Preventive Action Plan 2019
The Netherlands

Ministry of Economic Affairs and Climate Policy
Directorate-General for Climate and Energy
The Hague
The Netherlands
30 September 2019

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 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 2019 is an update of earlier Preventive Action Plans drafted under regulation 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. This includes the incorporation of remarks and questions received last year from the European Commission on the previous Preventive Action Plan 2016.

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. United Kingdom, Denmark 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 been consulted as well 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.

Contents and Outline
The primary focus of this Preventive Action Plan is on the risk for the entire gas system. For a correct understanding of the scope and level of detail contained in this Plan it is necessary to recall the overall conclusions of the 2011, 2014, 2016 and 2018 Risk Assessment that there is a negligible risk for a disruption of the gas supply in the Netherlands. It is therefore that this Preventive Action Plan contains no other security of supply measures than those that are already in place based on Dutch regulation.

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 the regional chapter for the 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

Members of the Norway risk group are Belgium, Denmark, France, Germany, Italy, Ireland, Luxembourg, Portugal, Slovakia, Spain, Sweden and the Netherlands.
France coordinates the Norway risk group.

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

1.1.1.2 Low-calorific gas

Members of the L-gas risk group are Belgium, France, Germany and the Netherlands.
The Netherlands 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), and 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 2017 data). The Netherlands is the largest consumer and main supplier of L-gas in the region. 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, France and Germany). L-gas is exclusively supplied from within the L-gas region, there is no import from or export to other regions.

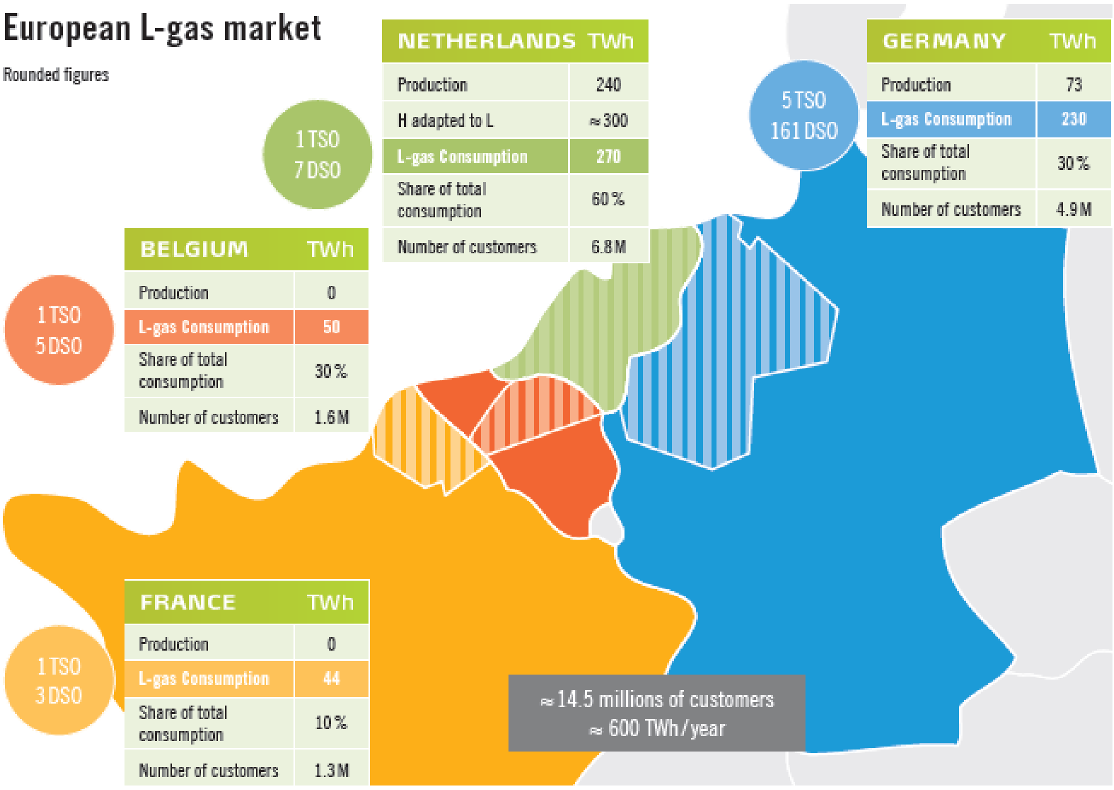

Figure 1: Overview of the L-gas market. Source: Gas Regional Investment Plan North West 2017

Figure 2 gives an overview of the L-gas consumption observed in the last three years[1]. The build environment accounts for more than half of the total L-gas consumption, making the demand sensitive to climatic conditions.

	2015		2016		2017	
	Yearly	Peak	Yearly	Peak	Yearly	Peak
	TWh	GWh/d	TWh	GWh/d	TWh	GWh/d
Build environment	288	5,049	306	5,020	297	5,012
Industry and power generation	263		276		272	
Total	551		583		569	

Figure 2: Historic L-gas consumption, source data supplied by member states

Total L-gas production in the region over the last three years is shown in Figure 3. These figures further illustrate the role of the Netherlands as main supplier of L-gas. Belgium and France only have quality conversion capacity to produce L-gas out of H-gas.

[1] L-gas consumption for power generation is incomplete as the figures for Germany are partly missing.

Year	2015		2016		2017	
Country	Volume produced (TWh)	Maximal daily production capacity (GWh/d)	Volume produced (TWh)	Maximal daily production capacity (GWh/d)	Volume produced (TWh)	Maximal daily production capacity (GWh/d)
NL	495	4,899	528	4,804	519	4,674
DE	75	220	70	220	62	220
FR	0	57	0	57	0	57
BE	0	65	1	65	0	65
Total	570	5,241	599	5,146	582	5,016

Figure 3: L-gas production in the region, source data supplied by member states

Figure 4 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	49	742	698
Alkmaar	NL	5	357	357
Epe Nuon	NL	3	117	117
Epe Eneco	NL	1	95	41
Epe Innogy	NL	3	119	119
Peakshaver	NL	1	312	312
Epe L-Gas (innogy)	DE	2	98	98
Epe L-Gas (UES)	DE	4	238	0
Lesum	DE	2	52	52
Nüttermoor L-Gas	DE	0	24	24
Speicherzone L-Gas (EWE)	DE	10	306	306
Empelde	DE	2	73	73
Gournay	FR	13	248	248
Total		96	3,032	2,696

Figure 4: L-gas underground gas storage facilities

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 France. These can blend the different gasses and/or use nitrogen to produce the required Wobbe-index for low calorific gas.

Figure 5 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	Planned
Rehden	DE	Peak	Operational
Broichweiden	DE	Peak	Planned
Loenhout	BE	Peak	Mothballed
Lillo	BE	Peak	Operational
Loon Plage	FR	Peak	Operational

Figure 5: Quality conversion facilities in the L-gas region

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.
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, Sweden and the Netherlands.
Denmark coordinates the Denmark risk group.

The Danish gas system (figure 1) consists of gas production facilities and pipelines in the Danish part of the North Sea, a transmission system, where gas is transported across the country, and a distribution system through which gas is delivered to the gas customers. Moreover, the gas system consists of a gas treatment facility (Nybro), two underground storage facilities (Stenlille aquifer and Ll. Torup salt caverns) and a compressor station (Egtved). The compressor station at Egtved was established in 2013 in order to enable transportation of gas from Germany to Denmark.

[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.

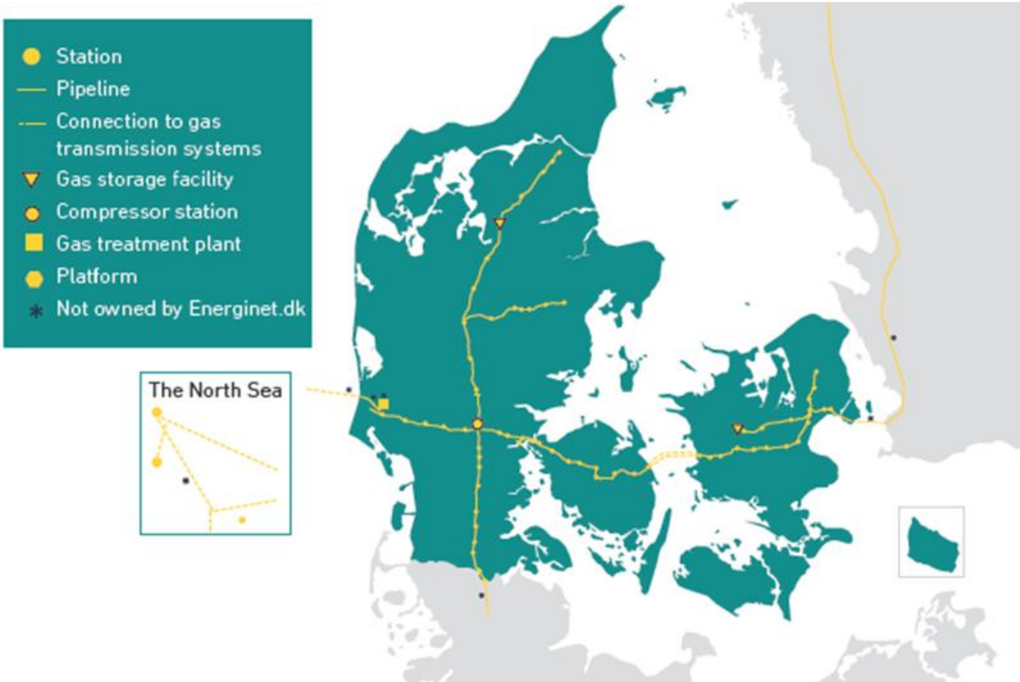

Figure 6: The Danish Gas system.

The Danish gas system has three physical entry/exit points (Nybro, Ellund, and Dragør) through which gas can be supplied to or from the Danish gas market, with Ellund being the only point with physical reverse flow. Furthermore, there are a number of virtual entry/exit points for gas traded within the system (bilateral contracts or gas exchange) and for biomethane.

From Nybro (landfall of Danish North Sea gas) and Ellund (Germany), the gas is transported to customers in Denmark and Sweden or stored at one of the two underground storage facilities.

An overview of capacities and utilisation of the Danish transmission system in 2017 is shown in table 1 below.

Point		Capacity mcm/day	Maximum daily flow 2017 mcm/day
Nybro	Entry	32.4[1]	14.0
Ellund	Entry/Exit	10.8[2]/20.0	4.9/5.2
Dragør Border	Exit	7.2[3]	4.7
The Danish Exit zone	Exit	25.5	16.7
Ll. Torup Gas Storage Facility[4]	Injection Withdrawal (100 %) Withdrawal (30 %) Injection/Withdrawal	3.6 8.0 8.0	3.8/7.6
Stenlille Gas Storage Facility[4]	Injection Withdrawal (100 %) Withdrawal (30 %) Injection/Withdrawal	4.8 8.2 8.2	4.8/6.3

Figure 7: Capacities and utilisation of the gas transmission system in 2017. Note 1: Total capacity of the receiving terminals at Nybro. The potential supplies are smaller today as the Tyra-Nybro pipeline is subject to a capacity constraint of approx. 26 mcm/day, and large volumes cannot be supplied from the Syd Arne pipeline. Note 2: At a calorific value of 11.2

kWh/Nm^3. Note 3: The Swedish system is not designed to receive the firm capacity at the assumed minimum pressure at Dragør of 44 barg in normal operation (Interconnection agreement). Note 4: The Danish storage company dimensions the commercial injection capacity conservatively in relation to the pressure in the gas transmission grid. When the pressure occasionally increases, it is possible to inject more gas into the storage facilities than the specified injection capacity.

1.1.1.4 United Kingdom

Members of the United Kingdom risk group are Belgium, Germany, Ireland, Luxembourg, United Kingdom and the Netherlands.
The United Kingdom coordinates the UK risk group.

See appendix II.1.4.

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, Poland, Slovakia and the Netherlands.
Poland coordinates the Belarus risk group.

See appendix II.2.1.

1.1.2.2 Baltic Sea

Members of the Baltic Sea risk group are Austria, Belgium, Czech Republic, Denmark, France, Germany, Italy, Luxembourg, Slovakia, Sweden and the Netherlands.
Germany coordinates the Baltic Sea risk group.

See appendix II.2.2.

1.2 Description of the Dutch gas system

1.2.1 Configuration of regional grids

In the Netherlands there is a total of 135,000 km of gas pipelines[3]. At the time of writing there were 8 Local Distribution Companies for gas in the Netherlands[4], of which there are 7 operating gas transmission grids for L-gas and 1 for H-gas[5]. On the map, figure 8, the service areas of the different distribution companies for L-gas are indicated.

[3] Netbeheer Nederland, http://www.netbeheernederland.nl/branchegegevens/infrastructuur/
[4] https://www.acm.nl/
[5] ZEBRA Gasnetwerk B.V. operates a high calorific gas transmission grid in Zeeland and Brabant.

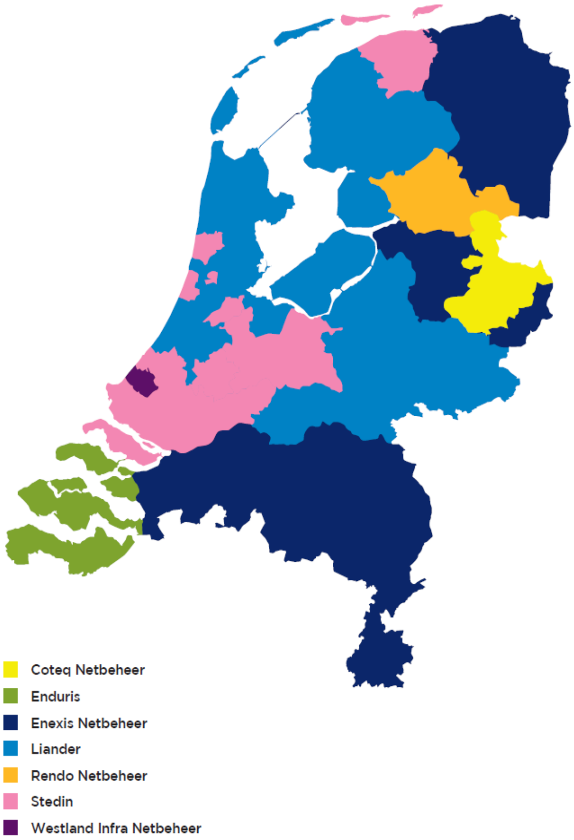

Figure 8: Service areas of the Dutch Local Distribution Companies for L-Gas in 2018. Source: http://www.energieleveranciers.nl/netbeheerders/gas

1.2.2 Configuration of national grid

Of the 135,000 km, 11,000 km is high pressure pipelines, operated by GTS. The high pressure gas network is shown on the map, figure 9. The Dutch high pressure network is directly connected to Belgium, Germany, Norway and the United Kingdom. Through over 1,000 gas custody transfer stations gas is distributed to the Dutch domestic market for example large to industries, power plants and local distribution companies.

