L-Gas Market Conversion Review

Summer Briefing 2023

Task Force Monitoring L-Gas Market Conversion

Ministry of Economic Affairs and Climate Policy

Foreword

This is the eighth edition of the report monitoring the conversion of the low calorific gas markets in Belgium, France, Germany and the Netherlands in order to reduce demand for Groningen gas. This report looks back on the market developments during the heating season of gas year (GY) 2022/23, and at the same time it looks forward to the coming gas years in regard to the expected demand for Dutch low calorific gas and conversion progress of the gas installations. Special focus will be on the conversions planned in the current gas year, since the conversion programmes are expected to reach their highest levels of conversion so far.

The report is compiled by the Task Force Monitoring L-gas Market Conversion, consisting of government representatives, representatives of transmission system operators (TSO's) and energy market regulators from Belgium, France, Germany and the Netherlands, and an observer from the European Commission. The activities of the Task Force are supported by the General Secretariat of the Benelux Union. The report is published twice a year: a Winter and a Summer Briefing. The Netherlands will use these reports to inform the Dutch Parliament on the progress of reducing the demand for Dutch low calorific gas.

Executive summary

In March 2018, the government of the Netherlands announced its decision to terminate natural gas production from the Groningen field as soon as possible, in order to guarantee safety in the area of Groningen against the risk of earthquakes resulting from natural gas extraction. In this process, security of supply is taken into account.

Household appliances in the Netherlands still depend on gas from the Groningen field (G-gas, max. Wobbe 44.4 MJ/m^3), while households in Germany, France and Belgium depend on gas with a slightly higher quality (low calorific gas, or L-gas, max. Wobbe 46.5 MJ/m^3). Without Groningen-gas, so called "pseudo L-gas" is needed to secure supply in the L-gas market region. Pseudo L-gas can be produced by either adding nitrogen to high calorific gas (H-gas) in order to bring down the Wobbe-value until it meets the upper Wobbe-limits of the L-gas specifications or by adding H-gas to (pseudo) Groningen-gas[1] until the same upper Wobbe-limit of the L-gas specifications is reached. The Groningen field can only be closed if the total L-gas market can be supplied by sufficient pseudo L-gas produced from H-gas and nitrogen.

Pseudo L-gas is exported to neighboring markets in Belgium, France and Germany, where it serves dedicated L-gas consumers. As a result of the Groningen phase out, the transmission system operators of Belgium, France and Germany have made arrangements to undertake extensive conversion programmes to reduce L-gas supply from the Netherlands. By GY 2029/30, imports of L-gas for these countries will be reduced to nearly zero.

The current report aims to monitor the progress in the L-gas conversion programmes in Belgium, France and Germany and the activities in the Netherlands to reduce the consumption of (pseudo) Groningen-gas. It provides the analysis needed by the Ministry of Economic Affairs and Climate Policy to decide on the allowed Groningen production and to meet the requirements of the resolution of the Dutch Parliament to be informed twice a year about the progress in reducing the demand for Groningen gas.

Overall, it can be concluded that the L-gas market conversion is progressing well. During the 2022/23 heating season, the total L-gas demand from the Netherlands has declined by 59.7 TWh with respect to GY 2021/22 heating season. This decline is approximately equally caused by the lower demand by the relative high prices and the conversion programmes in Belgium, France and Germany. In GY 2022/23, a total of just over 1,000,000 gas connections and appliances are expected to be converted, the highest number of the market conversion programmes so far. The estimated volume effect of the GY 2022/23 conversions (43.7 TWh) is ~52% higher than the volume effect of the conversions in GY 2021/22. The planned conversions in Belgium, Germany and France for 2023 are either successfully completed or on track to be.

In the upcoming years until GY 2029/30, combined L-gas exports from the Netherlands to Belgium, France and Germany are expected to be reduced at an average rate of approximately 10% per year due to the conversion programmes[2]. Consequently, L-gas demand met with imports from the Netherlands is expected to fall to 0 in Belgium by GY 2024/25, to 0 in France by GY 2029/30 and to 0.3 TWh in Germany[3] by GY 2029/30 both in an average and cold GY[4].

Under the current market conditions, the Task Force does not foresee any possibilities to further accelerate the conversion process. Currently, all efforts are aiming at achieving the agreed demand reduction for the coming years. To meet this declining L-gas demand against an even faster decreasing Groningen production, there is a crucial role for the production of pseudo G/L-gas. The Netherlands increased the production of pseudo G/L-gas by expanding the nitrogen blending capacity at the Wieringermeer conversion facility from 215,000 to 295,000 m^3/h starting from December 2019. This translated into an additional 48.9 TWh of pseudo G/L-gas production capability. Moreover, a new nitrogen plant at Zuidbroek with a capacity of 180,000 m^3/h N_2, which translates into an additional pseudo L-gas production with a maximum of 97 TWh, is currently under construction. It was planned to start operations in April 2022, but the construction has been impacted by the outbreak of COVID-19 and the consequent lockdowns and more recently by disputes between the Engineering, Procurement and Construction (EPC) contractor and subcontractor. GTS informs the market of the planning via REMIT messages[5]. Due to the price driven demand reduction, the delay does not affect the Groningen production. It is now foreseen that the Zuidbroek facility will come into operation in the beginning of GY 2023/24.

The security of L-gas supply is becoming intimately linked to the deliverability of H-gas into the Netherlands. During the previous gas year the supply of H-gas from Russia to Northwest-Europe diminished and eventually

[1] Pseudo Groningen-gas (or pseudo G-gas) is obtained via enrichment: nitrogen is added to high calorific gas (H-gas) in order to bring down the Wobbe-value until it meets the upper Wobbe-limits of the G-gas specifications (44.4 MJ/m3). This gas quality is stored in the Dutch G/L-gas storages.
[2] GTS (2017), Netwerk Ontwikkelingsplan 2017.
[3] Please note that the remaining demand in GY 2029/30 (0.3 TWh / 100.000 kWh/h) is given by a regional grid in Germany, that can only be supplied via the Netherlands (Haanrade / Thyssengas).
[4] In the case of Belgium and France, the demand profile for a cold GY has been calculated based on 1995-96 temperature profile by GTS as stated in the Dutch Gas Act for the L-gas supply-demand balance of this briefing. In the case of Belgium, the preferred national approach is to consider the year 1962-63 as a cold year profile. The French regulation approach is requiring to work with a 2% risk cold GY (using Lille weather data); leading to a demand profile national reference shared with the French stakeholders, about 2% above the GTS's figures. The preferred national approach both in the case of Belgium and France are reflected in Figure 2.5 and in the tables 2.2 and 2.3 of the Annex.
[5] More information at https://www.gasunietransportservices.nl/transparency/remit/urgent-market-messages/2-2406

stopped, this continued to be the situation in the current gas year. With the disappearance of the H-gas supply from Russia, 30% of the H-gas demand needs to be supplied from other sources. The main source for H-gas is currently LNG, supplied through existing terminals in the United Kingdom, Belgium and the Netherlands. Since these terminals do not have enough capacity to replace the former Russian supply, additional LNG-import facilities have been and are being developed in the Netherlands[6], Germany and France. An extension of the re-gas capacity at the LNG terminal of Zeebrugge in Belgium is ongoing. Although some of these projects are operational already (expansion of the GATE LNG-terminal and the realization of the EemsEnergyTerminal in the Netherlands), most of them are still under development and will contribute mainly to the mid-term solution. On the short term, the demand supply balance is being kept by a decline in the European gas demand due to high prices. However, there is still a risk of H-gas shortages. This means that there is a possibility that there may not be enough H-gas supply for both the H-gas market demand and full usage of the conversion facilities for the production of the still needed amounts of pseudo L-gas.

