal obligation of GTS.

8.2 Pillar II: a licensing system for suppliers of protected customers
There is a licensing system for suppliers of protected customers in the Netherlands. Suppliers of these small consumers are set standard requirements, amongst others through chapter 5

of the Dutch Gas Act and the "Decision license for delivering gas supply to small consumers." A supplier can get his license from the ACM) only when he can prove his ability to provide his customers in the circumstances stipulated in the license. The ACM publishes the companies with such a license on its website.

The requirements to gain a permit can be summarised along the four following main requirements (which are supervised by the ACM):

- The obligation to supply to any small customers (protected customer) who requires so.
- The obligation of a constant reliable supply.
- The obligation to apply fair tariffs and fair conditions.
- The obligation to be organisationally, financially and technically sound.

Suppliers that have a permit need to live up to 4 requirements:

- The obligation to supply to any small customers (protected customer), to collect the transport fares and to transfer this money to the regional network operators.
- The obligation to timely inform the ACM about organisational, financial and technical changes.
- The obligation to provide information to the ACM about the result of the business undertaking. And the obligation to provide clear, understandable information to its customers about billing and contract wise.
- The obligation to inform ACM about new tariffs, tariff changes, supply conditions and the gas quality.

Via this licensing system ACM ensures its regulatory oversight delivers security of supply to protected customers.

8.3 Pillar III: GTS to take action in case of bankruptcy of a supplier

On the basis of the aforementioned 'Decision Security of Supply Gas Act', GTS is also legally responsible for the uninterrupted supply of gas to protected customers in case of a bankruptcy of a supplier, by guaranteeing the payment to producers and by the co-ordination of the re-distribution of protected customers of the bankrupt supplier among the remaining suppliers. In such a case GTS has a coordinating task to make sure that the customers of the non-compliant supplier continue to receive gas. Non-compliance of a supplier does not imply shortage of gas, and will therefore be solved by the market. In this way these customers can choose a new supplier within a reasonable time without an interruption in their gas supply. Bankruptcy of a supplier does therefore not imply shortage of gas towards the protected customers.

9. Stakeholder consultations

10. Regional cooperation: general aspects

10.1 Regional cooperation
Since the discovery of the Groningen field in 1959 the Netherlands has played an important role in the supply of gas to the North-West European region. Currently this region has one of the worlds' highest levels of gas penetration in households, industries and power plants. The North-West European market represents approximately 50-60% of the total EU-28 peak gas demand.[28]

The North-West European gas transmission grid was built to transport indigenous production from Dutch and UK gas fields to regional demand centres. Yet due to dwindling indigenous production, the requirement to source gas from further afield became a necessity resulting in infrastructure projects undertaken to bring gas to North-West Europe from Norway and Russia, as well as in the form of LNG. Besides an exporting country the Netherlands also became a transit country. As a result, the already intensive regional cooperation only further increased.

With more and more gas supplies originating from distant sources additional local swing is required, mainly through an increase in storage capacity. The link between storages located on German territory and the Dutch gas network is another example of the close regional cooperation.

All these years of cooperation and experience have result in intensive contact with neighbouring TSO's and governments.

10.2 Operational cooperation between TSO's

10.2.1 Cooperation in North-West Europe
TSOs are tasked with running their networks as efficiently as possible either through incentives or other mechanisms, and as such solving constraints on cross-border points is part of the day-to-day operational business of TSOs. Neighbouring dispatching centres work closely together, where required, optimising gas flows and operation of the network in the region.

The dispatching centres of the region have various means to deal with such cross-border issues. For example:
- to swap gas (re-routing), not only bilaterally but also tri-laterally;
- operational Balancing Agreements (OBAs);
- mutual assistance, for instance to reduce fuel gas;
- exchange of personnel, knowledge and knowhow.

All these years of cooperation and experience have resulted in intensive contacts between the neighbouring TSO's in North West Europe. Working with Neighbouring Network Operators (NNOs) is for GTS a common practise as is working nationally with Distribution System Operators.