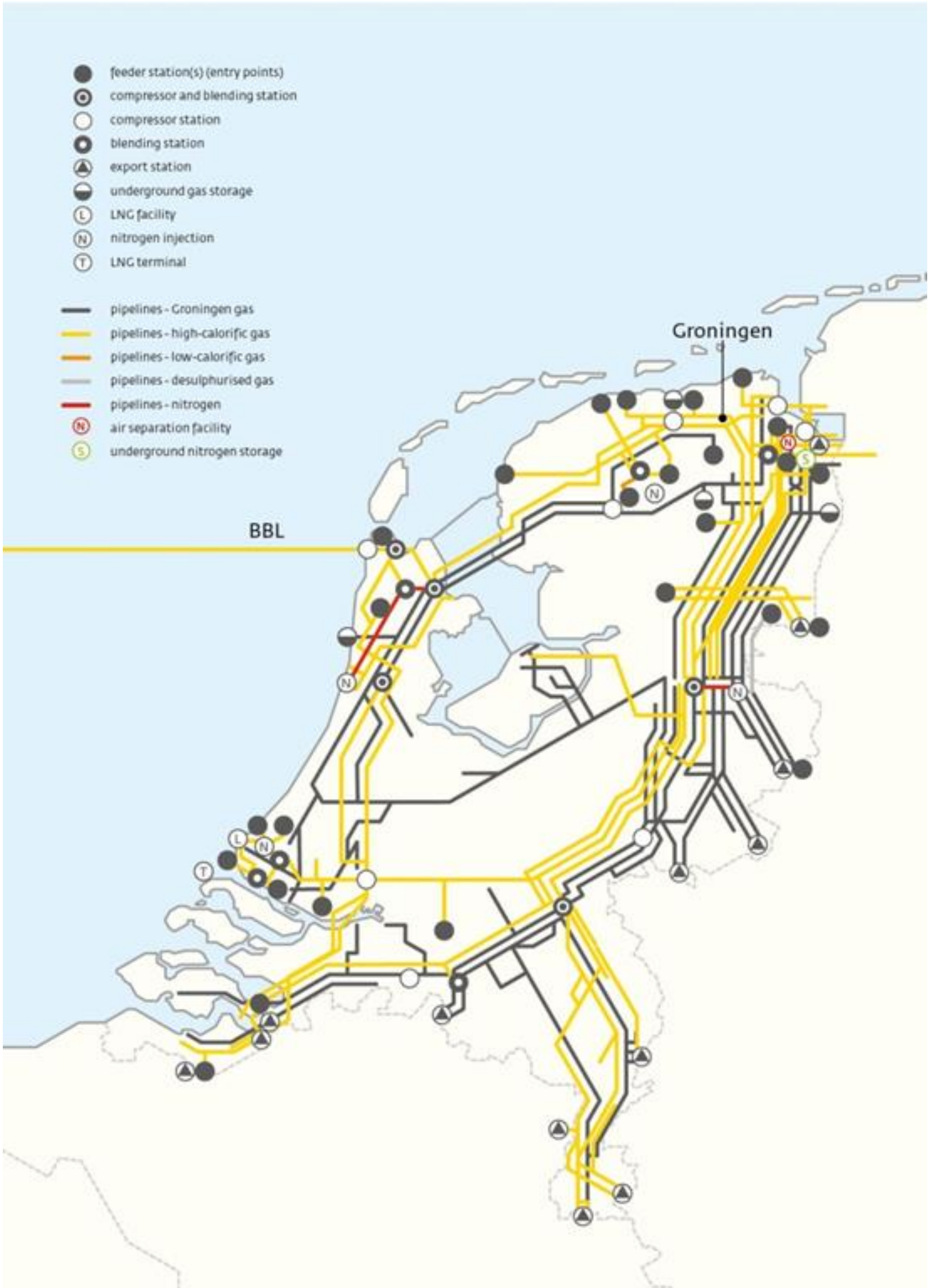

Figure 9: The high pressure gas network in the Netherlands 2015. Source GTS

1.2.3 **Dutch gas market size**

A good illustration of the size of the Dutch gas demand is the fact that peak demand for gas is almost 10 times the size of peak demand for 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 by the figure below, where the gas demand is compared to the electricity demand.

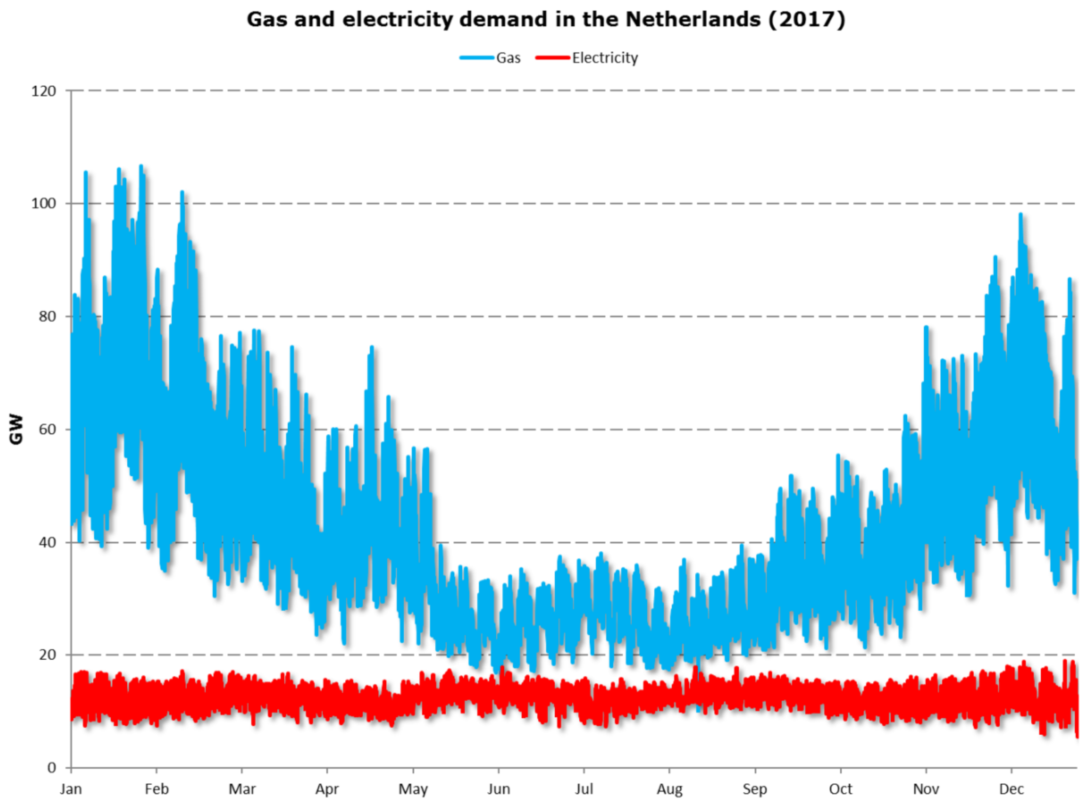

Figure 10: Gas and electricity demand in the Netherlands in 2017. Source GTS, TenneT

In 2017 GTS transported 98.2 bcm. This means that the average Dutch annual gas consumption of 38.3 bcm is less than half of the total volume of gas that annually is transported through the country. This is due to export of indigenous gas and the role of the Netherlands as a transit country. Depending on climatic conditions, the share of L-gas in the domestic gas demand varies from year to year. In 2017, the L-gas demand was almost 25 bcm, roughly 65% of the total gas demand.

	2015		2016		2017	
	Yearly	Peak	Yearly	Peak	Yearly	Peak
	TWh	GWh/d	TWh	GWh/d	TWh	GWh/d
Residential area	112	2,226	119	2,191	115	2,238
Industry and power generation	237	1,503	248	1,457	259	1,440
➢ L-gas	127	943	128	943	128	872
➢ H-gas	110	560	120	514	131	568
Total	349	3,729	367	3,648	374	3,678

Figure 11: Historic gas demand in the Netherlands, Source GTS

While on average national demand slightly decreases, domestic production is on the longer term in strong decline, also due to the recent decision to phase out the production from the Groningen field as fast as possible (see 1.2.5.2.). As a result more volumes have to be imported. Infrastructure has been and will be adjusted to facilitate this. According to the National Network Development Plan of GTS, the Netherlands will become a net importer of gas between 2020 and 2035, depending on considered scenario[6].

6 https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

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 production, LNG, Norwegian gas and Russian gas, while gas coming from the United Kingdom may also flow through the Netherlands. The figures below show the gas flows from and to neighbouring countries and the yearly utilisation rates of the infrastructure that were observed in 2017.

Actual cross-border flows in bcm in 2017				
		L	**H**	**Total**
Belgium				
	To Belgium	9.3	8.8	18.1
	From Belgium	0	4.6	4.6
Germany				
	To Germany	18.9	9.0	27.9
	From Germany	0	10.6	10.6
Norway				
	To Norway	0	0	0
	From Norway	0	23.5	23.5
United Kingdom				
	To the UK	0	2.1	2.1
	From the UK	0	0	0

Figure 62: Actual cross-border flows in 2017. Source: GTS[7]

Utilisation in 2017	Quality	Entry	Exit
Hilvarenbeek	L	n.a.	37%
OSZ-G	L	n.a.	33%
Winterswijk-Zevenaar	L	n.a.	40%
Tegelen	L	n.a.	12%
Haanrade	L	n.a.	48%
Emden-OSZ-H	H	49%	5%
Limburg	H	n.a.	38%
Zandvliet H (Fluxys)	H	n.a.	77%
Vlieghuis	H	n.a.	33%
Julianadorp-Zelzate	H	29%	18%
Dinxperlo	L	n.a.	9%
Zandvliet Wingas	H	n.a.	39%
OSZ UGS	H	16%	13%
Caverns Epe	L	7%	10%
GATE LNG Terminal	H	6%	0%

Figure 13: Yearly utilisation rates. Source: GTS

[7] The actual flows does not include Zebra pipeline or the flows related to cross-border connections to German storages.

1.2.4.2 **Relevant infrastructure for security of supply**
Identification of key infrastructures is based on the relative size and share in the supply mix. The following infrastructures are considered to be of great importance to the security of gas supply of the Netherlands:

- The gas import station at Emden, for being the largest import terminal and the largest single infrastructure in the Netherlands
- The underground gas storage at Norg, for being the single largest infrastructure in the L-gas region and an important source of flexibility for the protected customers in the Netherlands.
- The blending station at Wieringermeer, for being the largest source of quality conversion in the L-gas region to supply the protected customers in the Netherlands as well as elsewhere in the L-gas region.

Because of their importance to the security of supply, the effect of disruption of each 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 to be key infrastructures. It should however 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**
The Title Transfer Facility (TTF) is the virtual gas trading platform in the Netherlands where gas can be traded. Trade on the TTF continues to grow steadily, further strengthening its leading position on the European continent. In January 2018 148 traders were active on the platform, compared to 114 in June 2014. The volume of gas traded on the TTF in 2017 was 20,962 TWh, compared to 13,216 TWh in 2014. This is more than three times the volume of all other continental exchanges put together, making it the most liquid continental hub.
Figure 14 shows the strong growth in the number of parties on the TTF, the increase in traded volumes and the net volume between January 2013 and January 2018.

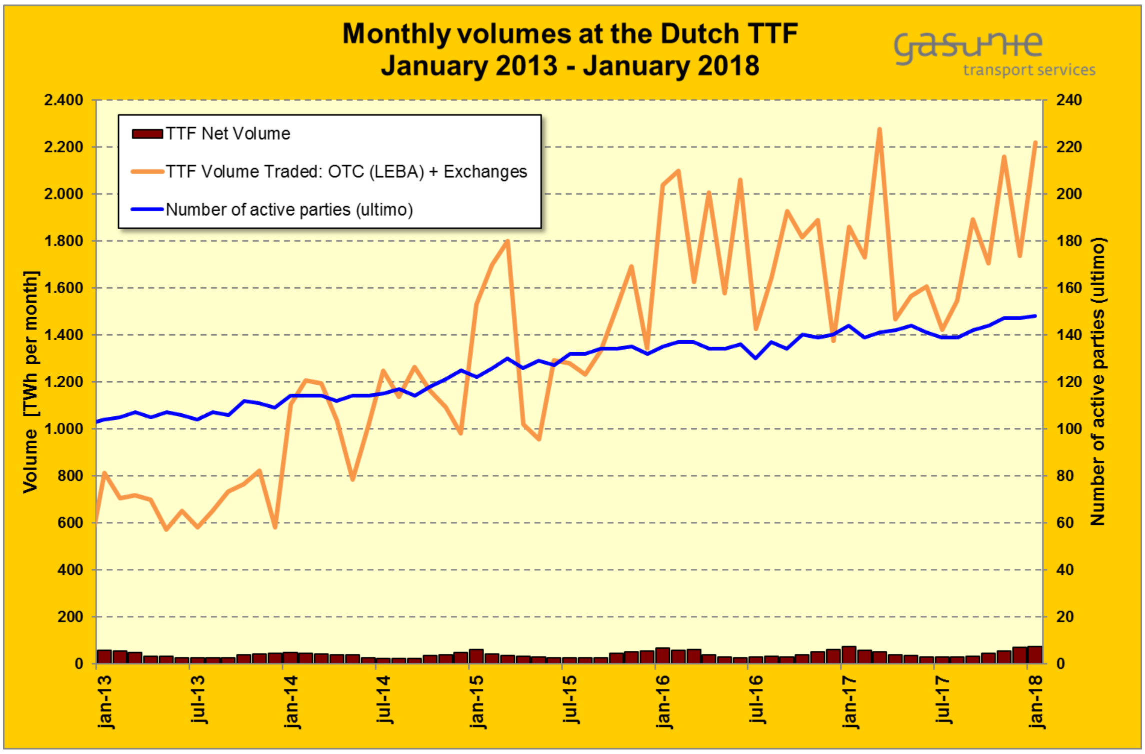

Figure 14: Monthly volumes and number of active participants TTF 2009 – 2017. Source: https://www.gasunietransportservices.nl/over-gts/publicaties

On TTF gas is traded in energy units (kWh), not in specific gas qualities.

1.2.5 **Gas production in the Netherlands**

1.2.5.1 **History of production**

In 1959 one of the world's largest sources of natural gas was discovered in the Netherlands. This Groningen gas field is a giant natural gas field located near Slochteren in the Groningen province in the north eastern 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 of so-called G-gas quality.

The Groningen field has been producing natural gas for more than 50 years. It had an estimated total production volume of 2,800 bcm of which around 20% is in theory still available. In order to save this field, the Netherlands has been dedicated since the 1970s to extracting gas from smaller fields, and the Groningen field is used to provide stability in the provision of energy, the so-called small fields policy. Since then, over 466 small gas fields have already been discovered in the Netherlands, of which the larger part (236) have already been taken into production. Altogether, these small fields provide currently about a third of the total gas production in the Netherlands

For many years total annual production in the Netherlands was about 80 bcm. This has already decreased in the past year and will continue to decrease in the coming years due to lower production levels of the small fields Dutch, production limitations set on the Groningen field and the aim to bring the production from the Groningen field back to 0 as soon as possible following recent earthquakes.

1.2.5.2 **Forecasted indigenous production**

The Figure 715 below details long term Dutch small fields gas production estimates.[8] For the graph the most recent information, dating back to 2017 was used.