Based on an optimal usage of the blending facilities the Dutch State Secretary, responsible for the phase out of the Groningen production, did set the cap for Groningen production in GY 2022/23 at 28 TWh for both an average and a cold year. This production volume is the result of the decision of the State Secretary to keep all remaining eleven Groningen production locations open during the winter of GY 2022/23 in line with the advice of Gasunie Transport Services (GTS, the Dutch transmission system operator). These production locations will produce at a minimum flow in order to ensure availability in case of extreme cold weather, unexpected (out of spec) qas qualities, transportation limitations, a shortage of H-gas or an outage in the L-gas system. After the winter, the State Secretary decided on the closure of six of the production locations on the Groningen field as previous studies from GTS (still based on the assumption of sufficient supply of H-gas) have shown the earliest possible closing date of the Groningen field to be the start of GY 2023/24. Five production locations remained operational during the summer, pending the decision of the State Secretary on the allowed Groningen production for GY 2023/24.

Yearly in January, GTS provides advice to the State Secretary on the needed Groningen capacity and volume for the security of supply for the upcoming gas year. For GY 2023/24 GTS advised the State Secretary to keep the capacity of the eleven remaining Groningen production locations available for security of supply[7]. Reason for this is that based on the current assumptions, GTS still foresees the possibility of scarcity in the H-gas supply, despite an increase of LNG import capacity. At the moment it is unclear what the impact will be on the production from the Groningen field for the years after GY 2023/24. This advice was supplemented in May of this year[8], when GTS presented an analysis that showed that both the volume and capacity on the Groningen field is only needed in more exceptional scenarios, which are in case of extreme low temperatures and disruption of the single largest infrastructure to fill the peak demand or to fill the seasonal storages after they have been heavily used for security of supply during a cold winter. Having the production locations of the Groningen field on the current level of availability with accompanying minimum flow is not necessary from a gas transport point of view[9] to ensure the availability of the Groningen field in these situations.

In June 2023, the Dutch State Secretary announced the intention to put a stop to the production from the Groningen field in GY 2023/24. This means that the premise is zero gas extraction from the production locations, but that limited gas extraction may be necessary in the event of extremely exceptional situations in the coming gas year. The final decision, expected in September 2023, will define the situations in which production sites will be used.

Security of L-gas supply is being ensured by increasing the H-gas conversion capacity via nitrogen blending in the Netherlands and the market conversion from L-gas to H-gas in Germany, Belgium and France. This, as well as the activities in the Netherlands to reduce the consumption of L-gas, will ensure the security of L-gas supply to consumers in all markets both in an average and in a cold year.

Throughout the market conversion period, the role of enrichment will decline in line with the decreasing Groningen production. Hence, nitrogen blending facilities will have an increasing role in meeting L-gas demand through the next GYs.

[6] https://www.gasunietransportservices.nl/gasmarkt/investeringsplan/investeringsplan-2022
[7] For more details see the advice from GTS dated the 31st of January 2023, entitled *Advies Benodigde Groningencapaciteiten en -volumes ten behoeve van leveringszekerheid voor gasjaar 2023/2024*
[8] 'Analyse stand van zaken op de gasmarkt en leveringszekerheid in het volgende gasjaar', kenmerk L 23.00289, d.d. 26 mei 2023. English version of this advice can be found on the GTS website.
[9] GTS presented a theoretical analyses, where the technical aspects of the installation was not taken into account.

1. Introduction

In March 2018, the government of the Netherlands announced its decision to terminate natural gas production from the Groningen field as soon as possible, in order to guarantee safety in the area of Groningen against the risk of earthquakes resulting from natural gas extraction.

The initial schedule for production phase-out - which aimed for termination in 2030 at the latest - was revised in 2019 following the adjusted advice of the Dutch State Supervision of the Mines after an earthquake occurred on 22 May 2019. The termination of gas production from the field was brought forward to GY 2022/23 for average weather conditions. From the start of GY 2022/23, Groningen gas is expected to only be needed in case of extreme low temperatures (-9 degrees Celsius or colder), unexpected (out of spec) qas qualities, transportation limitations, a shortage of H-gas and in case of a severe disruption elsewhere in the L-gas system. To be able to guarantee production in those circumstances the field will operate on minimum flow during the entire gas year. Groningen gas has a notably lower calorific value compared to the average European gas, which means it cannot simply be replaced by other domestic or imported sources. These need to be converted, principally via nitrogen blending, to L-gas.

Groningen-gas (G-gas) is consumed in the Netherlands and L-gas is exported to neighboring markets in Belgium, France and Germany, where it serves dedicated L-gas consumers. As a result of the phase-out of the Groningen field, these consumers will be converted to other sources of energy, mostly H-gas. In fact, whilst over 90% of L-gas in Northwest-Europe is produced in the Netherlands, almost half of it is currently consumed in the three importing markets.

Hence, the decision to terminate Groningen production has consequences in terms of adaptation for the Dutch domestic gas market, but also for import markets in Belgium, France and Germany. The four countries have been working together on the phasing-out of G/L-gas consumption since 2012, which was initially motivated by the natural decline of the Groningen field. Belgium, France and Germany have developed and are implementing concrete plans to have their consumers of L-gas converted to other sources of energy, most notably H-gas, by 2030.

The Dutch Parliament adopted a resolution which requires the Ministry of Economic Affairs and Climate Policy to report twice a year on concrete measures to reduce the demand for Groningen gas and their foreseen impact[10]. In this report, explicit attention has to be given to measures within and with regard to neighboring countries. Moreover, the claimed reductions should be substantiated with actual data and options should be investigated to accelerate the reduction of the demand. In order to fulfil this requirement, the Netherlands proposed to establish a Task Force on Gas Market Conversion Monitoring within the framework of the Pentalateral Gas Platform. The authorities of Belgium, France and Germany concurred with this proposal.

The current report aims to monitor the progress in L-gas conversion in Belgium, France and Germany and the activities in the Netherlands to reduce the consumption of G/L-gas. It provides the analysis needed by the Ministry of Economic Affairs and Climate Policy to decide on the allowed Groningen production and to meet the requirements of the resolution of the Dutch Parliament. It also creates a dedicated platform through the Task Force to further improve transparency and mutual understanding among the involved countries, and enables to share options to accelerate the conversion, without prejudice to national operators and end users. During the previous years, it has served as a platform to monitor and discuss developments related to COVID-19 and its impact on the market conversion planning. The Netherlands has used the information received during these meetings to inform their Parliament on 21 February, 8 April, 19 June and 21 September in 2020, on 11 February, 16 April, and 25 June in 2021, on 14 March and 26 September in 2022, and most recently on 6 March in 2023.

The current report provides an update on the progress of the conversion programs, with a focus on the planned conversions through GY 2022/23.

[10] The Parliament's resolution followed the decision made by the Dutch Council of State on July 3, 2019, which annulled the Ministry of Economic Affairs and Climate Policy's decision on the allowed Groningen production in the GY 2018/19. The Council of State concluded that it was not sufficiently motivated why the demand for Groningen gas could not be reduced faster than foreseen. The Council of State not only referred to Dutch demand but also to exports. According to the Council of State it was not sufficiently clear what the Ministry meant with his statement that he is in dialogue with neighboring countries to reduce their demand and what actions he undertakes to accelerate the reduction of exports of Groningen gas.