In case of a constraint at an interconnection point (whether this is due to maintenance, climatic conditions or interruption of supply) NNOs inform each other and relevant shippers immediately through bilateral contacts and through publication on the respective websites. Various actions can be taken to overcome or minimize the constraint. Either through the balancing regimes, or by re-routing gas via other entry/exit points in case the preferred route is constrained.

10.2.2 Regional cooperation within ENTSOG
With the 3rd Energy Package the European Network Transmission System Operators (ENTSOG) was founded. The Netherlands has been an active member from the start.

[28] Gas Regional Investment Plan Northwest Europe 2013

The bi-annual publication of the Ten Year Network Development Plan (TYNDP) and the Gas Regional Investment Plan (GRIP NW) are examples of these new ways of cooperation in North West European.

10.3 Regional cooperation on security of supply between Member States:

10.3.1 Pentalateral Gas Platform – the L-gas risk group

Regional issues related to security of supply are addressed and discussed in the Pentalateral Gas Platform. In this platform the following Ministries responsible for energy policy participate: Belgium, France, Germany, Luxembourg and the Netherlands, while the Commission is sometimes invited as an observer. The Benelux Secretariat provides logistic support. National Regulatory Authorities and TSOs are also sometimes invited.
The L-gas risk group activities have been and are conducted within the framework of the Pentalateral Gas Platform under the chairmanship of the Netherlands who currently acts as the group's coordinator.

10.3.2 Cooperation in other risk groups

Following the requirements of the regulation the Netherlands has participated in and contributed to the activities of the following risk groups:

- Norway and United Kingdom
- Denmark
- Belarus
- Baltic Sea

The results of these risk groups are summarized in this preventive action plan.

11. Regional cooperation: the L-gas risk group

11.1 Calculation of the N-1

The calculation set out below shows that the N-1 score for the entire L-gas region is 114% for 2018, which lies above 100%.

$$N-1\,[\%] = \frac{EP_m + P_m + S_m + LNG_m - I_m}{D_{max} - D_{eff}} \times 100,\; N-1 \geq 100\,\%$$

The calculation of the N-1 value is based upon the input of the four contributing countries. Because of the Russian invasion of Ukraine the situation on the West European gas market has changed. Above that it is assumed that the Groningen field is closed permanently and that the main source of L-gas consists of H-gas conversion in The Netherlands (besides relative small L-gas production and conversion facilities in Germany). The changed situation on the gas market leads to a potential shortage of supply (of H-gas) under extreme (N-1) conditions, for this reason the expected H-gas balance (supply and demand, including H-gas export) in The Netherlands is incorporated in the N-1 calculation.

Where:

EP_m	realistic capacity of entry points, other than production, LNG and storage facilities covered by P_m, S_m and LNG_m: the sum of the realistic capacity of all border entry points capable of supplying gas to the calculated area	H-gas import via pipeline and small fields production)
P_m	maximal technical production capacity (in GWh per day): the sum of the maximal technical daily production capability of all gas production facilities which can be delivered to the entry points in the calculated area.	(production of L-gas in L-gas region: German L-gas production and conversion)
S_m	maximal technical storage deliverability (GWh per day): the sum of the maximal technical daily withdrawal capacity of all storage facilities which can be delivered to the entry points of the calculated area, taking into account their respective physical characteristics	(Entry capacity of all (H+L) storages in The Netherlands and all L-gas storages in Germany, Belgium and France)
LNG_m	maximal technical LNG facility capacity (in GWh per day): the sum of the maximal possible technical daily sent-out capacities at all LNG facilities in the calculated area, taking into account critical elements like offloading, ancillary services, temporary storage and re-gasiifcation of LNG as well as technical send-out capacity to the system.	
I_m	technical capacity of the single largest gas infrastructure (in GW per day) with the highehst capacity to supply the calculated area. When several gas infrastructures are connected to a common upstream or downstream gas infrastructure and cannot be separately operated, they shall be considered as one single gas infrastructure.	(entry capacity of UGS Norg)
D_{max}	total daily gas demand (in GWh per day) of the calculated area during a day of exceptionally high gas demand occurring with a statistical probability of once in 20 years.	Realistic expectation of the market side demand under low temperature conditions (-17°C for The Netherlands and 1:20 year conditions for the other countries). For The Netherlands the realistic expectation of the H-gas export is also added.)