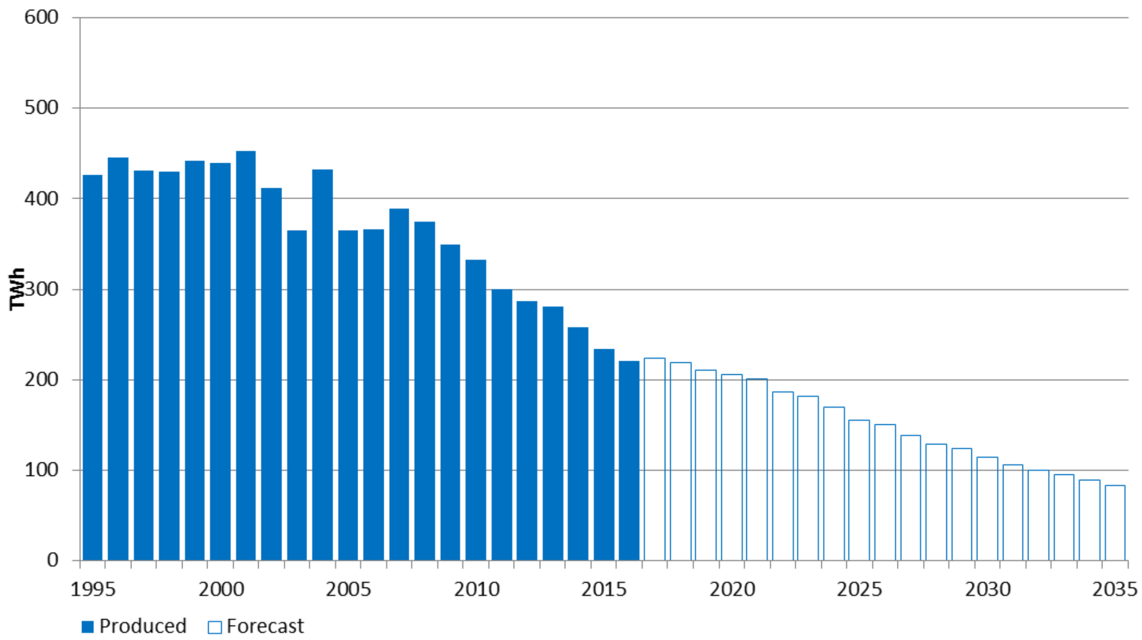

Figure 75: Historic and estimated production of Dutch small fields. Source: GTS

Due to the earthquakes related to the gas production in Groningen the volume allowed to be produced has been restricted in the past years. This has resulted in a reduction of production level from the Groningen field from 54 bcm in 2013 to 23.98 bcm in gas year 2017[9].

[8] https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

[9] https://www.nam.nl/feiten-en-cijfers/gaswinning.html#iframe=L2VtYmVkL2NvbXBvbmVudC8/aWQ9Z2Fzd2lubmluZw==

On the 8th of January 2018 a gas production induced earthquake occurred at Zeerijp in the province of Groningen. Following the advice of the State Supervision of the Mines, the Dutch Minister of Economic Affairs and Climate Policy has decided to reduce the Groningen production as fast as possible to 12 bcm and then continue to 0 bcm e.g. terminate the production from the Groningen field.

To achieve this, GTS will invest in a new nitrogen plant at Zuidbroek which can, starting gas year 2022-2023 produce up to 7 bcm of pseudo L-gas in a cold year. In addition, GTS will purchase additional nitrogen for one of its existing nitrogen facilities which can produce an additional 1 to 1.5 bcm of pseudo L-gas from gas year 2020-2021 onwards. It has also been decided to fill the L-gas storage of Norg (UGS Norg) to the extent possible with H-gas that has been converted into L-gas instead of with gas coming to the Groningen field, while during summer time converted H-gas will be delivered on the interconnection point Oude Statenzijl instead of has coming directly from the Groningen field. Furthermore a law is in preparation which will oblige the nine largest industrial clients to convert from L-gas to H-gas or other sources of energy between gas year 2019-2020 and gas year 2022. Possibilities to accelerate the market conversion in Germany, Belgium and France are also investigated.

In the meantime, it has been decided that the production from the Groningen field may never be more than is required from a security of supply perspective at L-gas regional level, considering the needs of adjacent countries. This means that the blending stations of GTS will produce baseload (on average 100% of blending stations Ommen and Wieringermeer) and the Groningen field together with the other sources (storages) will cover the rest of the demand.

These measure combined have made it possible to lower the allowed level of production from the Groningen field to 11.8 bcm in gas year 2019-2020.

As regards efficiency measures for L-gas, the nine largest domestic industrial consumers have been asked to replace the L-gas in their industrial processes by H-gas or more renewable sources, at the latest by the end of 2022. This process will become part of binding law in the next few years. Moreover, many other domestic (industrial) consumers have been asked to replace their L-gas industrial processes by H-gas or renewable energy, although in a less binding timeframe. In the built environment, the current cabinet aims for a swift, responsible and affordable phasing-out of natural gas, especially towards swiftly driving down demand for Groningen gas. Gas-free new-build properties will already become the norm during the current legislative period.

In addition to these volume reducing measures, it has also been decided to close the production clusters in the Loppersum region of the Groningen field. This will reduce the capacity of the Groningen field by approximately 25% compared to the nominal production capacity as available in the past couple of years.

Because these new circumstances were not known at the time the Security of Supply simulations were performed[10], the disruption scenarios have been recalculated with the latest decisions of the Dutch Minister. In addition to a Norg disruption (Peak and two week) a disruption of the blending station Wieringermeer (Peak and two week) has also been considered.

1.2.6 **Quality conversion facilities**

In addition to the L-gas production from the Groningen field, GTS has the possibility to perform quality conversion. Currently, GTS operates five facilities to dilute H-as with nitrogen to make L-gas[11]. The combined nitrogen production capacity is 627,000 m3/h. Preparation for a sixth

[10] https://entsog.eu/publications/security-of-gas-supply#UNION-WIDE-SIMULATION-OF-SUPPLY-AND-INFRASTRUCTURE-DISRUPTION-SCENARIOS-

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

facility is currently under way, adding an addition capacity of 180,000 m3/h to ensure security of supply while the production from the Groningen field can be reduced further.

Facility		Status	Capacity (Nm3/h N2)
Ommen	Baseload	Operational	146,000
Wieringermeer	Baseload	Operational	215,000
Pernis	Back-up	Operational	60,000
Zuidbroek I	Baseload	Operational	16,000
Heiligerlee (cavern)	Back-up	Operational	190,000
Zuidbroek II	Baseload	Planned	180,000

Figure 16: Overview of quality conversion facilities in the Netherlands, source: GTS

1.2.7 Gas storage in the Netherlands

Indigenous gas production plays 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 role 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.
The following table (Figure 5) was taken from the database underlying the Gas Storage Europe (GSE) map 2016. It lists the storages in the Netherlands. The storage operators provided this data to GSE.

Facility/ Location	Type	Operator	Gas Quality	Working gas TWh	Withdrawal 100% GWh/day	Withdrawal 30% GWh/day	Injection GWh/day
EnergyStock	SC	EnergyStock BV	L-gas	2.8	252.0	252.0	215.0
Grijpskerk	DGF	NAM	H-gas	27.7	719.3	630.0	172.9
Norg	DGF	NAM	L-gas	48.7	758.9	698.0	448.8
Alkmaar	DGF	TAQA Energy BV	L-gas	5.0	356.5	356.5	39.6
Bergermeer	DGF	TAQA Energy BV	H-gas	45.6	634.5	425.1	467.8

Figure 17: Storage facilities in the Netherlands.
Source: http://www.gie.eu/index.php/maps-data/gse-storage-map (Norg, Alkmaar and EnergyStock store G-gas, the other storages store H-gas).

UGS Norg is directly connected to the Groningen field via the dedicated NorGron pipeline. As such, UGS Norg is considered to be part of the Groningen gas production system. However, in future the UGS Norg will be filled with growing levels of converted H-gas.
Besides access to storages located on Dutch territory, the Dutch gas network has access to German storage facilities. Figure 18 below shows the capacities at Interconnection Points connecting these storages and the GTS grid.

Location	NWP	Gas quality	Entry capacity (GWh/d)	Exit capacity (GWh/d)
Cluster Enschede/Epe storages	Cluster	L	314	168
Enschede (Eneco-UGS Epe)	301397	L	94	48
Enschede (Innogy-UGS Epe)	301198	L	103	53
Enschede (Nuon-UGS Epe)	301309	L	118	84
Cluster Oude Statenzijl storages (H)	Cluster	H	816	590
Oude Statenzijl (Astora Jemgum)	301391	H	564	564
Oude Statenzijl (Etzel-Crystal-H)	301400	H	362	259
Oude Statenzijl (Etzel-EKB-H)	301360	H	396	278
Oude Statenzijl (Etzel-Freya-H)	301401	H	259	245
Oude Statenzijl (EWE Jemgum)	301453	H	564	564
Oude Statenzijl (EWE-H)	301361	H	216	209
Oude Statenzijl Renato (OGE)	301185	H	286	271

Figure 88: Capacities at Interconnection Points connecting German storages to the GTS grid Source: NOP Appendix VI, https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

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. The terminal currently has a throughput capacity of 12 bcm per annum and consists of three storage tanks, two jetties and a process area where the LNG is regassified. Annual throughput capacity can be increased to 16 bcm in the future. The terminal dovetails with Dutch and European energy policies, built on the pillars of strategic diversification of LNG supplies, sustainability, safety and environmental awareness. The initiators and partners in Gate terminal are N.V. Nederlandse Gasunie (Gasunie) and Koninklijke Vopak N.V. (Vopak). The Gate terminal is an important factor in importing gas from other countries and sources into Europe. It increases the security of supply and also enables new players to enter the European gas market.

1.2.9 Role of gas in power generation

Traditionally, gas fired power generation played an important role in the supply of electricity in the Netherlands. This is illustrated in the figure 19 below, which shows the installed power generation capacities of the various sources. Since 2015, gas fired installed capacity slightly decreased, due to closure and mothballing of power stations. Current installed capacity is almost 15 GW, roughly 40 percent of this capacity is decentralised generation (CHP).
In 2000, gas fired power plants provided almost 60 percent of all electricity in the Netherlands. In 2015, the market share of gas fired generation dropped to slightly more than 40 percent[12], despite an increase in available generation capacity. This illustrates that gas fired generation increasingly becomes source of flexibility. This trends is expected to increase as more intermittent generation comes online.

[12] Source: Nationale Energieverkenning (PBL, 2017)

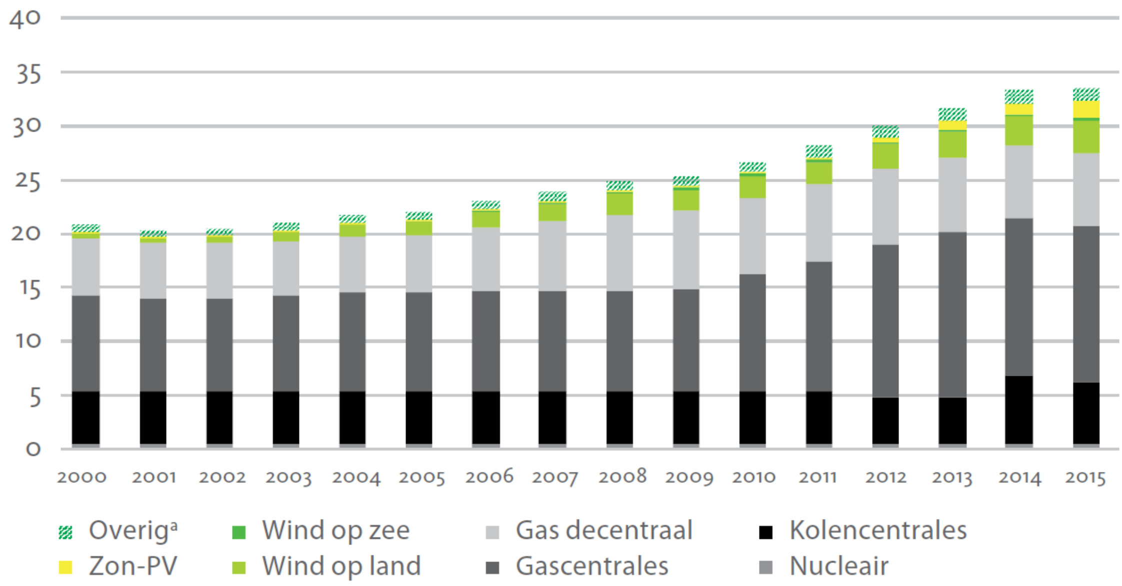

Figure 19: Installed capacity for electricity generation in the Netherlands, source: Nationale Energieverkenning (PBL, 2017)

During an emergency and on reasonable grounds, upon a request of the relevant electricity or gas transmission system operator a Member State may decide to prioritise the gas supply to certain critical gas-fired power plants over the gas supply to certain categories of protected customers.
The Netherlands uses four criteria to determine if a gas fired power plant is considered critical:

1. Power plants that cannot be missed because of their high share in the total generation capacity,
2. Power plants that are needed to balance the electricity grid (this function becomes more important with increasing installed capacities of intermittent generation like solar pv and wind power),
3. Power plants that have a black start function,
4. Power plants that are critical for continued operation of vital infrastructures, like telecommunications, natural gas production and transmission or vital industries.

The gas-fired power stations that meet these criteria change over time. As a consequence, the selection of critical gas-fired power plants is a continuous collaboration between the TSOs for electricity (TenneT) and gas (GTS).

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

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

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

(information provided by the coordinator of the Denmark risk group (Denmark))

Denmark and Sweden are facing a period where the supply may be tight in the event of exceptional high demand or in case of a serious technical incident due to the forthcoming reconstruction of the Tyra complex in the Danish North Sea. Denmark and Sweden will from November 2019 to July 2022 be almost fully dependent on gas supplies from Germany via the interconnection point Ellund.

ENTSOG's security of supply simulations (volume incidents, not sudden hydraulic incidents) based on a technical interruption of all supplies from Germany under normal weather conditions indicate that it will be possible to supply the Danish and Swedish market. It is a precondition that the market actors have sufficient gas in storage to handle such a critical situation.

Energinet and Gasunie Deutschland (GUD) have analyzed a situation where 35% of the gas supply from Germany is interrupted. Even with reduced supply from Germany it will be possible to supply the Danish and Swedish market for 30 days under cold weather conditions.

The worst case will be a situation with no supplies from Germany due to a technical failure. In such a situation it will not be possible to supply the total Danish and Swedish market and it will be necessary to immediately declare Emergency in Denmark and Sweden in order to reduce the consumption and thereby ensure supplies to the protected customers in Denmark and Sweden.

In order to mitigate the risks the following steps have been taken:

- Investment in increased withdrawal capacity at Lille Torup storage facility; to be completed in 2019.
- Energinet has been in dialog with GUD on technical issues to in-crease the firm capacity at Ellund. This resulted in an extra 1 GWh/h offered by GUD in a PRISMA auction in July. The capacity was not booked. However, GUD has decided to increase the capacity, which will be available for the distribution company in Schleswig-Holstein. The capacity available in Ellund to Denmark and Sweden offered by GUD to-day (2018), continues to be available.

2.1.1.4 **United Kingdom**
See appendix II.1.4.

2.1.2 **Eastern gas supply risk groups**

2.1.2.1 **Belarus**
See appendix !!.2.1.