2. L-gas market conversion volume

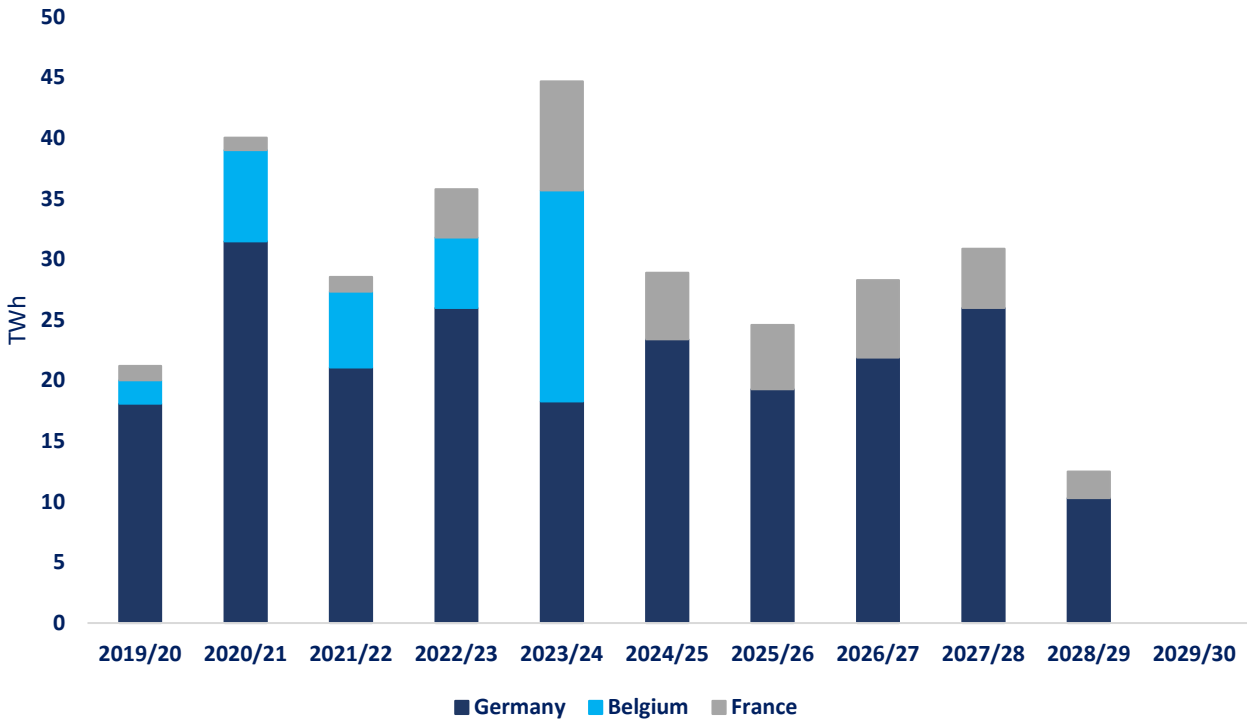
The gas infrastructure operators of Belgium, France and Germany have made arrangements to undertake extensive conversion programmes, mainly switching L-gas consumers to H-gas, to reduce the L-gas supply from the Netherlands: by GY 2029/30, their imports of L-gas will be reduced to close to zero.

Both the realised number of gas installations or consumers that are converted and the corresponding volumes are important to consider. In this report, countries supply data for each.

The current report provides an update on the progress of the conversion programmes, with a special focus on the conversions through GY 2022/23. Just over 1,000,000 gas connections and appliances are expected to be converted in GY 2022/23, the highest number through the market conversion programmes so far.

The estimated volume effect of the 2022/23 conversions (43.7 TWh) is ~52% higher than the volume effect of the conversions in GY 2021/22, when it was just over 28 TWh.

Figure 2.0.1. Volume effect of actual and planned conversions between GY 2019/20 and GY 2029/30 (TWh, based on average temperatures).



2.1 Germany

Legislative changes and conversion costs

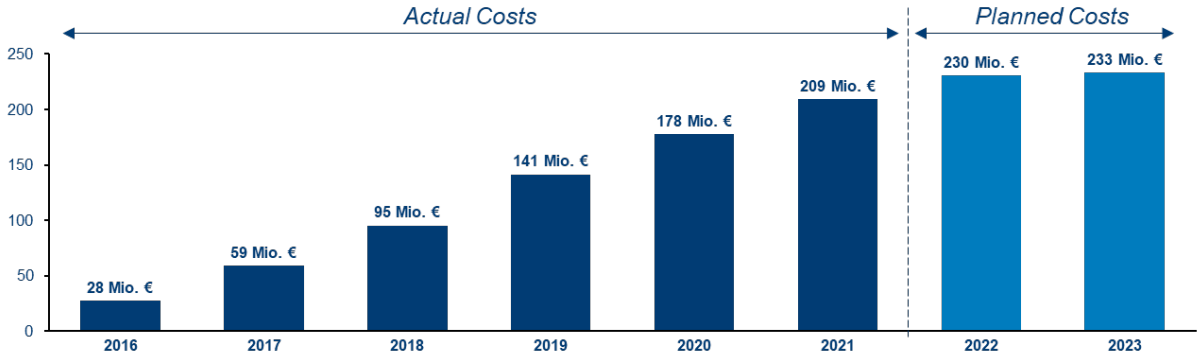
In order to implement the market conversion in Germany some 5.5 million gas appliances need a physical adaptation. A sophisticated timetable for the conversion process was put into place in 2014 and legal changes have been introduced. As of 2017, the Energy Industry Act (EnWG) had been revised substantially in order to serve as the basis for the market conversion from L- to H-gas. § 19a of the Energy Industry Act clarifies since that the legal responsibility for the process lies with the transmission system operators and that the necessary costs of adaptation of gas appliances are socialised (as an integral part of the gas grid fee). In addition, at a later stage the Energy Industry Act was amended concerning access to the German L-gas grid in order not to provide substantial amounts of L-gas to new customers.

The total costs for the conversion from L- to H-gas in Germany are estimated at approximately €4.3 billion. The conversion costs can be split into two different cost categories: (1) costs for adapting the customers' appliances from L- to H-gas and (2) costs for grid expansion.

The costs for adapting the customers appliances from L- to H-gas are reimbursed. The reimbursement only refers to the adaption and not the replacement of appliances. Customers with installations that cannot be adapted from L- to H-gas and have to be replaced are entitled to receive a lump sum of up to € 600 under certain circumstances.

The actual costs for the adaption of appliances from the years 2016 – 2021 and the planned costs for the years 2022 – 2023 are displayed in the illustration below, altogether totaling to approximately € 1.2 billion.

Figure 2.1.1. Actual and planned costs for the adaption of appliances, 2016-23 (€ million)



The respective costs are financed by a "market conversion levy" that is paid on top of the TSO transport tariffs. Estimates for the cumulated market conversion levy until 2029 see costs of roughly € 2.3 billion.

Costs for grid expansion on TSO and DSO level are not included in the market conversion levy described above. TSO costs for grid expansion related to L- to H-gas conversion amount to another € 2 billion and are financed by the regular transport fees.

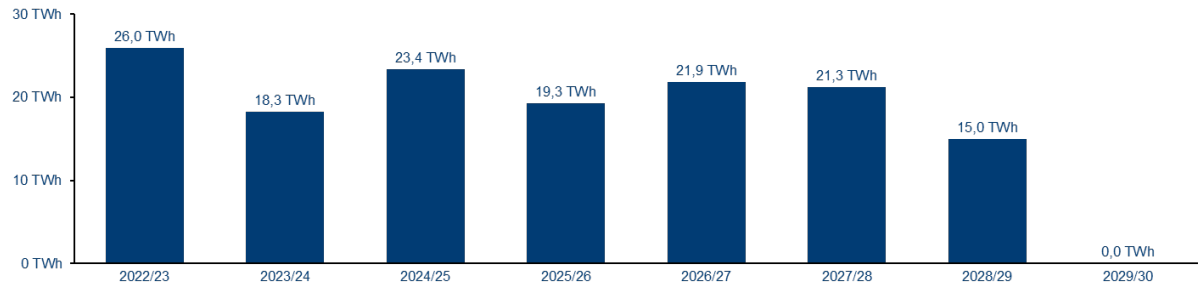
Conversions from 2015 to 2022

Approximately 2,050,000 appliances have been converted from L- to H-gas in the years 2015 – 2022, which amounts to almost 40% of the overall conversions.

During the years 2015 – 2018, several early conversions have been implemented ahead of the scheduled dates for conversion. Furthermore, the German TSOs have accelerated the planning for the consecutive years repeatedly. The conversions realised between 2015 and 2018 account for a capacity of 4.6 GWh/h and a yearly volume of 28 TWh. More than half of this volume accounted to conversions ahead of schedule, which served to bring down demand for Groningen gas earlier. As the advanced changes had been made years before the due date, they continue to be a relief for the Groningen production in the years to come.