D_{eff}	Measures on the demand-side	Defines as zero.

The following input parameters are used for the N-1 calculation:

GWh/d	Projected data			
	2024	2025	2026	2027
Technical capacity of entry points (EPm)	253	253	253	253
Maximal technical production capacity (Pm)	150	143	134	127
Maximal technical storage deliverability (Sm)	3.912	3.895	3.717	3.717
Maximal technical LNG facility capacity (LNGm)	732	732	732	732
Technical capacity largest gas infrastructure (Im)	801	801	801	801
Market-side demand (Dmax)	5.563	5.049	4.781	4.526
Market-side response (Deff)	0	0	0	0
Result N-1 calculation	76%	84%	84%	89%

Figure 27: N-1 input parameters for the L-gas region.

Figure 27 shows the outcome of the N-1 formula for the period 2024-2027. In all years, the N-1 criterium is below 100%. However the percentage is increasing each year, mainly due to declining market demand.

11.2 Cooperation between Member States

Regional issues related to security of supply are addressed and discussed in the Pentalateral Gas Platform. In this platform the following Ministries responsible for energy policy participate: Belgium, France, Germany, Luxembourg and the Netherlands, while the Commission is sometimes invited as an observer. The Benelux Secretariat provides logistic support. National Regulatory Authorities and TSOs are also sometimes invited, just as the European Commission. The L-gas risk group activities have been and are conducted within the framework of the Pentalateral Gas Platform under the chairmanship of the Netherlands who currently acts as the group's coordinator.
If necessary these arrangements make it possible to scale up rapidly to the political level if needed. The earthquake in Zeeriip in 2018 illustrates this. Directly after this earthquake there has been meeting of the responsible directors-general of the L-gas countries to discuss the situation, followed by bilateral phone calls between the Dutch Minister of Economic Affairs and Climate Policy and his colleagues. This finally led to the creation of the Task Force L-gas Market Monitoring which reports twice a year about the progress of the L-gas market conversion in Belgium, France, Germany and the Netherlands. Also here logistic support is provided by the Benelux Secretariat. Members of the Task Force are the governments, NRAs and TSOs of the four countries, while ENTSOG and the Commission are invited as observers. The reports of the Task Force are by default send to the Dutch Parliament.

11.3 Preventive measures

The preventive measures to enhance the security of supply of L-gas supply and to diminish the dependence on the Groningen field are the following:

- The building of a new nitrogen plant (Zuidbroek II) by GTS. The plant is expected to be operational in gas year 2023/2024 and will be able to produce a maximum of 97 TWh of pseudo L-gas.
- Additional nitrogen purchases by GTS of 80,000 m^3/h at nitrogen station Wieringermeer. This addition leads to an additional production of pseudo L-gas volume of ~24 TWh.
- The required utilization rate of the baseload nitrogen facilities Ommen and Wieringermeer has been increased from 85% via 92,5% to 100%.
- This additional pseudo L-gas production enables the filling the UGS Norg with pseudo L-gas and to deliver pseudo L-gas on the interconnection point Oude Statenzijl.
- Converting nine large-scale users of L-gas in the Netherlands to H-gas or other sources of energy. This would lead to an estimated amount of L-gas saved of ~30 TWh.
- Conversion of the Belgian, French and German L-gas markets to adapt all gas appliances and networks to H-gas supply. For the latest situation on the conversion, see the latest rapport of the Task Force Monitoring L-gas Market Conversion.

These measures make it possible to decrease the need for production from the Groningen field and accelerate the stop of the production from the Groningen field taking into account security of supply.