2.1.2.2 **Baltic Sea**
(information provided by the coordinator of the Baltic Sea risk group (Germany))

According to the regulation, each Member State shall ensure that in the event of a disruption of the single largest infrastructure the necessary measures are taken in order to continue to supply the market. This is the infrastructure criterion. With its geographical location in the middle of Europe, Germany plays a central role as a consumer and transmission country, hence Germany is a member of seven risk groups and chairs the Baltic Sea Risk Group.
The Baltic Sea risk group is chaired by Germany and made up of the following countries: Austria, Belgium, Czech Republic, Denmark, France, Germany, Luxembourg, the Netherlands, Slovakia, Sweden.

The description of the gas infrastructures in the various Member States reveals a tightly meshed gas infrastructure in this region. This risk group has a variety of supply sources and routes at its disposal.

The risk group possesses considerable storage capacity. Germany alone has more than 40 gas storage facilities and the second highest storage capacities in Europe (if Ukraine is included). In combination with the storage capacities in the other countries in this area, this region is capable of ensuring a very high level of security of supply.

Further to this, a considerable amount of investment is currently planned in the region. The majority of the investment in Germany will have a direct and positive impact on the interconnection capacities with neighbouring Member States. Additional transport capacities have a positive effect on the trading markets, since different transport routes and supply sources can be used.

The trading markets in this region are also characterised by a high level of liquidity, which also has a positive impact on security of supply. The Title Transfer Facility (TTF) in the Netherlands and the two German market areas, Gaspool and Net Connect Germany (NCG), are trading places with some of the highest liquidity in Europe.

The region meets the N-1 standard. The calculation of the N-1 standard has been undertaken for the two leading entry points into the region, Greifswald and Velke Kapusany. Both calculations show that the N-1 standard is well above 100%. This will improve further in the future as a host of infrastructure measures will be realised which will further increase the import capacities.

The risk group has not identified a risk to which it feels particularly exposed. Risks do of course exist, particularly technical ones which cannot be entirely excluded, as was shown in 2017 by the Baumgarten incident. But at the same time one has to say that the gas infrastructure in this region displays a high level of resilience due to significant redundancies. The scenarios defined in this risk group cover the widest possible range of disruption, irrespective of the risk event triggering the disruption.

The analysis has shown that all the Member States in this risk group are capable of coping with the defined disruption to supply and interruption scenarios without external support, i.e. using the infrastructure available to them and by using alternative sources of gas, such as liquefied natural gas (LNG), without any impact on supply being expected. Furthermore, the Member States in this risk group are not reliant on support from neighbouring countries, and no cross-border effects or repercussions have been identified.

The resilience of this risk group to exogenous supply shocks is bolstered by domestic production, alternative gas imports, existing storage capacities and liquid and developed gas markets. Supply can be maintained even in the case of extreme scenarios.

2.2 National risk assessment

The analysis presented in the Dutch National Risk Assessment demonstrates that the gas supplies may be considered reliable for the forthcoming years. Calculations of the N-1 formula show that the gas transmission system meets the requirement of the infrastructure standard. Disruption scenarios for demand situations such as the two coldest weeks of the last 20 years and peak demand as well as for the disruption of UGS Norg show that disruptions can be handled. Furthermore, there have been no particular social, technological and economic risks identified.

More in detail the following scenarios have been assessed on top of the afore mentioned scenarios of the L-gas risk group:

- Disruption of the two largest infrastructures (Emden and UGS Norg) for their total capacity.
- Disruption of UGS Norg and the entire Emden/Oude Statenzijl entry capacity
- Disruption of Emden and the GATE LNG terminal.
- L-gas export fully honoured despite disruption of the largest infrastructure (Emden).
- L-gas supply without Groningen.

Only the last scenario leads to a situation in which the remaining supply is not sufficient to meet all L-gas demand. So this scenario assessment confirms the dependence of L-gas supply in the Netherlands and its neighboring L-gas consuming countries on the availability of Groningen. 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. The Dutch government decided to reduce production from the Groningen field as fast as reasonable possible and ultimately to close down de field completely (see 1.2.5.2.). However the effect of decreased L-gas production from the Groningen field on security of the gas supply, in the Netherlands and the other countries of the L-gas region has always been part of the assessments on the allowed production from the Groningen field and will be part of future assessments on the allowed production.

2.3 Summary of identified risks

In the common L-gas risk assessment and in the national risk assessment a number of disruption scenarios were analyzed. In all but one of these scenarios, the security of supply in the Netherlands proved to be more than sufficient. However, these assessments also confirmed the dependence of L-gas supply in the Netherlands and its neighboring countries on the production from the Groningen field. Although the failure of the entire field (consists of multiple

feeding points and separate power supplies) is highly unlikely from a technical point of view, there is a political risk of closing the entire field in case the safety in the Groningen area is threatened by major earthquakes.
This risk, however, is already recognized for some time. Therefore, the Dutch government already announced that it will invest in several measures to reduce the required production from the Groningen field in order to reduce the earthquake risk. The ultimate goal of these measures is to completely close down the entire Groningen field, provided that the security of supply in the L-gas region is maintained. Currently three measures are already under preparation:

- Substantial additional nitrogen production capacity at Zuidbroek,
- Additional nitrogen purchases for existing blending stations.
- Increase the utilization rate of the baseload nitrogen facilities to 100%.
- Conversion of major L-gas customers to H-gas.
- Filling UGS Norg with growing levels of pseudo L-gas.
- Deliver pseudo L-gas on the interconnection point Oude Statenzijl to the extent possible.

Two additional prospects are currently under investigation, which can reduce the dependence on Groningen production even further:

- Decreasing gas demand by enhancing energy transition measures,
- Accelerated reduction of export.

All of these measures are discussed in more detail in chapter 7.

3 Infrastructure norm

In this chapter, the N-1 infrastructure standard is calculated for the entire L-gas region and for the Netherlands as such.

3.1 N-1 for the L-gas region

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%.

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

Where

EP_m: technical capacity of entry points, other than production

P_m: maximal technical production capacity

S_m: maximal technical storage deliverability

LNG_m: maximal technical LNG facility capacity

I_m: technical capacity of the single largest gas infrastructure

D_{max}: total daily gas demand

D_{eff}: demand-side measures

GWh/d	Historical Data			Projected Data			
	2015	2016	2017	2018	2019	2020	2021
Technical capacity of entry points (EPm)*	0	0	0	0	0	0	0
Maximal technical production capacity (Pm)	5,241	5,146	5,016	4,425	4,350	4,186	4,024
Maximal technical storage deliverability (Sm)	2,197	2,176	2,289	2,289	2,289	2,289	2,289
Maximal technical LNG facility capacity (LNGm)	0	0	0	0	0	0	0
Technical capacity largest gas infrastructure (Im)	759	759	742	742	742	742	742
1 in 20 gas demand (Dmax)	5,325	5,270	5,278	5,264	5,221	5,181	5,099
Market-based demand side response (Deff)	2	2	2	2	2	2	2

Figure 20: N-1 input parameters for the L-gas region

There are no L-gas entry points in the L-gas area as all the L-gas comes from locations that are qualified as production locations. The capacity of the blending stations is together with the domestic production of L-gas included in the production capacity. UGS Norg (in the Netherlands) is currently the largest single infrastructure in the L-gas region (the "-1").
In the Dutch system the average daily demand at effective temperature of -17°C is used in the calculations (in accordance with the Dutch Gas Act) and therefore is the basis for Dutch gas demand in the scenarios. Gas demand of protected customers is included in the numbers for peak gas demand. For Germany, Belgium and France the average daily demand for 1 in 20 is used in the scenarios.

Example N-1 calculation for the entire L-gas risk group for 2018

$$114\% = \frac{0 + 4{,}425 + 2{,}289 + 0 - 742}{5{,}264 - 2}$$

The figure below shows the outcome of the N-1 formula for the period 2015-2021. In all years, the N-1 criterium is met. However the percentage is decreasing slightly each year, due to declining production from the Groningen field.

	Historical Data			Projected Data			
	2015	2016	2017	2018	2019	2020	2021
Reference scenario (Norg unavailable)	125%	125%	124%	114%	113%	111%	109%

Figure 19: Outcome of the N-1 calculation for the L-gas region level

3.2 N-1 for the Netherlands

The calculation set out below shows that the N-1 score of the Netherlands lies far above 100%, even with reduced UGS deliverability.

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

100% UGS deliverability:

$$\mathbf{206\% = \frac{1,855 + 2,886 + 3,421 + 399 - 943}{3,692} \times 100\%}$$

Reduced UGS deliverability (30% full):

$$\mathbf{196\% = \frac{1,855 + 2,842 + 3,069 + 399 - 943}{3,692} \times 100\%}$$

All technical capacities are based on hydraulically calculations performed by GTS.

3.2.1 Parameters and sources of the N-1 formula

The Regulation describes how the parameters of the formula should be calculated (see grey text in boxes). This paragraph describes for the Netherlands which value corresponds with which parameter, together with a short description of how the value is determined.

2018 has been chosen as the reference year. The values of the parameters are equal (hourly data x 24) to the data published in (or underlying) the Dutch Network Development Plan

2017.[13] In this public document the calculation of the values is specified. In addition to this the value for the technical capacity of the single largest gas infrastructure was calculated. The parameters make no distinction between G/L-gas and H-gas.

3.2.2 Demand-side definition

Dmax — 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 statistical probability of once in 50 years).

GTS recalculates annually the total expected daily gas demand in the Netherlands for the coming years. For the N-1 calculation, the peak demand figures of the Towards Sustainable Transition scenario of the National Network Development Plan 2017 were used. Demand of protected customers is automatically included when taking account the demand under peak circumstances. Demand-side measures are not applied in the Netherlands and are therefore not included in the D-max calculation.

Dmax = 3,692 GWh/d

3.2.3 Supply-side definitions

EPm — 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.
The connection with the United Kingdom currently only allows for a physical gas flow from the Netherlands to the United Kingdom. However, the BBL Company started a project to make the BBL pipeline bi-directional for 1/3rd of the forward flow capacity, which is planned for completion in July 2019. National Grid will not invest in additional flow capacity from Bacton towards The Netherlands or to other interconnection points in the EU.

The table below (figure 22) gives an overview of the maximum border capacity in GWh/d in 2018. 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.

EPm = 1,855 GWh/d

Entry point (GWh/d)	GTS capacity	NNO capacity	Lesser rule capacity
Emden Ept (Gassco)	943	989	943
Oude Statenzijl (GUD)	78	46	46
Oude Statenzijl (Gascade)	350	298	298
Oude Statenzijl (OGE)	557	162	242
Zelzate (Fluxys)	394	325	325

Figure 22: Lesser rule calculation of entry capacity in 2018

13 https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

Sm — 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 for storage 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. UGS Norg is not included in the figures, because it is considered a production facility (and is therefore included in Pm). Figure3 shows the capacities of all UGS in the beginning (100% full) and near the end (30% full) of the heating season.

Sm (100%) = 3,421 GWh/d
Sm (30%) = 3,069 GWh/d

Storage facility (GWh/d)	Capacity (100% full)	Capacity (30% full)
EnergyStock	252	252
Grijpskerk	719	630
Alkmaar	357	357
Bergermeer	635	425
Epe Nuon	117	117
Epe Eneco	95	41
Epe Innogy	119	119
Peakshaver	312	312
Oude Statenzijl caverns	816	816
Total	3,421	3,069

Figure 23: Capacities of storage facilities

Pm — 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.

Under peak demand and/or emergency situations the maximum production capacity from the Groningen field can be used. Therefore the production capacity for 2018 as projected in the Dutch Network Development Plan 2017 is the input for this variable. On February 1st, the Minister of Economic Affairs & Climate Policy decided to close the production clusters in the Loppersum area of the Groningen field to reduce the risk of earthquakes. The production capacity figures were reduced accordingly.
UGS Norg, directly connected to the Groningen field via to NorGron pipeline, is considered here as a production facility and included in the figures. However, Norg still operates as a UGS so its deliverability depends on the gas volume in storage. In case UGS Norg is only 30 percent filled, its withdrawal capacity is slightly reduced. As a consequence, the production capacity is also slightly lower.

Pm (100%) = 2,886 GWh/d
Pm (30%) = 2,842 GWh/d

LNGm — 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 an LNG terminal, the GATE terminal on the Maasvlakte in Rotterdam.

LNGm = 399 GWh/d

Im — 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.

3.2.4 Identification of the single largest infrastructure

Up until 2015, the UGS Norg was the single largest gas infrastructure in the Netherlands. However in 2016, the two Emden import terminals were merged into one commercial entity, effectively becoming the new single gas infrastructure with the largest capacity.

Im = 943 GWh/d

3.3 Bidirectional capacities

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.

Furthermore, the authorities from the United Kingdom have given a physical bidirectional flow exemption has been given for the BBL pipeline between the UK and the Netherlands until the 28th of September, 2022.
Furthermore, the authorities from the United Kingdom have given a physical bidirectional flow exemption for the BBL pipeline between the UK and the Netherlands until the 28th of September, 2022. Currently gas can only flow from the Netherlands to the UK.

4 Compliance with the supply standard

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 currently the most liquid gas hub on the European continent. This highly effective gas market is supported by a legal framework which safeguards security of supply. It should nevertheless not be forgotten that although infrastructure might be 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.

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[14]

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 van 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[15]. Figure 24 shows that the yearly offtake of category G2A was 1.96 bcm in 2017. The total of domestic offtake was in 2017 38.32 bcm, therefore the yearly offtake of category G2A was 5.13% of the total domestic offtake in 2017. Over the past years this percentage has always been around 5-6%.

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

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%

Figure 24: 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'.[16] 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 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.

[16] 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)

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 25: Overview of lowest temperatures in De Bilt since 1987, source KNMI

Figure 25 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[17] 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.

[17] 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.[18].

[18] 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.

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

The GTS Network Development Plan 2017[19] laid down a number of investments measures that improve the interconnection with other Member States and further diversify gas sourcing in the Netherlands. Each of these projects are in different stages of development:

- Transferring L-gas infrastructure to H-gas,
- Expansion of Gate LNG Terminal,
- Balgzand to Bacton Pipeline reverse flow,
- Additional import capacity at Oude Statenzijl.

In addition, the Dutch government announced that it will invest in several measures to reduce the required production from the Groningen field, this to reduce the earthquake risk. The ultimate goal of these measures is to completely close down the entire Groningen field, provided that the security of supply in the L-gas region is maintained. Currently three measures are already under preparation:

- Substantial additional nitrogen production capacity at Zuidbroek,
- Additional nitrogen purchases for existing blending stations,
- Increase the utilization rate of the baseload nitrogen facilities to 100%.
- Conversion of major L-gas customers to H-gas.
- Filling UGS Norg with pseudo L-gas.
- Delivery of pseudo L-gas on the interconnection point Oude Statenzijl to the extent possible.

Two additional prospects are currently under investigation, which can reduce the dependence on Groningen production even further:

- Decreasing gas demand by enhancing energy transition measures,
- Accelerated reduction of export.

These measures are discussed in more detail in chapter 7

[19] https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

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

Figure 26 gives an overview of existing interconnections with the gas transmission grid in the neighboring countries.

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 (GASCADE-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
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 26: Overview of existing interconnections with other Member States

7.1 Measures to reduce dependence on Groningen

In March 2018 the Dutch government announced several measures to reduce the required production from the Groningen field, to reduce the earthquake risk. The ultimate goal of these measures is to completely close down the entire Groningen field, provided that the security of supply in the L-gas region is maintained.