In 2022, 495,000 appliances were converted, with an estimated volume effect of 21.2 TWh (average year). While the number of appliances to be converted per gas year is rather stable for the upcoming years, the resulting volume effect differs significantly due to the regional distribution of industry and power plants with a high gas consumption.

Figure 2.1.2. Estimated volume effect of market conversion per Gas Year (TWh)



Grid expansion required for the L-/H-gas conversion steps in 2022 were commissioned in time, including an 18 km connection pipeline in the area of Euskirchen and several pressure regulating and metering stations.

Conversions in 2023

In 2023, 552,000 installations are to be converted leading to an estimated volume effect of 26 TWh. As of June 2023, all conversion steps are conducted on time and the required grid expansion projects are completed. Concerning L-gas storages, two conversions took place in 2023:

- In April 2023, one of the L-gas storages in Epe has been partially converted to H-gas. A working gas volume of approximately 2 TWh has been shifted towards the H-gas system.
- The storage Huntorf is now totally converted to H-gas. This is the reason for the decrease of working gas at the UGS EWE-Zone L down to approx. 6 TWh. The storage zone UGS EWE-Zone L formerly included the storage of Nüttermoor L and Huntorf.

Figure 2.1.3. Conversion areas in 2023

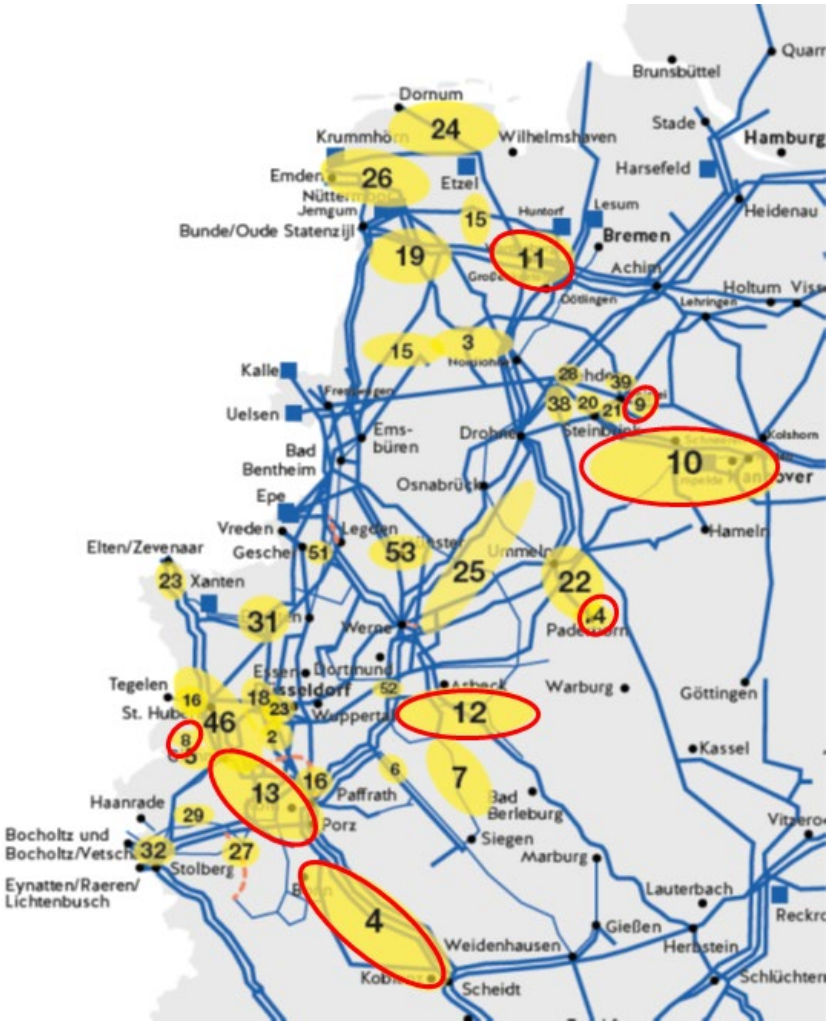


Table 2.1.1 Market conversion in Germany in 2023

Nr.	Conversion Area	TSO	# of installations	Month
4	Mittelrhein	OGE	67,000	April
4	Mittelrhein	OGE	30,000	May
4	Mittelrhein	OGE	19,000	July
4	Mittelrhein	OGE	30,000	August

4	Mittelrhein	OGE	20,000	August
4	Mittelrhein	OGE	17,000	September
8	Viersen-Meerbusch	TG	8,000	May
8	Viersen-Meerbusch	TG	6,000	June
8	Viersen-Meerbusch	TG	15,000	July
8	Viersen-Meerbusch	TG	16,000	August
8	Viersen-Meerbusch	OGE	3,000	April
8	Viersen-Meerbusch	OGE	5,000	September
11	EWE-Zone Teil IV	GTG	66,000	February - August
11	EWE-Zone Teil IV	GTG	23,000	October- November
9	Bereich Voigtei	Nowega	7,000	September
10	Drohne - Ahlten	OGE	17,000	September
12	Hagen - Iserlohn - Ergste	OGE	18,000	April
12	Hagen - Iserlohn - Ergste	OGE	44,000	May
12	Hagen - Iserlohn - Ergste	OGE	38,000	August
12	Hagen - Iserlohn - Ergste	OGE	14,000	October
13	Köln - Bergisch Gladbach	OGE	2,000	March
13	Köln - Bergisch Gladbach	OGE	11,000	May
13	Köln - Bergisch Gladbach	OGE	11,000	July
13	Köln - Bergisch Gladbach	OGE	11,000	September
13	Köln - Bergisch Gladbach	OGE	8,000	October
13	Köln - Bergisch Gladbach	TG	2,000	March
13	Köln - Bergisch Gladbach	TG	11,000	May
13	Köln - Bergisch Gladbach	TG	11,000	July
13	Köln - Bergisch Gladbach	TG	9,000	September
13	Köln - Bergisch Gladbach	TG	8,000	October
14	Paderborn	TG	8,000	May

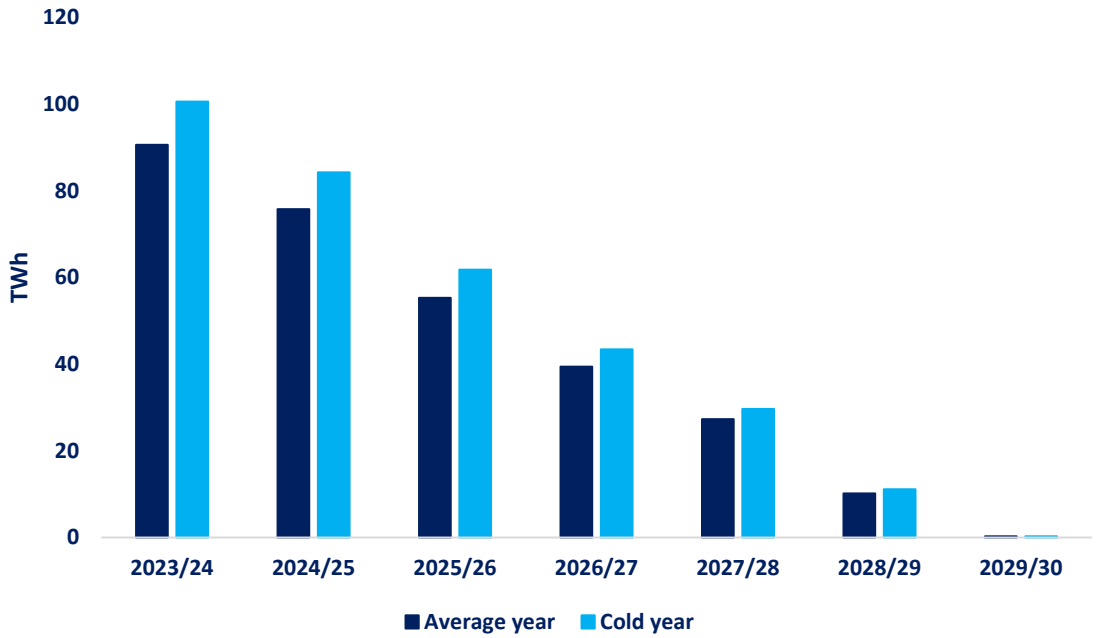
Conversions until GY 2029/30

In Germany, approximately 2.7 million gas appliances will still need to be converted between GY 2023/24 and GY 2028/29, translating into a total volume of 119 TWh.