Next to this the Netherlands will investigate possibilities to decrease gas demand by enhanced energy transition measures (switch to renewable energy sources instead of H-gas). Some of these measures are described in paragraph 5.9.

Annex I: Overview of European and national regulations related to security of supply aspects.

VELIN list of regulation applicable to high pressure pipeline transport
26 Dutch companies involved in high pressure pipeline transport are united in the Dutch Association of Pipeline owners (VELIN).

On its website VELIN has listed all relevant international and Dutch regulations, in Dutch. The list exemplifies the wide extend of regulation which is related to gas transport and is accessible to the general public. See:
(http://www.velin.nl/images/stories/Bestanden/Bericht_wet_en_regelgeving_bij_buisleidingen_final_-_Algemene_Ledenvergadering_13_mei_2013_2.pdf).

General
Below, an overview is given of the most relevant European and national regulations and standards that are applied in the Netherlands. The list includes a variety of regulation topics.

European legislation gas transmission networks
Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010
Common rules for the internal market in natural gas Directive 09/73/EC
Conditions for access to the natural gas transmission networks Regulation (EC) No 715/2009
Commission Regulation establishing a Network Code on Capacity Allocation Mechanisms in Gas Transmission Systems (984/2013/EU)
Commission Regulation establishing a Network Code on Gas Balancing of Transmission Networks (312/2014/EU)
Commission Regulation establishing a Network Code on interoperability and data exchange rules (703/2015/EU)

European legislation assets
Pressure Equipment Directive 97/23/EC
Simple Pressure Vessels Directive 2009/105/EC
ATEX 95 equipment Directive 94/9/EC
ATEX 137 workplace Directive 99/92/EC
Appliances burning gaseous fuels Directive 2009/142/EC
Machinery Directive 2006/42/EC
Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC

Gas transmission and distribution systems – transport (in Dutch)
Dutch Gas Act
Gasvoorwaarden

Gas transmission and distribution systems - operations: secondary legislation and standards (in Dutch)

BEVB Besluit Externe Veiligheid Buisleidingen - 2011
BEVI Besluit externe veiligheid inrichtingen
BRZO'99 Besluit risico's zware ongevallen 1999
NEN-EN 1775 Gasleidingen in gebouwen – max. werkdruk < 5 bar
NEN-EN 12186 Gasvoorzieningsystemen – Gasdrukregelstations voor gastransport en distributie – Functionele eisen
EN 13480 Metalen industriële leidingsystemen
NEN 1059 Eisen voor gasdrukregel- en meetstations met een inlaatdruk lager dan 100 bar; Nederlandse editie op basis van NEN-EN 12186 en NEN-EN 12279
NEN-EN 15001, deel 1 en deel 2
Gasinstallatieleidingen met bedrijfsdrukken groter dan 0,5 bar voor industriële en niet-industriële gasinstallaties
NEN 1091 Veiligheidseisen voor stalen gastransportleidingen met een ontwerpdruk hoger dan 1 bar en lager of gelijk aan 16 bar.
NEN 3650 Eisen aan stalen transportleidingen
NEN 3651 Aanvullende eisen voor stalen leidingen in kruisingen met belangrijke waterstaatswerken
NPR 2760 Wederzijdse beïnvloeding van buisleidingen en hoogspannings-verbindingen
NPR 6912 Kathodische bescherming
NEN-EN 13480 Metalen industriële leidingsystemen
WION Wet Informatie Ondergrondse Netwerken, februari 2008
NEN 3655 Veiligheidsbeheersysteem voor buisleidingen
NTA 8620 Veiligheidsmanagementsysteem voor risico's op zware ongevallen

Appliances for the use of gas: standards (in Dutch)

NEN-EN 656 CV-ketels met een atmosferische brander en een belasting tussen de 70 kW en 300 kW
NEN-EN 676 Gasbrander met ventilator
NEN-EN 746 Industriële installaties voor warmtebehandelingsprocessen, delen 1, 2, 3, 4, 5 en 8
NEN-EN-IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems
NEN-EN-IEC 61511 Functional safety – Safety instrumented systems for the process industry sector