Currently three measures are already under preparation. Three additional prospects are being discussed, which can reduce the dependence on Groningen production even further. The section below will elaborate on all of these measures.

7.1.1 Measures under preparation

7.1.1.1 Nitrogen plant

The construction of a new nitrogen plant with an expansion of an existing blending station has started. This is because the L-gas that can be produced out of H-gas with the existing nitrogen installations offers a limited prospect of a rapid, large-scale reduction in gas production from the Groningen field. The new nitrogen plant with a capacity of 180,000 m3/h offers the potential for limiting the production of gas from the Groningen field by around 68 TWh (7 bcm) (in a cold year). The new plant is expected to be operational by Q1 2022.
The environmental impact of the new nitrogen plant has been investigated and no negative effects have been found. The new plant may however lead to higher costs for gas consumers since the costs of the plant will be recovered through the transport tariffs.

7.1.1.2 Additional nitrogen purchases

Buying additional nitrogen for one of the existing blending station can further increase the production of L-gas, for which limited measures would need to be carried out in the GTS network. These measures can be in place with effect from gas year 2019/2020 at the earliest. There would be an estimated amount of gas saved from the Groningen field of 10 to 15 TWh (1 to 1.5 bcm).
The measures may lead to a slight increase of the transport tariffs.

7.1.1.3 Converting major L-gas customers

Converting nine large-scale users of L-gas in the Netherlands to H-gas or other sources of energy is one of the measures that can further decrease the use of L-gas. This would lead to an estimated amount of gas saved from the Groningen field of approximately 20 TWh (2 bcm) by 2022.The measures required consist of the construction of new pipelines and of pressure reducing measures in the network or at gas custody transfer stations, due to the fact that H-gas operates at a higher pressure. Modifications to customers' equipment itself will also be necessary. These would include modifications to, or replacement of, burners and turbines so they could handle the higher calorific value and also the greater gas quality bandwidth of H-gas. Some customers use L/G-gas as a feedstock and will have to develop alternatives for this. An additional volume reduction of 2,1 bcm could be achieved if the remaining large scale users of L-gas are converted. However, it is expected that this conversion will take place after the timeframe of this specific preventive action plan (from 2022 onwards).

7.1.1.4 Filling UGS Norg with pseudo L-gas

Building an additional nitrogen installation in Zuidbroek would also mean the production of additional L-gas, even when there is not an all-year-round demand for it. By making it possible 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 can be reduced further. How much further this can be reduced, as well as the associated costs, will be explored in a further study.

7.1.1.5 Delivering pseudo L-gas on Oude Statenzijl

For the reason set out in the previous paragraph it will also be possible to deliver pseudo L-gas on the interconnection point Oude Statenzijl during summer time.

7.1.2 **Potential additional measures**

7.1.2.1 **Decreasing gas demand by enhanced energy transition measures**

Several measures are discussed in the national discussion on the energy transition, which is expected to lead to a CO2 reduction of 49% in 2030 as compared to 1990 levels. A number of proposals have been made concerning the build environment such as new building norms, new ways to finance energy saving measures and a joint approach to reduce energy consumption. An important new decision is the withdrawal of the obligation to connect every house to the gas network . Furthermore, the horticulture sector has announced its ambition to become climate-neutral. Further proposed measures can be found in the Dutch Climate Agreement.[20]

7.1.2.2 **Accelerated reduction of export**

Due to the foreseen natural decline of the Groningen field the Netherlands in 2012 started discussions with the other countries in the L-gas region on the phasing out of L-gas as no other sources of natural L-gas would be available to substitute the production from the Groningen field. Following these discussions, which increased in intensity as a consequence of the earthquakes in the area of Groningen in 2012-2018, Belgium, France and Germany developed concrete plans to phase out L-gas by 2030. (These plans had however to be made anyway as it was originally foreseen that the Groningen field would be exhausted by 2030 following the natural decline of the field.)
After the 2018 earthquake in Zeerijp (see 1.2.5.2.) Belgium, France and Germany were asked if it would be possible to accelerate their plans and/or to identify some quick wins.
Following this request from the Netherlands, Germany identified some quick wins which are currently been implemented. In addition, talks are taking place with France to concerning the overflow of L-gas to H-gas.

7.2 Improvement of interconnection with other Member States

The National Network Development Plan 2017[21] laid down a number of investments measures that improve the interconnection with other Member States and further diversify gas sourcing in the Netherlands. Each of these projects are in different stages of development. These measures are expected to improve the functioning of the EU gas market.

7.2.1 **Transferring L-gas infrastructure to H-gas**

As of 2020 the export of L-gas from the Netherlands to Germany, Belgium and France will be gradually reduced at a rate of approximately 10% per year. The planned annual rate of reduction for Belgium and France is less well-defined than that for Germany, and should be regarded as indicative at this stage. The phasing out of L-gas in Germany, Belgium and France will free up L-gas infrastructure which can be used to transport H-gas. The advantage is that with limited investments, the current infrastructure can be used to transport H-gas to end users. The first project for simultaneous cross-border delivery of L-gas and H-gas to the same operator has already been identified, at the request of Gastransport Nord GmbH (GTG Nord) in Germany. This would involve a new H-gas connection at Oude Statenzijl connecting GTS and GTG Nord, adjacent to the existing L-gas connection.

7.2.2 **Expansion of the entry capacity from Gate LNG Terminal**

Since 2016 the owners of Gate terminal B.V. (Gate) consider 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. 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.

---

[20] https://www.government.nl/latest/news/2019/06/28/climate-deal-makes-halving-carbon-emissions-feasible-and-affordable
[21] https://www.gasunietransportservices.nl/netwerk-operations/onderhoud-transportsysteem/netwerk-ontwikkelingsplan-2017-nop2017

7.2.3 Balgzand to Bacton Pipeline Reverse Flow

The BBL pipeline connects the TTF market area with the NBP market area. At this moment the BBL is only able to physically transport gas from the Netherlands (Julianadorp) towards the United Kingdom (Bacton). Currently, the BBL Company is investing to be able to operate the BBL pipeline (partly) bi-directionally.

7.2.4 Additional import at Oude Statenzijl

In order to transport additional Russian gas supplied by Nord Stream 2 to the Netherlands, network reinforcements in the Nordeuropäische Erdgas Leitung (NEL) and the transmission system of GUD (or alternative routes in Germany) and also in the Dutch transmission systems are necessary. There is as yet no clear indication of a range of potential capacity needs at the Dutch border if and when Nord Stream 2 and NEL expansion are completed, but up to an additional capacity of at least 288 GWh/d the associated investments in the GTS system would be limited to the debottlenecking of the Oude Statenzijl area. Currently, this project is part of the incremental process. This process includes an assessment to determine the viability of the proposed investment and results in an auction process to offer new capacity to the market. The first cost estimate is that the investments for this will be limited to between 0.5 and 7.1 mln. euros or less, depending on the transport route chosen in Germany.

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

A previous draft of the preventive action plan has been shared for consultation with stakeholders in October 2018.

The following stakeholders in The Netherlands have responded to our request for input:

- Gas Storage Netherlands (Vereniging Gasopslag Nederland, VGN)
- VEMW, Dutch Association for Energy, Environment and Water
- Energie-Nederland. Association for Energy companies
- ACM, Authority for Consumers & Markets, Regulator,
- TenneT, TSO for Electricity

Furthermore, a draft of the preventive action plan has been shared with neighbouring countries and the countries that are members of the same risk groups as The Netherlands in October 2018, following the obligations as derived from Regulation 2017/1938.

The comments from the stakeholders were taken into account in this final version, for instance by adding more information on the gas storages (indication of gas quality) as well as on protected customers. However, there were also comments received on the (future) gas production from the Groningen fields which have not been taken on board in this plan, but which will be incorporated in the Dutch emergency plan by explaining what will be done in case the production is not enough to ensure security of supply.
There were no comments received from other Member States.

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.[22]

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.

---

[22] 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
- Denmark
- United Kingdom
- 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%.

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

Where
EP_m: technical capacity of entry points, other than production
P_m: maximal technical production capacity
S_m: maximal technical storage deliverability
LNG_m: maximal technical LNG facility capacity
I_m: technical capacity of the single largest gas infrastructure
D_{max}: total daily gas demand
D_{eff}: demand-side measures

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

GWh/d	Historical Data			Projected Data			
	2015	2016	2017	2018	2019	2020	2021
Technical capacity of entry points (EPm)*	0	0	0	0	0	0	0
Maximal technical production capacity (Pm)	5,241	5,146	5,016	4,425	4,350	4,186	4,024
Maximal technical storage deliverability (Sm)	2,197	2,176	2,289	2,289	2,289	2,289	2,289
Maximal technical LNG facility capacity (LNGm)	0	0	0	0	0	0	0
Technical capacity largest gas infrastructure (Im)	759	759	742	742	742	742	742
1 in 20 gas demand (Dmax)	5,325	5,270	5,278	5,264	5,221	5,181	5,099
Market-based demand side response (Deff)	2	2	2	2	2	2	2

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

There are no L-gas entry points in the L-gas area as all the L-gas comes from locations that are qualified as production locations. The capacity of the blending stations is together with the domestic production of L-gas included in the production capacity. UGS Norg (in the Netherlands) is currently the largest single infrastructure in the L-gas region (the "-1").
In the Dutch system the average daily demand at effective temperature of -17^{0}C, which corresponds with a 1 in 50 peak demand, is used in the calculations (in accordance with the Dutch Gas Act) and therefore is the basis for Dutch gas demand in the scenarios. Gas demand of protected customers is included in the numbers for peak gas demand. For Germany, Belgium and France the average daily demand for 1 in 20 is used in the scenarios. For Belgium this corresponds to a temperature of -11^{0}C

Example N-1 calculation for the entire L-gas risk group for 2018:

$$114\% = \frac{0 + 4{,}425 + 2{,}289 + 0 - 742}{5{,}264 - 2}$$

The figure below shows the outcome of the N-1 formula for the period 2015-2021. In all years, the N-1 criterium is met. However the percentage is decreasing slightly each year, due to declining production from the Groningen field.

	Historical Data			Projected Data			
	2015	2016	2017	2018	2019	2020	2021
Reference scenario (Norg unavailable)	125%	125%	124%	114%	113%	111%	109%

Figure 28: Outcome of the N-1 calculation for the L-gas region

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.

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 by GTS. The plant is expected to be operational by Q2 2022 and will be able to produce around 68 TWh (7 bcm) of pseudo L-gas (in a cold year).
- Additional nitrogen purchases by GTS for one of the existing blending stations to further increase the production of pseudo L-gas. This would lead to an estimated amount of gas saved from the Groningen field of 10 to 15 TWh (1 to 1.5 bcm).
- The required utilization rate of the baseload nitrogen facilities Ommen and Wieringermeer has been set to 100%. This will make it possible to fill the UGS Norg with growing levels of pseudo L-gas and to deliver pseudo L-gas on the interconnection point Oude Statenzijl during summer time.
- 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 gas saved from the Groningen field of approximately 20 TWh (2 bcm) by 2022.
- Conversion of the Belgian, French and German L-gas markets to adapt all gas appliances and networks to H-gas supply.

These measures make it possible to decrease the need for production from the Groningen field to a level lower than 12 bcm/year in gas year 2019/2020.

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

11.3.1 **Conversion of the Belgian L-gas network**

After the Dutch authorities announced the deadlines for a reduction in production, Belgium has developed a conversion plan. Although the date announced by the Netherlands for the beginning of the decrease in exports was 2024, a pilot phase of conversion was carried out in 2016 and 2017. Moreover, as of 2015, the last major industrial zone fueled by L-gas has been converted. No power station is supplied with L- gas anymore.
According to the sector, gas appliances in Belgium as from 1978 are generally compatible with both types of gas but sometimes need their settings adjusted to function properly and safely when switching to H-gas. On the contrary, gas appliances prior to 1978 are generally not compatible, which means they will probably have to be replaced. However, for the sake of precaution, systematic verification by a technician is required to ensure compatibility, to make any adaptations (adjustment for example) and ensure proper and safe operation of the appliances. In most cases, no replacement of the appliance is therefore necessary, but a verification by a qualified technician is strongly recommended.
In 2017, there were about 1.6 million clients connected to the Belgian L-gas network. Synergrid (Belgian federation of transport and distribution networks) has put into place an indicative planning for the conversion of these connections, the details of which are presented in **Fout! Verwijzingsbron niet gevonden.**. In June 2018, approximately 50,000 connections have been converted as the first phase of the conversion plan.
A public information campaign was set up in 2017 and was launched at a press conference of the Belgian Energy Ministers (federal and regional). The indicative conversion schedule was communicated to the population at that time.
Some growth is still observed in the peak consumption by the public distribution, mostly due to new clients being connected to the networks. To take this into account in the future consumption previsions, we adjusted the initial planning by Synergrid with an annual growth of 1.5% (see figure 29).

	Connections to be converted	
Year	Based on 2017	Growth adjusted
2018	53.217	54.015
2019	30.787	31.718
2020	127.663	133.494
2021	238.789	253.442
2022	221.278	238.379
2023	208.077	227.520
2024	91.698	101.771
2025	94.695	106.673
2026	162.419	185.708
2027	126.540	146.855
2028	90.740	106.887
2029	209.141	250.053
TOTAL	**1.655.044**	**1.836.515**

Figure 29: Indicative conversion planning Belgium, with growth

In order to translate the decreasing number of connections into a decreasing L-gas consumption, the assumption has been made that the consumption is proportional to the number of connections on the public distribution (i.e. that each client, apart from the industrial consumers, has roughly the same peak consumption). Based on this assumption and the previous years' winter analyses, figure 26 shows the decrease in consumption by the public distribution (TD) and the industrial customers connected to the transport network (TI).

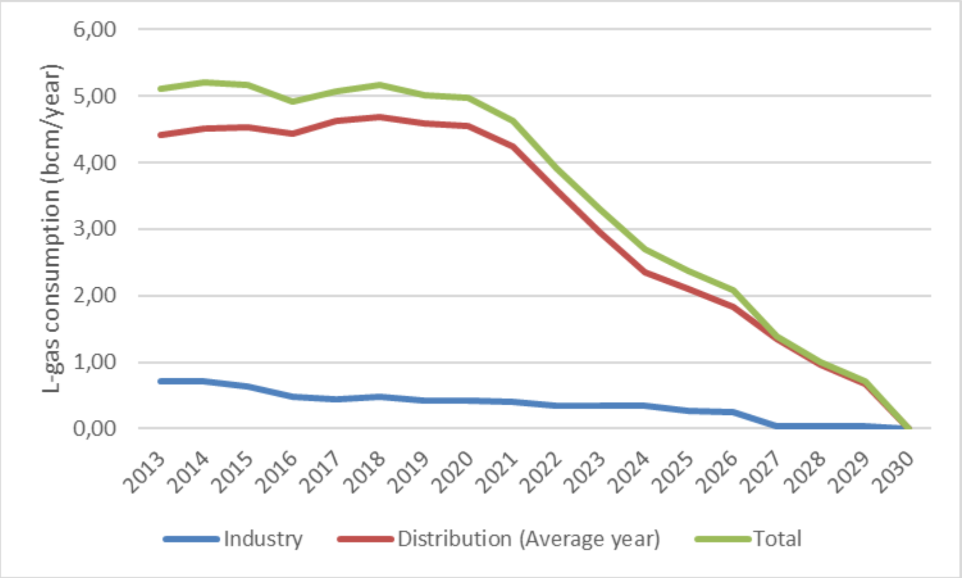

Figure 30: Yearly consumption on Belgian L-gas network (2013-2031)

These feasibility of these measures will be assessed in the forthcoming period.