Consequently, L-gas imports from the Netherlands to Germany are expected to fall to 0.3 TWh by GY 2029/30, both in an average and cold GY.

The conversion planning as presented in the summer briefing has been accelerated compared to the previous planning: the conversion of 135,000 appliances has been brought forward from the year 2029 to the year 2028.

Figure 2.1.4. Germany's L-gas imports from the Netherlands (GY 2022/23 - GY 2029/30) for average and cold GYs



2.2 France

Conversion of the French L-gas network

In 2018, almost 1.3 million of French gas consumers were supplied with L-gas, for a total volume of 43.4 TWh/y. All these consumers have to be converted to H-gas before GY 2029/30.

Since 2015, the French legal and regulatory framework has been adapted to carry out the conversion of the L-gas network. Costs incurred by the TSO and the DSOs for the conversion of the L-gas networks are covered through transmission and distribution tariffs and are estimated to amount to approximately € 800 million.

Conversions from 2018 to 2022

A pilot project was carried out between 2018 and 2020 to test the conversion process of the gas network. Approximately 68,000 customers have been converted from L- to H-gas during this period accounting for an annual volume of 1 TWh.

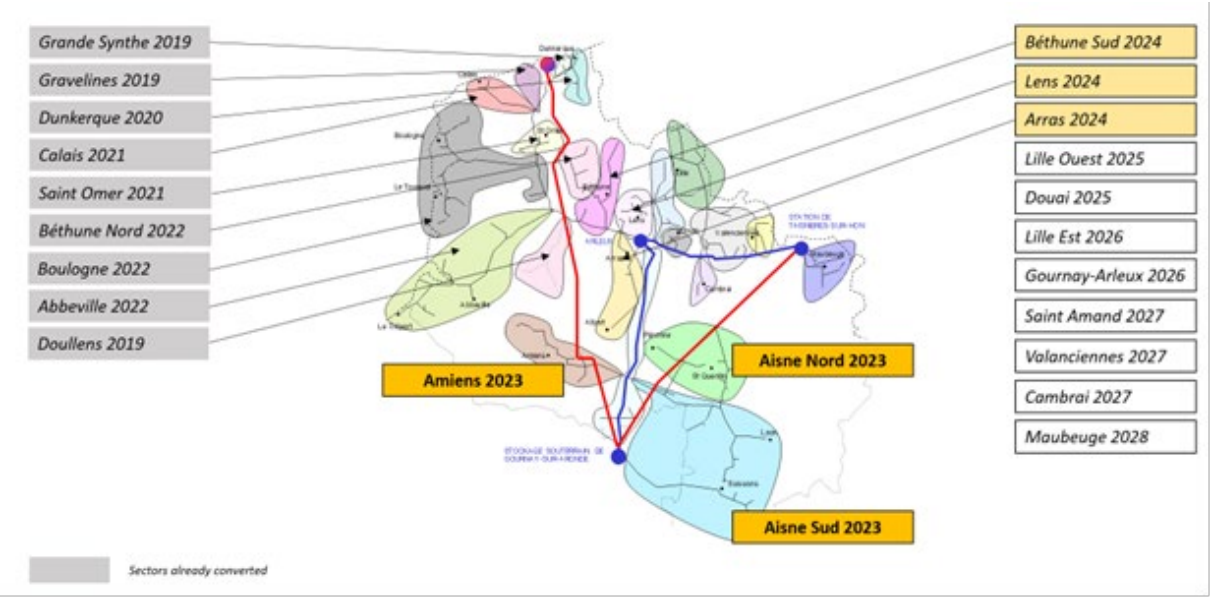
In 2021, two sectors with a total of 54,000 customers and, in 2022, three sectors with a total of 122,000 customers have been converted accounting respectively for an annual volume of 1.2 TWh and 4 TWh under average weather conditions.

Conversions in 2023

In 2023, three sectors with a total of 177,000 customers are to be converted leading to an estimated volume effect of 9 TWh. As of June 2023, all conversion activities are on track.

In 2024, three sectors with a total of 212,000 customers are to be converted accounting for an annual volume of 5.5 TWh under average weather conditions.

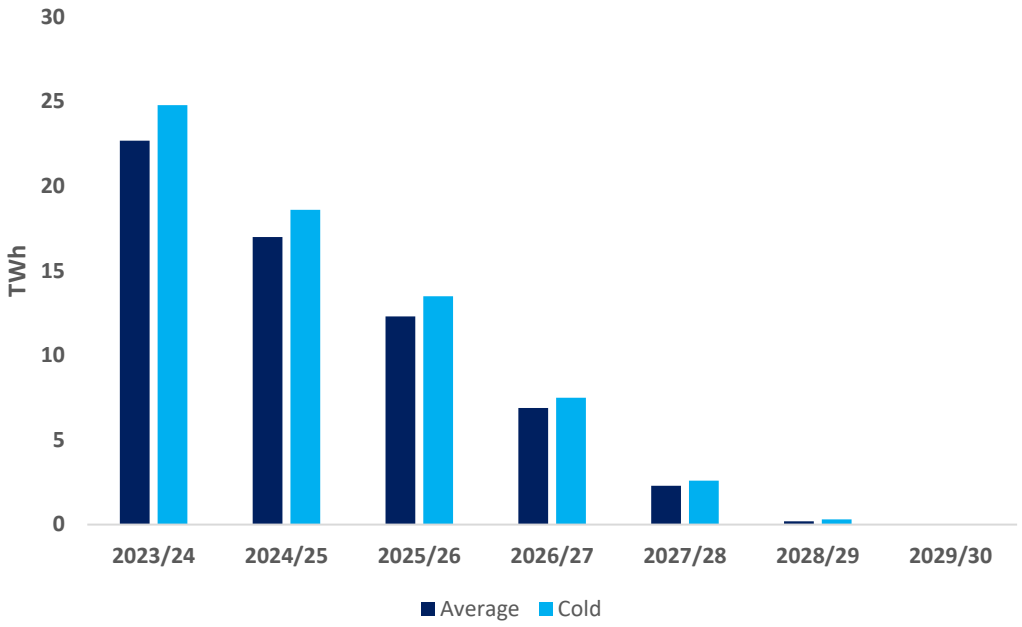
Map 2.2.1. Market conversions in France in 2019-2024



Conversions until GY 2029/30

In France, over 0.9 million of gas consumers will need to be converted between GY 2023/24 and GY 2029/30. Consequently, L-gas imports from the Netherlands to France are expected to fall to 0 by GY 2029/30, both in an average and cold GY.

Figure 2.2.1. France's consumers demand for L-gas from the Netherlands (GY 2023/24 - GY 2029/30) for average and cold GYs



2.3 Belgium

Conversions up to 2023

In GY 2018/19, around 35,000 connections were converted in Wallonia and Flanders. These conversions took place at junction points between the H- and the L-grids.

In GY 2019/20, almost 130,000 connections were converted, translating into an annual consumption of 1.92 TWh under average weather conditions. Due to the outbreak of the COVID-19 pandemic, delays in the works carried out at TSO level and in the activities at DSO level led to a postponement of the conversion from 1 June 2020 to 1 September 2020.