Safety rules regarding explosions: standards (in Dutch)

NEN-EN-IEC 60079 Explosieve atmosferen; Deel 10-1: classificatie van gebieden – Explosieve gasatmosferen
NPR 7910-1 Praktijkrichtlijn voor de Gevarenzone-indeling met betrekking tot ontploffingsgevaar; Deel 1: Gasontploffingsgevaar gebaseerd op NEN-EN-IEC 60079-10

Annex II: Regional chapters for the risk groups in which the Netherlands participates

II.1 North Sea gas supply risk groups

II.1.1 **Norway**
To be provided by the coordinator of the Norway risk group (France).

II.1.2 Low-calorific gas
See chapter 11.

II.1.3 Denmark
(Information provided by the coordinator of the Denmark risk group (Denmark))

II.1.4 **United Kingdom Risk Group**
(Information provided by the coordinator of the Baltic Sea risk group (United Kingdom).

II.2 **Eastern gas supply risk groups**

II.2.1 **Belarus**
(Information provided by the coordinator of the Belarus risk group (Poland).

The Belarus Risk Group serves as the basis to analyse risks related with gas supply disruptions

II.2.2 **Baltic Sea**
(Information provided by the coordinator of the Baltic Sea risk group (Germany)).

Annex III: Detailed explanation of N-1 calculations

Analysis I: Analysis where entry, import and domestic demand are based on realistic expectations at peak circumstances

This analysis is based upon the realistic capabilities of the infrastructure and no consideration is given to export expectations.

Demand side

D real = 3,145 GWh/d
Peak demand (D max) is not changed and also calculated from demand figures of the Klimaat- en energieverkenning 2022 for 2024 of the GTS Investment Plan 2022.

Supply side

EP real = 253 GWh/d
The only entry point where in realistic peak circumstances import of gas can be expected is Norway, for the other entry points connected to Belgium, Germany and the United Kingdom no import is expected at peak circumstances because the capacity is expected to be necessary for own use.

Entry point	Realistic capacity [GWh/d]
Emden EPT (Gassco)	253
VIP THE-H	0
VIP BENE-H	0
BBL company	0

S real (100%) = 3,656 GWh/d
S real (30%) = 3,139 GWh/d
At peak circumstances it is expected that most storages will operate identically as assumed in analysis I, the only exception are the German caverns connected to Oude Statenzijl which are assumed to send both to Germany and to The Netherlands (50%/50%). Resulting table:

Storage facility (GWh/d)	Capacity (100% full)	Capacity (30% full)
EnergyStock	431	431
Norg	801	702
Grijpskerk	620	225
Alkmaar	360	360
Bergermeer	469	446
Epe storages	356	356
Peakshaver	199	199
Oude Statenzijl storages	420	420
Total	3,656	3,139

P real = 763 GWh/d
The value of P is reduced compared to analysis I, because part of the Groningen field is not realistically available at peak circumstance. Only 5 of the 11 remaining clusters of the Groningen field are directly available to meet peak demand.

Entry point	Capacity [GWh/d]
Groningen field (5 clusters)	469
Small fields	294
Total	763

LNG real = 732 GWh/d
The values of the LNG terminals have also been adapted to realistic values. For both terminals the capacity is reduced to the lesser amount based upon supply capacity of the terminal and transportation capacity of the GTS network.

LNG terminal	Capacity [GWh/d]
Gate	492
EET	239
Total	732

I real = 801 GWh/d
In realistic circumstances the single largest gas infrastructure in The Netherlands is UGS Norg, because the expected import value at the Emden import terminal is lower than the expected send out value of UGS Norg.