11.3.2 **Conversion of the German L-gas network**

Specific preventive measures concerning the L-gas situation for Germany are:

- Continuous planning of market conversion in the German Network Development Plan (adaption every two years).
- Early conversion of industrial customers where feasible.
- Blending facility next to Oude Statenzijl will be ready winter 2019/20.
- Amendment of German energy law, that industrial customers do not get access to the L-gas grid if there is a reasonable access to the H-gas grid.

11.3.3 **Conversion of the French L-gas network**

There are about 1.3 million consumers connected to the French L-gas network. For the conversion, the French L-gas network has been split into around twenty geographic sectors. Conversion will be held independently and successively in each sector. A pilot phase of the conversion has been carried out since 2016.

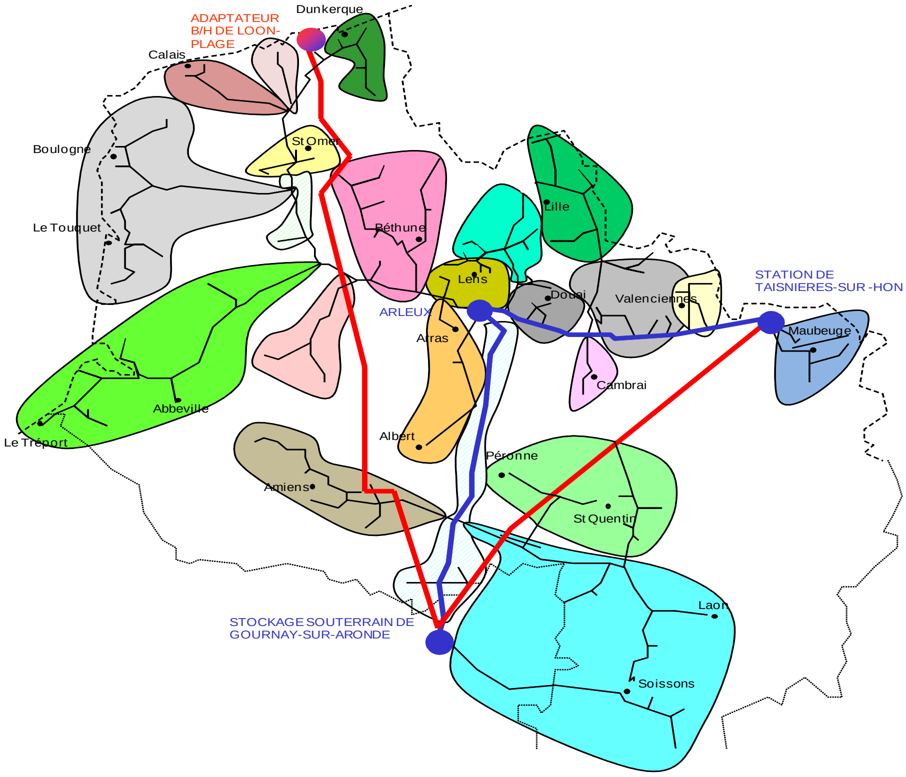

Figure 31: Geographic sectors for the conversion the French L-gas network

In France, there has historically been no requirement for dual-quality gas appliances. Therefore a gas technician has to visit each L-gas consumer to verify the compatibility of its gas appliances with H-gas supply. The operation schedule is established to allow each consumer to be converted to H-gas in 2029 at the latest.

	Estimation of connections to be converted
2019	60.000
2020	45.000
2021	60.000
2022	120.000
2023	180.000
2024	180.000
2025	180.000
2026	200.000
2027	180.000
2028	40.000
2029	
TOTAL	**1.235.000**

Figure 32: Indicative conversion planning France

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))

1. Calculation of the regional N-1
The common risk assessment for risk group Denmark covers a period, where the main source of gas in Denmark and Sweden, the Tyra complex, will be reconstructed and the gas supply to Denmark will therefore be significantly reduced. The main gas source during the reconstruction period is imported gas from Germany. The single largest infrastructure of the area relevant for risk group Denmark is therefore the Ellund entry/exit point. The parameter values based on the current capacities are shown in figure 33 below.

Parameter	Mcm/d	Description
D_{max}	25.5	Total daily gas demand on an exceptional cold day (20 year-incidence with an average temperature of -13 degrees Celsius). The Danish gas demand is expected to be 19.5 mcm/d (including biomethane) and the Swedish gas demand is expected to be 6 mcm/d.
EP_m	10.3	Total technical capacity for all entry points that can supply the calculated area, excluding production, storage and LNG facilities. The value of this parameter is equal to the entry capacity at the Danish side of the Ellund point based on the maximum existing capacity at the German side (the capacity at the Danish side is much higher).
Pm	1.0	Maximum technical production capacity. The forecast for the gas production in the Danish part of the North Sea is used instead of the maximum technical production capacity. In the period 2020-2022 the value of this parameter is expected to decrease significantly from 10.1 mcm/d to 0.5 mcm/d. Furthermore, this parameter includes the Danish biomethane production, which is expected to be 0.5 mcm/d in 2020.
Sm	16.2	Maximum existing technical withdrawal capacity from all storage facilities. The value of this parameter is the sum of the withdrawal capacity at the two Danish storage facilities: Stenlille 8.2 mcm/d and Ll. Torup 8.0 mcm/d. The withdrawal capacities for the two storages are the same irrespective of a storage level of either 30 % or 100 % of the maximum working volume. The capacity of the Swedish Skallen storage facility is not included as it mothballed and will only be commissioned again if it is commercially viable.
LNGm	-	Maximum technical capacity at all LNG facilities. There are no LNG facilities connected to the gas grid in Denmark or Sweden. An LNG facility will be available in Gothenburg. However, it is not assumed connected to the Swedish transmission system
Im	10.3	Technical capacity of the single largest infrastructure. Danish Ellund Entry point.
Deff	0.5	The amount of gas demand that can be covered with market-based demand-side measures. The Danish concept of "commercial interruptibility" entails Energinet to pay gas customers in Denmark and Sweden to voluntarily reduce their gas consumption within 3 hours if the crisis level Alert has been declared in the Danish gas system. Today's level has been chosen as a conservative level.

Figure 33: Demand and capacities before realisation of initiatives.

The increased storage withdrawal capacity (Sm) is shown in the table below.

Parameter	Mcm/d	Description
S_m	**18.5**	Maximum existing technical withdrawal capacity from all storage facilities. The value of this parameter is the sum of the

withdrawal capacity at the two Danish storage facilities: Stenlille 8.2 mcm/d and Ll. Torup 10.3mcm/d. The withdrawal capacities for the two storages are the same irrespective of a storage level of either 30 % or 100 % of the maximum working volume. The capacity of the Swedish Skallen storage facility is not included as it mothballed and will only be commissioned again if it is commercially viable.

Figure 34 Increased storage withdrawal capacity

A summary of the results from all the calculations are shown in the table below.

Largest infrastructure	Im (mcm/d)	N – 1 (%)
N – 1 based on current capacities	10	67
N – 1 based on current capacities with demand-side measures	10	69
N – 1 based on new capacities	12	76
N – 1 based on new capacities with demand-side measures	12	78

Figure 35: Summary of the results

The calculation of the regional N – 1 for the calculated area in risk group Denmark shows that N – 1 < 100 % for all scenarios. Therefore, the calculated regional area does not comply with article 5 (Infrastructure standard) of the Regulation during the period of reduced Danish national production due to the reconstruction of the Tyra complex.

However, it must be noticed that Sweden has an exemption from the infrastructure criteria and can only supply the protected market in case of a major incident.

2. Preventive measures

2.1. Pressure reduction Ellund
The risk group has been in dialog with Gasunie about how much capacity can be utilised, if the Quarnstedt compressor station fails. If the pressure in Ellund is reduced to 55 barg (60 bar agreed), the available capacity would increase to 65 % at Ellund by utilising the Ellund compressor. This shows the very low probability of the capacity at Ellund to be zero.

B.2. Firm capacity at Ellund
Capacity at Ellund Exit on the German side (northbound) is offered by two German TSOs: GUD and OGE. The capacity offered by GUD has been on firm terms while the capacity offered by OGE (0.9 GWh/h) has been on interruptible terms.

As of 1 January 2019 the capacity offered by OGE will also be on firm terms. This means that the total firm capacity at German Ellund Exit will increase from 101 GWh/d to 125 GWh/d, where the 101 GWh/d is offered by GUD and the 24 GWh/d is offered by OGE.

The capacity can be booked on yearly contracts at the yearly summer auction. Until then the capacity can be booked on shorter contracts.

This means that the firm capacity from both GUD and OGE will be available prior to the reconstruction of the Tyra complex.

B.3. Increase in capacity in North Germany
Energinet has been in dialog with Gasunie Deutschland (GUD) on technical issues to further increase the total firm capacity at Ellund.

This resulted in an extra 1 GWh/h (or 24 GWh/d) offered by GUD in a PRISMA auction in July. The capacity was not booked. However, GUD has decided to increase the capacity, which will be available for the distribution company in Schleswig-Holstein.

The capacity available in Ellund to Denmark and Sweden offered by GUD today (2018), continues to be available. A total capacity of 5.2 GWh/h including OGE capacity will be available in Ellund.

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

1. Regional Dimension

1.1 The North-West European gas system, comprising the six countries of the United Kingdom Risk Group, namely Belgium, Germany, Ireland, Luxembourg, the Netherlands and the United Kingdom, has a strong gas security of supply position characterised by extensive and resilient infrastructure, and significant levels of interconnection coupled with indigenous gas production. This strength of infrastructure is enhanced by a mature and liquid gas market which has demonstrated an ability to deliver even during the most extreme combination of infrastructure failure and increased demand.

1.2 The N-1 standard has been calculated for the entire United Kingdom Risk Group, using the formula prescribed in Annex II of the Regulation:

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

Where: N-1 Formula**:**

- EP_m - technical capacity of entry points, other than production
- P_m - maximal technical production capacity
- S_m - maximal technical storage deliverability
- LNG_m - maximal technical LNG facility capacity
- I_m - technical capacity of the single largest gas infrastructure
- D_{max} - total daily gas demand
- D_{eff} - demand-side measures

1.3 For EP_m, interconnection between Member States within the United Kingdom Risk Group has not been assessed. The appendix to this annex outlines the parameters used in the calculation of the N-1 standard. For the purposes of calculation, disruption of the largest infrastructure of the group has been assessed:

- Disruption of Felindre pipeline connecting the South Hook and Dragon LNG terminals to the UK National Transmission System with a capacity of 892GWh/d;
- Disruption of Mallnow interconnection point between Germany and Poland with a capacity of 932GWh/d;
- Disruption of Emden EPT entry point from Norway to the continent with a capacity of 989 GWh/d.

Technical capacity largest gas infrastructure (I_m)			**Historical Data**			**Projected Data**		
			2015	2016	2017	2018	2019	2020
			GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
UK	LNG Terminals	Felindre	946	946	957	892	892	892
DE	Poland IP	Mallnow	931	932	932	932	932	932
DE/NL	Norway Pipeline	Emden EPT	989	989	989	989	989	989

N-1 for region	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
Felindre	149%	148%	141%	144%	143%	142%
Emden	149%	147%	141%	143%	142%	141%
Mallnow	149%	148%	141%	143%	142%	141%

N-2	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
Felindre + Emden	143%	141%	135%	137%	136%	135%
Felindre + Mallnow	143%	142%	135%	138%	137%	136%
Emden + Mallnow	143%	141%	135%	137%	136%	135%

N-3	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
Felindre + Emden + Mallnow	137%	135%	129%	132%	130%	130%

1.4 As demonstrated above, the region's N-1 result is well in excess of 100%. The region is capable of achieving up to an N-3 result under the formula. For the UK Risk Group region to fail the N-1 test, around a third of existing gas infrastructure capacity would have to be lost.

1.5 Given its role in supporting security of supply across the Northwest Europe Gas System, the bi-directional flow capacity of interconnectors is shown in the table below:

Interconnection points with bi-directional capacity		Capacity (GWh/d)	Description of arrangements
Eynatten	BE > DE	542	
Eynatten	DE > BE	556	
IUK	BE > UK	814	
IUK	UK > BE	605	
Cluster Emden-Oude Statenzijl H	NL > DE	504	
Cluster Emden-Oude Statenzijl H	DE > NL	1847	
Zelzate	NL > BE	393	
Zelzate	BE > NL	393	
Oude Statenzijl H Gasunie	NL > DE	64	
Oude Statenzijl H Gasunie	DE > NL	36	
Oude Statenzijl H OGE	NL > DE	71	
Oude Statenzijl H OGE	DE > NL	162	

Interconnection points with reverse flow capacity (e.g. interruptible capacity) and bidirectional flow exemptions			Description of arrangements
Hilvarenbeek / Poppel	NL > BE	642	
Hilvarenbeek / Poppel	BE > NL		Backhaul Capacity and Backhaul Level 1
Oude Statenzijl L (GTG-Nord, GUD)	NL > DE	252	
Oude Statenzijl L (GTG-Nord, GUD)	DE > NL		Backhaul Capacity and Backhaul Level 1
Zevenaar	NL > DE	456	
Zevenaar	DE > NL		Backhaul Capacity and Backhaul Level 1
Winterswijk	NL > DE	179	
Winterswijk	DE > NL		Backhaul Capacity and Backhaul Level 1
Tegelen	NL > DE	5	
Tegelen	DE > NL		Backhaul Capacity and Backhaul Level 1
Cluster Limburg (Gravenvoeren, Bocholtz Tenp, Bocholtz Vetschau)	NL > DE	858	
Cluster Limburg (Gravenvoeren, Bocholtz Tenp, Bocholtz Vetschau)	DE > NL		Backhaul Capacity and Backhaul Level 1
Zandvliet H (Fluxys)	NL > BE	47	
Zandvliet H (Fluxys)	BE > NL		Backhaul Capacity and Backhaul Level 1
Vlieghuis-Kalle	NL > DE	72	
Vlieghuis-Kalle	DE > NL		Backhaul Capacity and Backhaul Level 1
Moffat IC1/IC2	UK > IE	330	
Moffat IC1/IC2	IE > IE		Virtual reverse flow. Physical Flow Exemption
BBL	NL > UK	494	

BBL	UK > NL		Virtual reverse flow. Physical Flow Exemption
Remich	DE > LU	39	
Remich	LU > DE		Exemption
Bras/Pétange	BE > LU	48.8	
Bras/Pétange	LU > BE		Exemption
South North Pipeline	IE > UK	66	
South North Pipeline	UK > IE		Exemption

1.6. The methodology for the N-1 calculation concerning the disruption of Felindre pipeline may be found in the annexed tables.

2. Mechanisms developed for cooperation

2.1 The United Kingdom Risk Group comprises the United Kingdom, Belgium, Germany, Ireland, Luxembourg, the Netherlands. The group operates on a consultative basis: the UK holds the pen on drafting the implementation of regional aspects of the Regulation, with all decisions made in consultation with members of the Risk Group. Regular group meetings held via teleconference and in person at the Gas Coordination Group are supported by email discussions and, where appropriate, bilateral communication.