In GY 2020/21, more than 300,000 connections were converted, translating into a total volume of 7.53 TWh under average weather conditions. As such, the volume effect of the 2021 conversion was the highest to date. The conversion took place as planned, without any delay to be reported.

In GY 2021/22 around 254,000 connections were converted translating into a volume of 3.73 TWh under average weather conditions. The conversion has been divided in two phases: Flanders & Wallonia (1 June).

In GY 2022/23, around 365,000 connections were converted on 1 June translating into a volume of 5.81 TWh under average weather conditions.

Remainder of the conversion – optimization of the conversion planning

The successful completion of the L/H-conversion phases to date led the Belgian gas network operators (TSO and DSOs) to identify ways of converting larger L-gas market areas to H-gas each year, thereby reducing the total duration of the conversion program. The new indicative planning foresees that the Belgian L/H-conversion should be completed in September 2024 (instead of June 2029, as previously planned). The areas remaining to be converted are shown on Map 2.3.1. in blue. Dark orange shows the areas converted to date.

This optimization of the conversion planning is the result of a joint analysis by the Belgian TSO and DSOs, whereby individual conversion areas have been grouped, resulting in efficiency gains. This was made possible by the previous conversion phases, whereby the network operators acquired positive experience and confidence in the feasibility in such a scheme. Essentially two changes have been brought to the conversion planning:

- The L-gas areas of Antwerp, which were due to be converted in 2028 and 2029, are now converted in 2023.
- The L-gas areas previously planned for conversion in 2025, 2026 and 2027 are now scheduled in 2024.

The last conversion phase foreseen in 2024 in 2 phases (1 June and 1 September) is formally validated.

The GY 2023/24 conversion represents around 467,000 connections and a converted volume of 17.35 TWh under average weather conditions.

Map 2.3.1. Indicative market conversion planning in Belgium in 2024

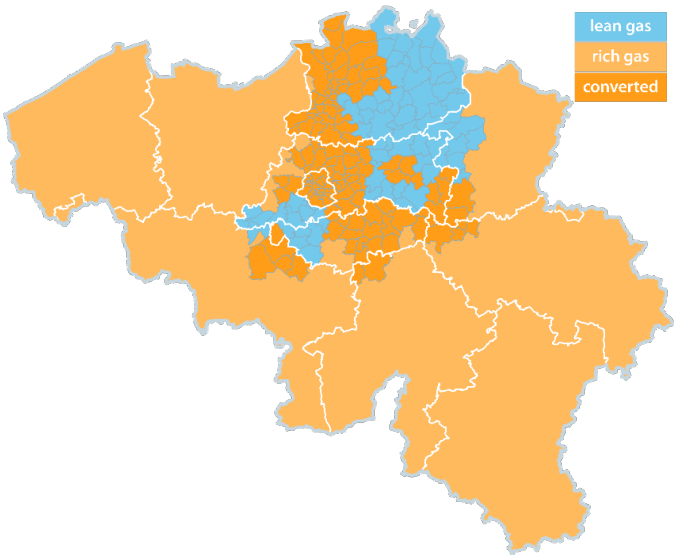
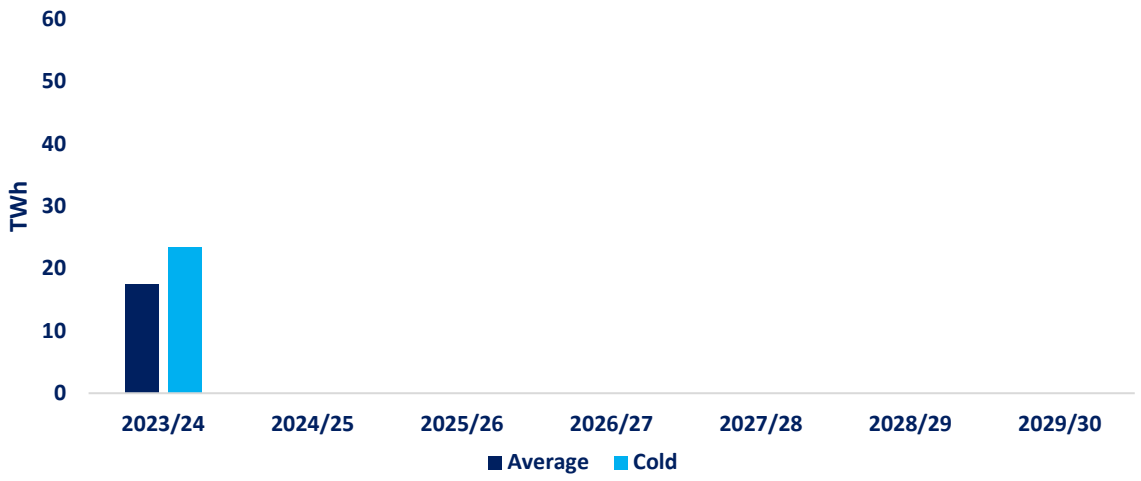


Figure 2.3.1. Belgium's L-gas imports from the Netherlands (GY 2023/24 - GY 2029/30) for average and cold GYs



2.4 The Netherlands

Contrary to other L-gas consuming countries, the Netherlands have decided not to enter into a large scale conversion operation. Instead, a new nitrogen facility is being built which, together with the already existing nitrogen facilities and some underground storage facilities, will be able to provide enough G/L-gas (volume and capacity) to meet Dutch and foreign L-gas demand in the years to come. For more details, please refer to Chapter 3 of the Report.

The legislative framework has been adapted in order to limit future G/L-gas consumption. The Dutch Gas Act has already been adapted to prevent future G/L-gas consumption growth by prohibiting the connection of newly built houses and buildings to the gas grid.
The legislation concerning the conversion of industrial customers (adopted on 20 June 2020) specifies that industrial customers who are connected to the L-gas network may not consume more than 100 million m^3 of G/L-gas per gas year. Moreover, the nine industrial consumers who consumed more than 100 million m^3 of G/L-gas annually for at least two years in GY 2016/17, 2017/18 or 2019/20 are not allowed to use L-gas anymore after October 2022. Therefore, Dutch demand for G/L-gas is expected to decrease by approximately ~30 TWh, equating to the consumption of these nine largest users. Five of these nine users have already stopped their offtake of G/L-gas and converted to other sources of energy. The remaining four industrial users have been and will be granted a temporary exemption from the ban by the Ministry of Economic Affairs and Climate Policy. This exemption holds until their planned conversion in the upcoming years.
In addition, steps are being taken to phase-out natural gas from the Dutch energy system between now and 2050. This follows the Paris Agreement on Climate Change and the Dutch Climate Agreement.

3. L-gas production

3.1. L-gas production in the Netherlands in the period GY 2015/16 – GY 2022/23 heating season

Following an increasing number of earthquakes linked to the natural gas extraction in the province of Groningen, the Dutch authorities have imposed successive caps on Groningen's gas production starting from GY 2014/15. This trend continued year-on-year, with the Groningen gas production at its lowest point at 44 TWh in GY 2021/22. In September 2022, the Dutch State Secretary of Mining decided on a production cap on the Groningen field of 28 TWh in both an average and cold year. GTS provided an additional analysis[11] supporting this decision,

[11] 'Aanvullend advies leveringszekerheid voor benodigde Groningencapaciteiten en – volumes gasjaar 2022/2023', d.d. 16 september 2022, kenmerk 22.0478. For the English version see the GTS website https://www.gasunietransportservices.nl/en/gasmarket/market-development/advice-production-groningen-field

claiming that this production volume would suffice when the demand reduction remained present and temperatures were mild.