Results of analysis II in the N-1 formula:

100% UGS deliverability:

$$\mathbf{146\% = \frac{253 + 763 + 3,656 + 732 - 801}{3,145} \times 100\%}$$

Reduced UGS deliverability (30% full):

$$\mathbf{130\% = \frac{253 + 763 + 3,139 + 732 - 801}{3,145} \times 100\%}$$

<u>Analysis II: Analysis where entry, import, export and domestic demand are based on realistic expectations at peak circumstances.</u>

In this analysis the assumptions of chapter 2.4 are further adapted to realistic circumstances by adding the export to neighbouring countries to the "D real" parameter. This is logical because the Netherlands is the only L-gas supplier for Germany, Belgium and France and it

has always been an important transit country for H-gas. Especially in the current situation where Germany is not supplied anymore by Russian gas they are fully reliant on imports from Norway, Belgium and the Netherlands. The results are calculated for two scenarios where the parameters for which the situation is unclear at the moment are varied between two levels. The first (high) scenario is a combination of high supply and low demand, the second (low) scenario is a combination of low supply and high demand, resulting in a bandwidth. Above that the resulting bandwidth is calculated for both the 100% and 30% UGS deliverability.
The parameters for which the situation is unclear and the chosen levels are:

Parameter	Belonging to…	Highest outcome formula [GWh/d]	Lowest outcome formula [GWh/d]
Groningen field	P real	469	0
Oude Statenzijl caverns	S real	420	0
Domestic and L-gas export market	D real	3,525	4,147

Demand side

D real (high) = 4,945 GWh/d
D real (low) = 5,359 GWh/d
The value for this parameter is expanded with the export to neighboring countries, above that is the G/L-gas market (domestic and export) chosen at two levels. The level for the low scenario is based upon the Klimaat- en energieverkenning 2022 scenario for 2024 of the GTS Investment Plan 2022 and L-gas Taskforce group. The value at the high scenario is 90% of the value at the low scenario reflecting the reduced market size caused by high gas prices. The H-gas export is based upon technical capabilities and historical data and it is assumed that this value is not influenced by the gas prices. Resulting values for the demand:

Parameter	Highest outcome formula [GWh/d]	Lowest outcome formula [GWh/d]
Domestic market	2,831	3,145
L-gas export	901	1,002
H-gas export	1.212	1,212
Total	4,945	5,359

Supply side

EP real = 253 GWh/d
The value for EP is the same as in analysis II.

S real (high) (100%) = 3,656 GWh/d
S real (high) (30%) = 3,139 GWh/d
S real (low) (100%) = 3,236 GWh/d
S real (low) (30%) = 2,719 GWh/d
At peak circumstances it is expected that the most storages will operate identically as assumed in analysis I, the only exception are the German caverns connected to Oude Statenzijl where it is not certain that these caverns will send to The Netherlands at peak circumstances, thus also for these caverns two levels are chosen resulting in the following values for the German caverns:

Value at high scenario		Value at low scenario	
Capacity (100%)	Capacity (30%)	Capacity (100%)	Capacity (30%)
420	420	0	0

For the rest of the storages the values are identical to the values in analysis I for both the high and the low level.

P real (high) = 763 GWh/d
P real (low) = 294 GWh/d
The production of the Groningen field is also uncertain, where it is not certain whether the field will be available for production or will be closed. The following values will be used:

Entry point [GWh/d]	Value at high scenario	Value at low scenario
Groningen field	469	0
Small fields	294	294
Total	763	294

LNG real = 732 GWh/d
The value for LNG is the same as in analysis II.

I m = 801 GWh/d
The value for I is the same as in analysis II.

Results of analysis III in the N-1 formula:

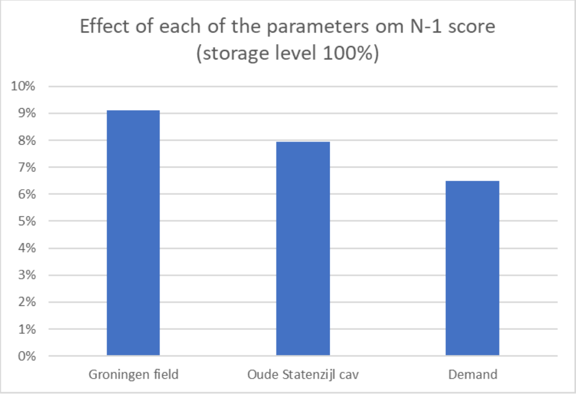
100% UGS deliverability:

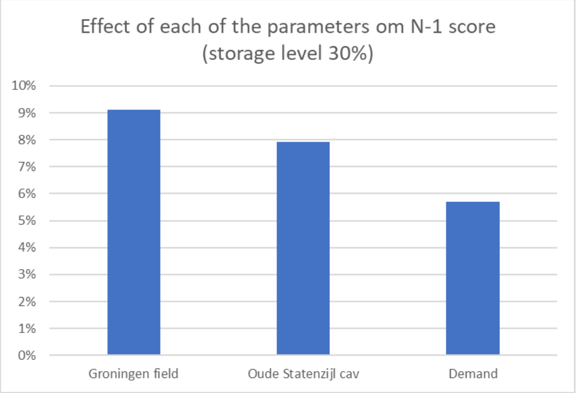
$$69\% = \frac{253+294+3{,}236+732-801}{5{,}359} \times 100\% \text{ to}$$
$$93\% = \frac{253+763+3{,}656+732-801}{4{,}945} \times 100\%$$

Reduced UGS deliverability (30% full):

$$60\% = \frac{253+294+2{,}719+732-801}{5{,}359} \times 100\% \text{ to}$$
$$83\% = \frac{253+763+3{,}139+732-801}{4{,}945} \times 100\%$$

The effect of each of the three parameters (Groningen field, Oude Statenzijl caverns and market demand) on the N-1 score is depicted in the following graphs:





Annex IV: Overview of existing interconnections with other Member States

Existing Interconnections Points	Interconnections with third countries	Names
L-gas cluster		
L-gas	NLD→BEL & NLD→GER	HILVARENBEEK (FLUXYS) ZEVENAAR (OGE/THYSSENGAS) WINTERSWIJK (OGE) ZANDVLIET (FLUXYS-G) OUDE STATENZIJL (GTG NORD-G) TEGELEN (OGE) DINXPERLO (BEW) HAANRADE (THYSSENGAS) OUDE STATENZIJL (GUD-G)[OBEBG]
H-gas clusters		
North East NL	NLD↔GER	VLIEGHUIS (RWE) OUDE STATENZIJL (OGE) OUDE STATENZIJL (GUD-H)[OBEBH] OUDE STATENZIJL (GTG NORD-H)
South West NL	NLD↔BEL	ZELZATE (FLUXYS) ZANDVLIET (FLUXYS-H) ZANDVLIET (WINGAS-H)
South East NL	NLD→BEL & NLD→GER	OBBICHT (FLUXYS) BOCHOLTZ TENP (OGE – FLX TENP) S-GRAVENVOEREN (FLUXYS) BOCHOLTZ VETSCHAU (THYSSENGAS)
North West NL	NLD→UK	JULIANADORP (BBL)
Access to the gas network of the Union		
Norwegian gas	NOR→NLD	EMDEN NPT (GASSCO) EMDEN EPT (GASSCO)
LNG	→NLD	GATE TERMINAL EEMSENERGYTERMINAL (EET)
Access to cross-border storage facilities		
	NLD↔GER	ENSCHEDE (RWE-UGS EPE) ENSCHEDE (ENECO-UGS EPE) ENSCHEDE (NUON-UGS EPE) VLIEGHUIS (RWE-UGS KALLE) OUDE STATENZIJL (ETZEL-EKB-H) OUDE STATENZIJL (ETZEL-CRYSTAL-H) OUDE STATENZIJL (ETZEL-FREYA-H) OUDE STATENZIJL (ASTORA JEMGUM) OUDE STATENZIJL (EWE JEMGUM) OUDE STATENZIJL RENATO (OGE) OUDE STATENZIJL (EWE-H)

Figure 28: Overview of existing interconnections with other Member States.