2.2. In the event of a national gas system emergency, the emergency measures set out in National Emergency Plans (NEPs) demonstrate how the Risk Group has adopted a collaborative approach to handling NGSE, where applicable.

2.3 The UK National Preventive Action Plan (PAP) for gas has been developed alongside this revision of the NEP and the regional cooperation mechanisms and agreements relating to managing emergencies across Northern Ireland and the Republic of Ireland.

2.4 The United Kingdom and Ireland have carried out a Joint Risk Assessment identify and assessing regional risks. This is contained at Chapter 6 of the UKRG Common Risk Assessment and provides details on the mechanisms developed for communication, including intergovernmental agreements, transportation arrangements and load shedding protocols.

2.5 The primary vehicle for regional co-operation on the Emergency Plan is through the UK and Ireland Gas Emergency Group. This group comprises representatives from governments, regulators and TSOs of GB, Ireland and Northern Ireland. The group meets twice a year and has developed a regional approach to emergency planning to ensure that the gas emergency operational plans of all jurisdictions work together. This is achieved through the development of protocols between the TSOs and modifications to emergency plans identified following joint emergency exercises. These are fundamental to the management of a stage 3 crisis level (i.e. emergency). Much of the work of this group has to-date focussed on this aspect of regulatory co-operation.

2.6 In addition, the group supports government and regulatory co-operation through the adoption and development of emergency planning procedures and communication protocols for emergency management. These measures have a primary role in the early warning and alert crisis levels and seek to ensure consistency of emergency response and preparedness.

3. Solidarity

3.1 Pursuant to Article 13 of Regulation 2017/1938, the Member States of the United Kingdom Risk Group are currently in the process of developing arrangements for Solidarity measures with interconnected Member States.

3.2 These measures are designed to facilitate gas sharing in the event of an extreme emergency situation where the interconnected Member States request solidarity gas. Further information on solidarity arrangements are set out in Member States' Emergency Plans.

4. Preventative Action Measures

Political risks associated with the UKRG

4.1 UKCS offshore production infrastructure is directly connected to the United Kingdom and Netherlands transmission networks. The Netherlands' production infrastructure is directly connected to the Netherlands transmission network. There are no third countries through which gas transits within the UKRG; there is, therefore, no need for preventative measures concerning transit of third countries.

UK risks associated with the UKRG

4.2 The production of natural gas from the United Kingdom Continental Shelf has declined since the turn of the millennium, although a small increase due to new fields was seen in 2015 and 2016. Despite this, the UK, along with the Netherlands, remains one of the two major gas producing nations within the EU.

4.2 UK oil and gas production is expected to start to fall again in the years ahead, though production estimates are subject to uncertainty. There are a wide range of possible outcomes because the future rate of production is dependent on a number of different factors including the level of investment and the success of further exploration. Operators continue to find it difficult to accurately predict additional production from investing in older fields as they mature. The projections are therefore the best estimates rather than a definitive prediction of future production of oil and gas from the UKCS.

4.3 For the United Kingdom's Continental Shelf (UKCS), the Oil and Gas Authority (OGA) has set out the Maximising Economic Recovery (MER) Review which allows the OGA to consider a regional element of security with the objective of maximising the economic recovery of the UK's oil and gas resources in the North Sea.

4.4 In the South of the North Sea (SNS) UKCS area, there is a risk of decline in the production of oil and gas based on a lack of investment. The lack of investment in SNS infrastructure puts at risk the production life of current assets in the SNS that retrieve 'stranded reserves' of oil and gas. At current the SNS is not being heavily invested in as it is a mature site of exploration, having been exploited since 1967. By leaving oil and gas reserves 'stranded' in the SNS from lack of coordinated investment; fiscal opportunities are being lost to the market and assets of gas security in the UKRG are also lost.

4.5 The OGA is working to maximise the economic recovery of hydrocarbons from the UKCS by creating an environment that stimulates exploration activity leading to the discovery of new oil and gas reserves. The OGA has made available large amounts of exploration data, including new government-funded seismic data, data on wells, prospects, geological mapping and lessons learned. This has helped generate new interest in UKCS oil and gas acreage.

4.6 Most issues are addressed and resolved through the stewardship process. Asset stewardship is crucial to maximising economic recovery from the UKCS and to delivering greater value overall. Effective stewardship means that asset owners consistently do the right things to identify and then exploit opportunities and that assets are in the hands of those with the right behaviours and capabilities to achieve MER UK.

4.7 The OGA has worked closely with operators, licence holders and other interested parties to develop Area Plans across the oil and gas life cycle that integrate exploration, development, production, operations and decommissioning to maximise economic recovery – for example, through the optimum use of infrastructure to extend the life of hubs. The OGA has reaffirmed its focus on the importance of collaboration and urged industry to increase the pace at which licensees develop a culture of collaboration internally and externally within existing joint venture (JV) partnerships and beyond.

4.8 Working with industry, government, and the research community, the OGA is committed to overcome current constraints on technology innovation and commercialisation. The OGA works closely with industry and government, including BEIS, HM Treasury and other key government departments, providing expertise and evidence where appropriate. The OGA works with a range of stakeholders including the Scottish Government to Over the last two years, we have seen many positive examples of collaboration between companies leading to solutions to long-running issues. The MER UK Strategy requires licence holders to ensure that optimal technologies are used for MER UK. As part of its Asset Stewardship Strategy, the OGA expects that licence operators have technology plans which identify actions and timelines to access and/or develop the critical technologies needed for their assets.

4.9 The MER Review is an example of how non-market-based Government actions can create positive impacts on the private market and a positive outcome for the UKRG security

Netherlands risks associated with the UKRG

4.10 For many years, total annual production in the Netherlands was about 80bcm. This has already decreased in the past year and will continue to decrease in the coming years due to production limitations set on the Groningen field and lower production levels of the small fields.

4.11 As a result of earthquakes related to gas production in Groningen, the volume allowed to be produced has been restricted in the past few years. In 2018, the Netherlands decided to reduce production from Groningen as fast as possible to 12bcm and then continue to 0bcm, i.e. to terminate production from the Groningen field. Since 2013, gas production from Groningen has fallen 54bcm to 23.98bcm in 2017 and will continue to fall. In addition, reduced production from Dutch small fields will further constrain natural gas production in the Netherlands.

4.12 On the 8th of January 2018, a gas production-induced earthquake occurred at Zeerijp. Following the advice of the State Supervision of the Mines, the Dutch Minister has decided to reduce production from Groningen as fast as possible to 12bcm and then continue to 0bcm, i.e. to terminate production from the Groningen field.

4.13 To achieve this, GTS will invest in a new nitrogen plant at Zuidbroek which can, starting gas year 2022-2023, produce up to 7bcm of pseudo L-gas in a cold year. In addition, GTS will purchase additional nitrogen which can produce 1 to 1.5bcm of pseudo L-gas from gas year 2020-2021. Furthermore, industrial clients will be converted between gas year 2019-2020 and gas year 2022-2023 from L-gas to H-gas. Possibilities to accelerate the market conversion in Germany, Belgium and France will also be investigated.

4.14 In the meantime, production from the Groningen field will never be more than is required from a security of supply perspective. This means that the blending stations of GTS will produce baseload (on average, 85% of blending stations Ommen and Wieringermeer); the Groningen field combined with other sources (storage facilities) will cover the rest of the market.

4.15 In addition to these volume-reducing measures, the Minister also decided to close the production clusters in the Loppersum region. This decision will reduce the capacity of the Groningen field by approximately 25%. This will have the following impact on Dutch production capacity:

Germany

4.16 In 2017, Germany produced 7.9bcm of natural gas with a calorific value of 9.77kWh/m^3 which is classified as L-Gas. Production in 2017 decreased by 8.6% compared to 2016, with the forecast production continuing to decline due to the depletion of existing reserves.

4.17 Despite this, there are many import routes to supply the German market known as "diversification of supply routes" and the German gas infrastructure network is well suited to meeting the demands for transportation of gas within Germany.

4.18 In addition, the relevant companies are already acting to prevent the decline in the availability of L-gas negatively affecting security of supply. German L-gas producers, who are the affected network operators and storage system operators have set up a joint working group to develop a plan for the coordinated conversion from L-gas to H-gas. This conversion plan is included in the national network development plan as an input parameter.

Ireland

4.19 The Kinsale Heads storage facility is now in blowdown mode and is therefore classed as production until its expected final closure in 2020. The gas security of Ireland is however ensured by the new Corrib gas field which commenced production during the 2015/16 gas year and supplied 62% of gas demand in Ireland in 2016/17. The Moffat Entry Point accounted for 31% of the overall requirement with the remaining 5% supplied from production gas from an off-shore gas field at the Inch entry point.

4.20 The Corrib gas field would be expected to supply approximately 27.7% of ROI peak day gas demand in 2018/19 in the event of a 1-in-50 winter peak day, with Inch accounting for around 2.3%. The Moffat Entry Point would be expected to meet nearly 69.9% and 78% of ROI demand and Gas Networks Ireland system demands respectively in 2018/19, in such circumstances. Moffat is anticipated to meet 89.5% and 92.2% of ROI and Gas Networks Ireland system peak day demands respectively in 2026/27.

<u>5. Connection with Member States outside of the risk group</u>

Germany

5.1 Germany has an extensive transmission system. The network of the transmission system operators is connected to the systems of neighbouring countries via a large number (>25) of cross-border interconnection points. This transport infrastructure is essential for Germany's natural gas market, situated as it is in the centre of Europe and functioning as an important trading hub for the continent. In the southern part there are significant import points on the borders of the Czech Republic and Austria. The major export points are on the borders to France, Switzerland and Austria. The transmission system is thus used for both transit and supply services.

5.2 In the past, gas consumed in the northern part of the supply area in Schleswig-Holstein and Hamburg largely came from Danish reserves. For some years now, Denmark has been stepping up preparations for supply from German imports via the Ellund station. The Nord Stream and Baltic Sea Pipeline Link (OPAL) pipelines were put into operation at the end of 2011. The OPAL can transport up to 35 bcm of natural gas a year from Nord Stream. This means that Nord Stream and the OPAL, together with pipelines in the Czech Republic

(Gazelle), ensure supply volumes for the Waidhaus import point and strengthen the security of supply for Germany, France and the Czech Republic.

Netherlands

5.3 In the Netherlands there is a total of 135,000 km of gas pipelines. There are 8 Local Distribution Companies for gas in the Netherlands, of which there are 7 operating gas transmission grids for L-gas and 1 for H-gas.

5.4. On the Maasvlakte in Rotterdam, Gate terminal has built the first LNG import terminal in the Netherlands. The terminal currently has a throughput capacity of 12bcm per annum and consists of three storage tanks, two jetties and a process area where LNG will be re-gassified. Annual throughput capacity can be increased to 16bcm in the future. The terminal dovetails with Dutch and European energy policies, built on the pillars of strategic diversification of LNG supplies, sustainability, safety and environmental awareness.

6. Non-Market Preventative Measures

6.1 The countries within the United Kingdom Risk Group adopt a market-based approach to guaranteeing security of supply, although a number of countries do adopt measures which they consider to be necessary to guarantee security of supply. The Preventative Action Plan focuses on those measures which proceed the declaration of an NGSE in Member States; as such, no measures relating to stages of an emergency are discussed here.

7. Conclusions

7.1 The UK gas market is resilient to all but the most unlikely combination of high demand and supply disruption. The UK Government continues to work closely with its stakeholders on additional projects to improve resilience within the sector and prevent disruption.

7.2 The UK Government welcomes the Regulation’s requirement that this national PAP is continuously reviewed and published at regular intervals.

7.3 The UK Government continues to work closely with its stakeholders and supports the consultations routinely executed by industry.

7.4 The relevant publications by National Grid as System Operator are:

- “The Winter Outlook Report”: Published annually following stakeholder consultation. This provides information to market participants on the supply and demand situation for the coming winter;
- “Future Energy Scenarios”: National Grid's annual publication setting out a range of potential pathways for future gas and electricity demand to 2050; and
- “Ten Year Statement”: Published annually - a rolling ten-year forecast of gas transportation system usage and likely system developments that can be used by companies which are contemplating connecting to the system, or entering into transport arrangements, to identify and evaluate opportunities.

7.5 In Northern Ireland the Utility Regulator publishes the Gas Capacity Statement which provides an assessment of the ability of the transmission network to meet forecast demands on the network over a ten-year period.

7.6 Information is also consolidated annually in the Statutory Security of Supply Report, which is published by BEIS and produced jointly with the economic regulator (Ofgem) with input from National Grid. That report provides analysis on security of supply risks and drivers, and scenarios to help inform the market.

Appendix – Regional Dimension

This annex reports the breakdown of the parameters used to compute the N-1 score for the United Kingdom Risk Group.

EP_m: Technical capacity of entry points

Technical capacity of entry points (EP_m)			Historical Data			Projected Data		
			2015	2016	2017	2018	2019	2020
			GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
BE	Norway	ZPT (Zeepipe)	515	515	515	515	515	515
BE	France	Alveringem	0	271	271	271	271	271
DE	Denmark	Ellund	37	91	33	33	33	33
DE	Austria	Oberkappel	133	160	160	160	160	160
DE	Austria	Überackern 2	230	230	230	230	230	230
DE	Austria	Überackern	54	61	61	61	61	61
DE	Czech Republic	Deutschneudorf	198	198	198	198	198	198
DE	Czech Republic	Brandov-Stegal (Olbernhau)	9	5	0	0	0	0
DE	Czech Republic	Waidhaus	904	907	907	907	907	907
DE	Norway	Dornum	774	721	721	721	721	721
DE/NL	Norway	Emden EPT	989	989	989	989	989	989
DE	Poland	Mallnow	931	932	932	932	932	932
DE	Poland	Kamminke/Gubin/Lasow	0.0	0.1	0.1	0.1	0.1	0.1
DE	Russia	Greifswald	618	618	618	618	618	618
UK	Norway	Langeled	770	770	770	836	836	836
UK	Norway	Vesterled	396	396	396	451	451	451
UK	Norway	FLAGS	275	275	275	330	330	330
Total			**6,833**	**7,140**	**7,076**	**7,252**	**7,252**	**7,252**

P_m: Maximum technical production capacity

Maximum technical production capacity (P_m)	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
BE	0	0	0	0	0	0
DE	301	301	301	301	301	301
IE	0	104	104	110	94	92
LU	0	0	0	0	0	0
NL	2,994	2,218	2,156	2,144	1,959	1,818
UK	1,111	1,232	1,319	1,355	1,349	1,327
Total	**4,406**	**3,854**	**3,879**	**3,910**	**3,702**	**3,538**

S_m: Maximum technical storage deliverability

Maximum technical storage availability (S_m)	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
BE	170	170	170	170	170	170
DE	4,600	4,600	4,600	4,600	4,600	4,600
IE	33	33	33	0	0	0
LU	0	0	0	0	0	0
NL	4,180	4,180	4,163	4,163	4,163	4,163
UK	1,650	1,606	1,231	1,279	1,279	1,279
Total	**10,632**	**10,588**	**10,197**	**10,212**	**10,212**	**10,212**

LNG_m: Maximum technical LNG facility capacity

Maximum technical LNG facility capacity (LNG_m)	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
BE: Zeebrugge LNG Terminal	461	461	461	461	461	461
NL: Gate	399	399	399	399	399	399
UK: South Hook	649	649	660	663	663	663
UK: Dragon	297	297	297	229	229	229
UK: Isle of Grain	649	649	649	653	653	653
Total	**2,455**	**2,455**	**2,466**	**2,405**	**2,405**	**2,405**

D_{max}: 1-in-20 gas demand

1 in 20 gas demand (D_{max})	Historical Data			Projected Data		
	2015	2016	2017	2018	2019	2020
	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
BE	1,307	1,303	1,357	1,466	1,478	1,490
DE	5,460	5,460	5,460	5,460	5,460	5,460
IE	207	221	206	277	281	288
LU	6	6	5	5	5	5
NL (1-in-50 demand)	3,729	3,648	3,678	3,692	3,678	3,664
UK	4,970	5,013	5,343	5,039	5,008	4991
Total	**15,680**	**15,651**	**16,048**	**15,940**	**15,910**	**15,898**

Assessed Margin	**Historical Data**			**Projected Data**		
	2015	2016	2017	2018	2019	2020
	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d	GWh/d
Technical capacity of entry points (EP_m)	6,833	7,410	7,076	7,252	7,252	7,252
Maximal technical production capacity (P_m)	4,406	3,854	3,879	3,910	3,702	3,538
Maximal technical storage deliverability (S_m)	10,632	10,588	10,197	10,212	10,212	10,212
Maximal technical LNG facility capacity (LNG_m)	2,455	2,455	2,466	2,405	2,405	2,405
Total peak supply	24,326	24,037	23,618	23,779	23,571	23,407
1 in 20 gas demand (D_{max})	15,680	15,651	16,048	15,940	15,910	15,898
Margin	8,646	8,386	7,570	7,839	7,662	7,509
Margin (%)	36%	35%	32%	33%	33%	32%

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 via Belarus, one of the pivotal gas supply corridors from the Russian Federation to the European Union. The Belarus Risk Group includes the EU Member States that are supplied with natural gas shipped via Belarus, or adjacent EU Member States that are affected by gas imports via Belarus.