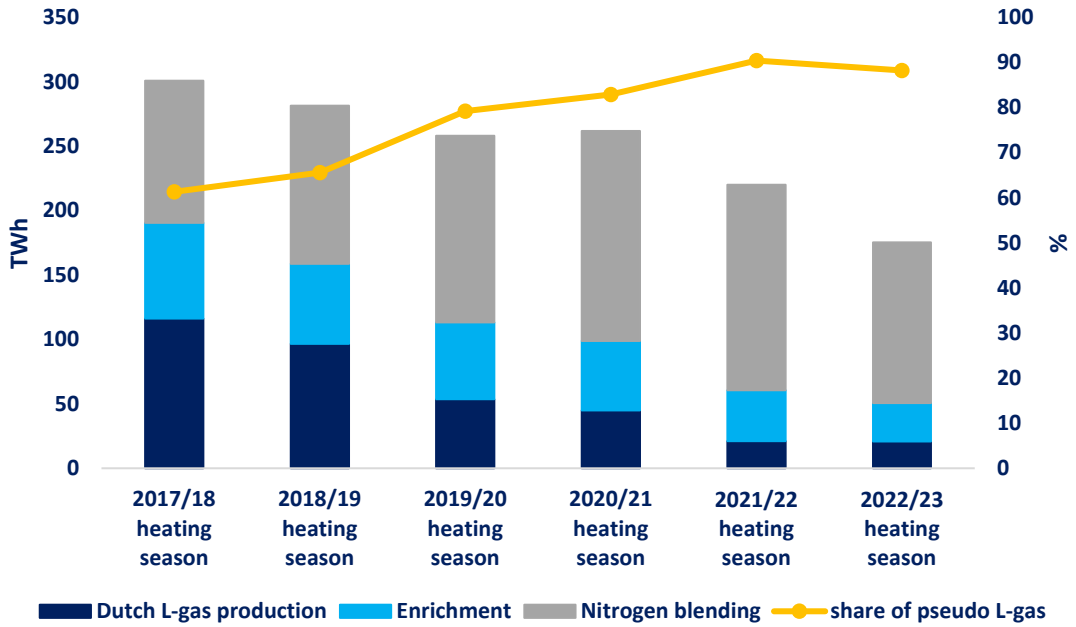
This decision meant that during the entire gas year, the production locations will produce at a minimum flow in order to ensure availability in case of extreme cold weather, unexpected (out of spec) qas qualities, transportation limitations, a shortage of H-gas or an outage in the L-gas system. This includes a small correction for the days that the daily average effective temperature is expected to be below zero.

For the heating season of the current gas year this results in a produced volume of the Groningen field of 19.9 TWh[12]. After the winter, the State Secretary decided on the closure of six of the production locations on the Groningen field as previous studies from GTS (still based on the assumption of sufficient supply of H-gas) have shown the earliest possible closing date of the Groningen field to be the start of GY 2023/24. This pending on the draft-decision on the production from the Groningen field for the upcoming gas year.

As stated, Groningen gas has a notably lower calorific value compared to the average European natural gas fields, which means that it can't be simply replaced by other (imported) natural gas sources. These need to be converted to L-gas referred in the current report as "pseudo L-gas". Pseudo L-gas can be produced either via nitrogen blending or via enrichment[13].

During the GY 2022/23 heating season, the total pseudo-gas production in the Netherlands declined by ~22% (or 44.7 TWh) with respect to GY 2021/22 heating season. Since both heating seasons have a comparable number of heating degree days (only ten heating degree difference), the main reasons for the decline is the lower demand due to relative high prices and the conversion programmes in Belgium, France and Germany. Both effects each account for half of the decline. The share of the L-gas production in total Dutch L-gas production remained ~90%, comparably to the share in the heating season of previous GY.

Figure 3.1.1. L-gas supply in the Netherlands in the period of GY 2017/18 – 2022/23 heating season.



For the previous years, the utilisation rate of the nitrogen facilities shows an increasing trend year-on-year for the previous heating seasons. The utilisation rate is calculated using the assumptions that GTS uses in the yearly advice on the Groningen production, corrected for the depth of the demand market when this is relative low.

[12] https://www.nam.nl/gas-en-olie/gaswinning.html#iframe=L2VtYmVkL2NvbXBvbmVudC8_aWQ9Z2Fzd2lubmluZyN0YWItdGFiLWRvd25sb2Fkcy1mNzE3OTc3M2Q1MTQ0NzZiYWNjOTVjNzMxZDgyYjQzNg

[13] In the process of nitrogen blending is added to H-gas in order to bring down the Wobbe-value until it meets the upper Wobbe-limits of the L-gas specifications. Enrichment refers to the process adding H-gas to Groningen-gas until the upper Wobbe limit of the L-gas specifications.

A utilisation rate above 100% indicates the use of back-up nitrogen capacity to produce higher volumes of pseudo G-gas. Due to the restrictions on the production from the Groningen field, namely minimum flow only, the utilisation rate of the nitrogen facilities is no longer of importance, since pseudo L-gas production can no longer be used to minimize production from the Groningen field.

With the declining natural L-gas production from the Netherlands, the production of pseudo L-gas plays a more important role in meeting the L-gas demand. The only remaining natural source for L-gas, the Groningen field, can only be closed if the total L-gas market can be supplied by pseudo L-gas. Sufficient H-gas and nitrogen are therefore needed.

With the disappearance of the H-gas supply from Russia, 30% of the H-gas demand needs to be supplied from other sources. The main source for H-gas is currently LNG, supplied through existing terminals in the United Kingdom, Belgium and the Netherlands. Since these terminals do not have enough capacity to replace the former Russian supply, additional LNG-import facilities have been and are being developed in the Netherlands[14], Germany and France. An extension of the re-gas capacity at the LNG terminal of Zeebrugge in Belgium is ongoing. Although some of these projects are operational already (expansion of the GATE LNG-terminal and the realization of the EemsEnergyTerminal in the Netherlands), most of them are still under development and will contribute mainly to the mid-term solution. On the short term, the demand supply balance is being kept by a decline in the European gas demand due to high prices. However, there is still a risk of H-gas shortages. This means that there is a possibility that there may not be enough H-gas supply for both the H-gas market demand and full usage of the conversion facilities for the production of the still needed amounts of pseudo L-gas.

3.2. L-gas production in the Netherlands for the period GY 2023/24 and further

Yearly in January, GTS provides advice to the State Secretary on the needed Groningen capacity and volume for the security of supply for the upcoming gas year. For GY 2023/24 GTS advises the State Secretary to keep the capacity of the Groningen production locations available for security of supply[15]. Reason for this is that based on the current assumptions, GTS still foresees the possibility of scarcity in the H-gas supply, despite an increase of LNG import capacity. At the moment it is unclear what the impact will be on the production from the Groningen field for the years after GY 2023/24. As the situation on the gas market is completely new and many developments are still uncertain, all trends and projects will be followed closely and GTS will update its advice at least yearly to take into account new insights. This advice was supplemented in May of this year[16], when GTS presented an analysis that showed that both the volume and capacity on the Groningen field is only needed in more exceptional scenarios, which are in case of extreme low temperatures and disruption of the single largest infrastructure to fill the peak demand or to fill the seasonal storages after they have been heavily used for security of supply during a cold winter. Having the production locations of the Groningen field on the current level of availability with accompanying minimum flow is not necessary[17] to ensure the availability of the Groningen field in these situations.

In June 2023, the Dutch State Secretary announced the intention to put a stop to the production from the Groningen field in GY 2023/24. This means that the premise is zero gas extraction from the production locations, but that limited gas extraction may be necessary in the event of extremely exceptional situations in the coming gas year. The final decision, expected in September 2023, will define the situations in which production sites will be used.

This is in line with the ambition of the Government of the Netherlands to close the Groningen field as quickly as possible, taking into account security of supply. In the previous years, multiple measures are taken to accelerate the time line of its closure. A number of these measures, such as enhancing the nitrogen production capacity on nitrogen blending facility Wieringermeer and filling the largest gas storage in the Netherlands Norg with pseudo G-gas, are completed. Others are expected to be finished this year. One of them is the conversion of the gas storage Grijpskerk from an H-gas storage to an G-gas storage. This conversion of the storage was planned so that it could, when volume and capacity are sufficient, take over the back-up functionality of the Groningen field and speed up the closure of the latter. Another measure is the construction of a new nitrogen plant at Zuidbroek. This blending facility has a capacity of 180,000 m^3/h N_2 and is able to produce a maximum of 97 TWh additional pseudo L-gas. With the construction being heavily impacted by the outbreak of COVID-19, consequent lockdowns and a dispute between the EPC contractor and subcontractor, the planned commissioning date of the nitrogen plant is delayed. GTS informs the market of the planning via REMIT messages[18]. Due to the price driven demand reduction, the delay does not affect the Groningen production in the current gas year.