Taking into consideration the geographical position of the countries of the region and infrastructure limitations, the Belarus Risk Group is divided into two sub groups:

- East-Baltic subregion and
- Middle-west countries sub region.

Creation of a separate East-Baltic subregion for the working purpose of the report follows from the fact that the Baltic States (together with Finland) remain isolated from the wider EU gas system. This means that for the time being there is no possibility to transport gas between both sub regions in normal and emergency conditions. These circumstances are set to radically change once the Gas Interconnection Poland – Lithuania (GIPL) is put into commercial operation.

	D_{max}	D_{eff}
	[GWh/d]	[GWh/d]
East-Baltic	**333,7**	**0,0**
Estonia	57,5	0
Latvia	125,19	0,0
Lithuania	151,0	0,0
Middle-west	**11 872**	**0,0**
Belgium	830,0	0,0
Czech Republic	699,5	0,0
Germany	5 142,1	0,0
Luxembourg	53,0	0,0
Netherlands	3 678,0	0,0
Poland	973,00	0,0
Slovakia	496,4	0,0

Figure 36: demand-side figureses, Dmax/Deff

REGION	COUNTRY	EP - outside BY RG	IP	EP_m [GWh/d]
East-Baltic SUM				**454,0**
East-Baltic	**Estonia**	EP Russian	Misso Izborsk	74.0
			Narva	12,6
			Värska	42.0

	Latvia	No entry points outside BY RG	-	-
	Lithuania	EP Belarus	Kotlovka	325,4
Middle-west SUM				**10 104,42**
Middle-west	**Belgium**	EP France	Alveringem	278,0
			Blaregnies (BE)/Taisnières (H) (FR) (Segeo/Troll)	-
		EP Norway	Zeebrugge ZPT	515,28
		EP United Kingdom	Zeebrugge IZT	732,24
	Czech Republic	No entry points outside BY RG	-	-
	Germany	EP Austria	Kiefersfelden - EXIT only	0,0
			Oberkappel	159,9
			Überackern/Burghausn	230,1
		EP Denmark	Ellund	91,1
		EP France	Medelsheim/Obergailbah - EXIT Only	0,0
		EP Norway	Dornum/NETRA	721,2
		EP Russian	Greifswald	1 776,1
		EP Switzerland	Wallbach - EXIT Only	0.0
	Luxembourg	No entry points outside BY RG	-	-
	Netherlands	EP Norway	Emden (NPT)	1 376,4
		EP United Kingdom	Bacton (BBL)	319,20
	Poland	EP Belarus	Kondratki (YAMAL TGPS)	1 024,3
			Tietierowka – local supply only not taken into consideration	7,3
			Wysokoje	169,1
		EP Ukraine	Drozdowicze	135,6
	Slovakia	EP Austria	Baumgarten	247,5
		EP Hungary	Balassagyarmat (HU)/Velké Zlievce (SK)	50,8
		EP Ukraine	Budince	249,6
			Uzhgorod (UA) - Velké Kapušany (SK)	2 028,0

Figure 37: Supply-side figures, EPm

	LNG_m	P_m	S_m /LEVEL OF STORAGES AT 30 %	S_m /LEVEL OF STORAGES AT 100 %
	[GWh/d]	[GWh/d]	[GWh/d]	[GWh/d]

East-Baltic	**122,4**	**0,0**	**241,6**	**315,6**
Estonia	0,0	0,0	0,0	0,0
Latvia	0,0	0,0	241,6	315,6
Lithuania	122,4	0,0	0,0	0,0
Middle-west	**1 018,0**	**2 513,8**	**8 405,3**	**12 916,3**
Belgium	461,0	0,0	67,8	169,5
Czech Republic	0,0	6,4	253,1	842,7
Germany	0,0	272,48	4 332	7 379,0
Luxembourg	0,0	0,0	0,0	0,0
Netherlands	399,0	2 156,0	3 069,0	3 421,0
Poland	158,0	75,8	437,6	544,0
Slovakia	0,0	3,1	245,8	560,1

Figure 38: Supply-side figures, LNG_m **/** P_m **/** S_m **-100%/** S_m **-30%**

Since the Belarus Risk Group was established to analyse risks associated with gas supply disruptions via Belarus, the single largest infrastructure to be taken into account for regional N-1 formula, with the highest capacity to supply the region through Belarus, is an entry point to Poland – Kondratki, which is where the Polish part of Transit Gas Pipeline Yamal – Europe starts. The Transit Gas Pipeline System in Poland represents a part of the gas pipeline system measuring an estimated 4 000 km, running from Russia through Belarus and Poland to Western Europe. Since the Baltic States remain isolated from the EU gas system (until Poland – Lithuania Interconnection is put into operation), N-1 for the East-Baltic sub region is calculated separately, taking into account UGS Inčukalns/Kotlovka an entry point to the Lithuania as the single largest infrastructure to supply the East-Baltic sub region.

	I_m	
	[GWh/d]	**-**
East-Baltic	315,6	
Estonia	Do not concern	
Latvia	315,6	UGS Inčukalns
Lithuania	Do not concern	
Middle-west	1 024,3	
Belgium	Do not concern	
Czech Republic	Do not concern	
Germany	Do not concern	
Luxembourg	Do not concern	
Netherlands	Do not concern	
Poland	1 024,3	Entry point to Yamal gas pipeline - Kondratki
Slovakia	Do not concern	

Figure 39: Single largest gas infrastructure of common interest for the risk group

	S_m -100%	S_m -30%
	D_{max}	D_{max}
East-Baltic: Estonia, Latvia, Lithuania	173%	151%
Middle-west: Belgium, Czech Republic, Germany, Luxembourg, Netherlands, Poland, Slovakia	215%	177%

Table 5: N – 1 formula results

II.2.2 **Baltic Sea**

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

1. N-1 calculation

For the calculation of the N-1 standard it is assumed that the entire region is seen as one "calculated area". This means that only the entry points connecting the region with countries outside the region are taken into account. Capacities at cross-border points inside the region are not included.

N-1 – standard

$$N\text{-}1[\%] = \frac{EPm + Pm + Sm + LNGm - Im}{Dmax - Deff} \times 100,\ N\text{-}1 \geq 100\%$$

Where

EPm: technical capacity of entry points, other than production, LNG and storage facilities, means the sum of the technical capacity of all border entry points capable of supplying gas to the calculated area

Pm: maximal technical production capacity

Sm: maximal technical storage deliverability

LNGm: maximal technical LNG facility capacity

Im: technical capacity largest gas infrastructure

Dmax: 1 in 20 gas demand

Deff: market-based demand-side response

The single largest infrastructure in this region is the Slovakian entry point Vel-ke Kapusany. The analysis we will conduct further focuses on the Greifswald entry point, which is slightly smaller than Velke Kapusany. The calculation of N-1 will be performed for both entry points.

Member State [GWh/d]]	**EPm**	**Pm**	**Sm**	**LNGm**	**Im**	**Dmax**	**Deff**
Austria	0.0	40.4	470.6	0.0		595.2	0.0
Belgium	1,247.5	0.0	169,5	461.6		1,356.8	0.0
Czech R.	0.0	4.3	754.9	0.0		709.4	0.0
Denmark	0.0	12.1	196.0	0.0		236.0	0.6
Germany	3,915.3	272.5	7,453.0	0.0	1,776.0	5,202.0	0.0
France	795.0	0.0	2,400.0	1		4,020.0	0.0
Luxembourg	0.0	0.0	0.0	0.0		52.0	0.0
Netherlands	2,266,0	2,156.0	3,421.0	399.0		3,678.0	0,0
Slovakia	2,204.8	2.1	560.2	0.0	2,028.0	470.9	0.0
Sweden	0.0	1.9	0.0	0.0		78.0	0.0
Total	**10,428.6**	**2,489.3**	**15,425,2**	**2,190.6**	**3,804.0**	**16,398.3**	**0.6**

N-1: Single largest infrastructure

N-1 for region with failure of	EPvk [GWh/d]	Pm [GWh/d]	Sm [GWh/d]	LNGm [GWh/d]	Im [GWh/d]	Dmax [GWh/d]	Deff [GWh/d]
Velke Kapusany (SLO)	9,168.1	2,478.2	15.245.2	2,190.6	3,804.0	16,187.8	0.5

$$N\text{-}1[\%] = \frac{11{,}372.9 + 2{,}478.2 + 15{,}245.4 + 2{,}190.6 - 2{,}080.0}{16{,}187.8 - 0.5} * 100 = 203\%$$

N-1: Second largest infrastructure

N-1 for region with failure of	EPg [GWh/d]	Pm [GWh/d]	Sm [GWh/d]	LNGm [GWh/d]	Im [GWh/d]	Dmax [GWh/d]	Deff [GWh/d]
Greifswald (D)	9,596.9	2,478.2	15.245.2	2,190.6	3,804.0	16,187.8	0.5

$$N\text{-}1[\%] = \frac{11{,}372.9 + 2{,}478.2 + 15{,}245.4 + 2{,}190.6 - 1{,}776.0}{16{,}187.8 - 0.5} * 100 = 206\%$$

N-2: the two largest infrastructures

N-1 for region with failure of	EPvk+g [GWh/d]	Pm [GWh/d]	Sm [GWh/d]	LNGm [GWh/d]	Im [GWh/d]	Dmax [GWh/d]	Deff [GWh/d]
Velke Kapusany (SLO) + Greifswald	7.568,9	2,478.2	15.245.2	2,190.6	3,804.0	16,187.8	0.5

$$N\text{-}1[\%] = \frac{11{,}372.9 + 2{,}478.2 + 15{,}245.4 + 2{,}190.6 - (2{,}080.0 + 1{,}776.0)}{16{,}187.8 - 0.5} * 100 = 193\%$$

The common risk group infrastructure consists of several operational facilities. Even with the failure of the two largest infrastructures, the resulting figure from the N-1 formula remains distinctly above 100%. This proves that the se-curity of gas supply does not depend on a few large facilities because the ex-tensive infrastructure offers more possibilities to transport and distribute gas.

2. Cooperation mechanism

A cooperation mechanism has been drawn up pursuant to Art.8(4) SoS Regulation. It basically provides for all forms of communication to be used for the cooperation within the risk group. Conference calls have proved to be an efficient method. Prior to a conference, the chair presents a proposal for discussion during the conference. Objections and requests for changes which affect all Member States equally are resolved if possible in consensus. In terms of crisis prevention, it is important to have expert contacts in order to avert harm by engaging in an early and transparent exchange of information. It has proved worthwhile also to use these forms of cooperation for the drafting of the preventive action and emergency plans in order to facilitate contacts in a crisis.

Crisis prevention is in principle a national responsibility; consultations take account of cross-border issues. In order to be able to take measures to maintain security of supply in neighbouring member states on a cross-border basis in the case of a crisis, it is urgently necessary to engage in advance in cross-border coordination between the relevant German and neighbouring TSOs at the respective international IPs, if necessary with the backing of the competent authorities. In particular, a common understanding of the handling of crisis levels and resulting measures should be reached, so that crisis management can be undertaken in line with the SoS Regulation in the case of a bottleneck, particularly where there is a shortage on both sides, and the burden of the measures can be distributed equally (i.e. on a nondiscriminatory basis).

The TSOs also involve neighbouring cross-border system operators in their considerations about the expansion of infrastructure in the context of the consultations on the Network Development Plan.

3. Preventive measures

The risk analysis has shown that the risk of a disruption to supply in the Baltic Sea risk group – caused by technical failure – is predictable. Nevertheless, it is important to continue to ensure that the system is reliably maintained and secure.

The German Network Development Plan Gas (NDP) plays an important role in ensuring of an orderly gas supply – including in the international context. It must contain all the effective measures which are technically required in the coming ten years for a secure and reliable operation of the system. These include:

- the needs-based optimisation and strengthening of the grid
- the needs-based expansion of the grid
- the maintaining of security of supply.

It thus makes a major contribution towards ensuring security of supply throughout the Baltic Sea region.

In particular, the NDP contains all the grid expansion measures which must be undertaken in the coming three years, including the timetables necessary for the implementation. The NDP is a key element for Germany, as a central transit country for gas flows. All the members of the Baltic Sea risk group – like other neighbours of Germany – depend on Germany’s security of supply and benefit from a high standard of planning. The ever-broader updating of the NDP is an in-dispensable element of this.

In order to enable the German TSOs to continue to fulfil their responsibility for a secure and reliable operation of the grid in future, they are required to produce a joint Network Development Plan in every even calendar year and to present it to the Bundesnetzagentur, the competent regulatory authority, by 1 April (Section 15a Energy Industry Act). This Network Development Plan is based on the sce-nario framework, and the TSOs must use this framework as they draw up the Plan (Section 15a subsection 1 sentence 4 Energy Industry Act).

The scenario framework must include appropriate assumptions about the devel-opment of gas production, supply, consumption and exchange with other coun-tries. Also, the TSOs must take account of planned investment projects in the re-gional and EU grid infrastructure, in storage facilities and in LNG regasification facilities. Finally, they must include the effects of possible disruption to supply.
In order to identify these measures, the Energy Industry Act requires that the German TSOs model the German long-distance gas grids when they draw up the Network Development Plan. This procedure guarantees not only the security of gas supply in Germany but also for their neighbouring countries.