[14] https://www.gasunietransportservices.nl/gasmarkt/investeringsplan/investeringsplan-2022
[15] For more details see the advice from GTS dated 31 January 2023, titled *Advies Benodigde Groningencapaciteiten en -volumes ten behoeve van leveringszekerheid voor gasjaar 2023/2024*
[16] 'Analyse stand van zaken op de gasmarkt en leveringszekerheid in het volgende gasjaar', kenmerk L 23.00289, d.d. 26 mei 2023. English version of this advice can be found on the GTS website.
[17] GTS presented a theoretical analyses, where the technical aspects of the installation was not taken into account.
[18] More information at https://www.gasunietransportservices.nl/transparency/remit/urgent-market-messages/2-2406

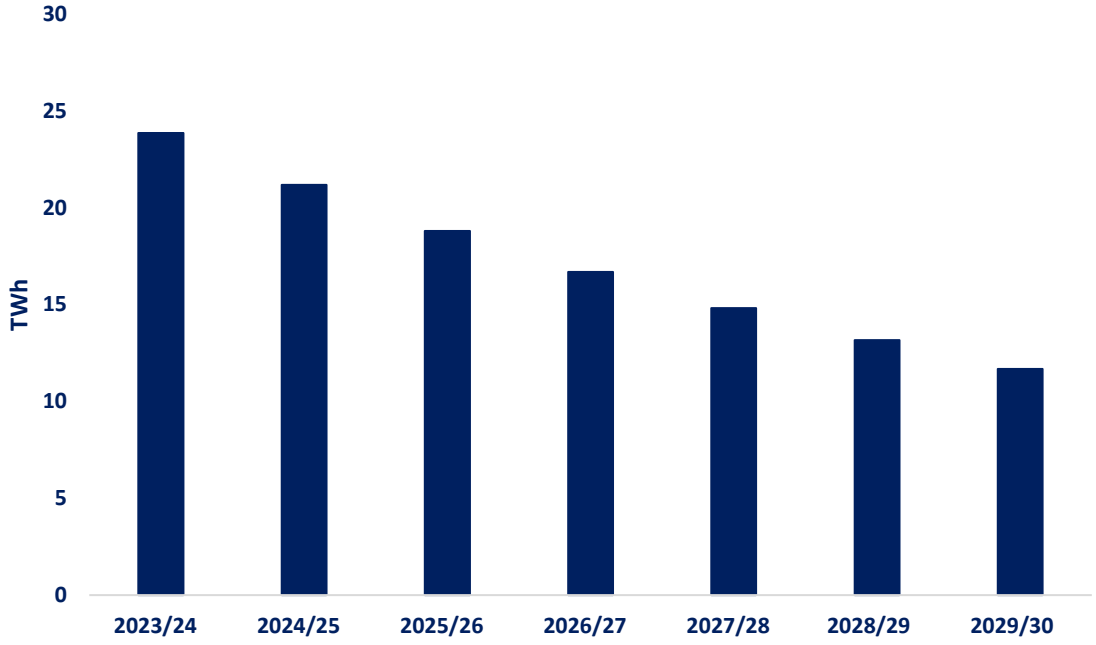
3.3 Expected L-gas production outside Netherlands for the period GY 2023/24 – 2029/30

In Germany, L-gas production is expected to decrease at an annual average rate of ~7% from 24.3 TWh in GY 2023/24 to 13.2 TWh by GY 2029/30. There is one peak nitrogen/H-gas blending facility in Germany, in Rehden, supplying only limited volumes of converted L-gas. In 2021, the blending facility in Rehden was extended with a local nitrogen plant for backing of the local supply demand balance.

In addition, the German TSO GTG Nord built a blending facility at the Dutch border. This facility allows for blending Dutch Groningen gas with H-gas. This blending facility is in operation since April 2021 and allows for an annual decrease of L-gas deliveries from the Netherlands of up to 30% (5-6 TWh/y approx.) of the demand of GTG's cross border point Oude Statenzijl, depending on, inter alia, the actual amount of gas imports. In GY 2021/22 1 TWh was blended. Thus, the facility is a further relief to the Groningen production. The building costs of the facility and its operational costs are borne by network users.

There is no L-gas production in Belgium and France. The French nitrogen/H-gas blending facility located at Loon Plage (near Dunkerque) designed for peak-load needs only was abandoned in 2021 as this area of GRTgaz network was converted. There is one peak nitrogen/H-gas blending facility in Lillo, Belgium, supplying only limited volumes of converted L-gas.

Figure 3.3.1. Indication of the L-gas production in Germany (GY 2023/24 – GY 2029/30) in TWh



Annex

Annex I: Consumers demand for L-gas from the Netherlands through the heating seasons of GY 2021/22 and 2022/23 in TWh

1.1 Consumers demand for L-gas from the Netherlands[19] through the heating season of GY 2021/22 in TWh

Heating season GY 2021/22	Germany	France	Belgium	Netherlands
October 2021	11.1	2.9	2.8	15.2
November 2021	14.0	4.5	4.2	22.6
December 2021	14.1	5.0	4.8	28.4
January 2022	14.5	5.3	5.1	29.2
February 2022	11.7	4.0	4.0	24.3
March 2022	12.0	3.5	3.4	19.9
Total	77.4	25.2	24.3	139.6

1.2 Consumers demand for L-gas from the Netherlands[20] through the heating season of GY 2022/23 in TWh

Heating season GY 2022/23	Germany	France	Belgium	Netherlands
October 2022	7.0	1.8	1.4	9.5
November 2022	8.5	2.9	2.4	15.7
December 2022	11.4	4.2	3.6	24.8
January 2023	11.0	3.9	3.5	23.4
February 2023	8.6	3.2	3.0	19.9
March 2023	10.0	3.1	3.0	20.0
Total	56.5	19.1	16.9	113.3

Annex II: Indication of the demand for L-gas from the Netherlands until GY 2029/30

2.1 Indication of the demand for L-gas from the Netherlands in Germany until GY 2029/30 (TWh)

	Cold		Average
Gas Year	**TWh**	**GWh/d**	**TWh**
2023/24	100.6	686.4	90.6
2024/25	84.3	573.6	75.8
2025/26	61.8	458.4	55.3
2026/27	43.4	343.2	39.4
2027/28	29.7	228.0	27.3
2028/29	11.1	115.2	10.2
2029/30	0.3[21]	2.4	0.3

[19] For Germany and Belgium, this accounts for imports of L-gas from the Netherlands and not total domestic demand. For France, this accounts for final consumers demand per month, not taking into account L-gas injections/withdrawals in/from Gournay storage, and L/H blending. For the Netherlands, it accounts for domestic demand.
[20] For Germany and Belgium, this accounts for imports of L-gas from the Netherlands and not total domestic demand. For France, this accounts for final consumers demand per month, not taking into account L-gas injections/withdrawals in/from Gournay storage, and L/H blending. For the Netherlands, it accounts for domestic demand.
[21] Please note that the remaining demand in the gas year 2029/30 (0.3 TWh / 100.000 kWh/h) is given by a regional grid in Germany, that can only supplied via the Netherlands (Haanrade / Thyssengas).

2.2 Indication of the demand for L-gas from the Netherlands in Belgium until GY 2029/30 (TWh)

	Cold		Average
Gas Year	**TWh**	**GWh/d**	**TWh**
2023/24	23.4	156	17.3
2024/25	0	0	0
2025/26	0	0	0
2026/27	0	0	0
2027/28	0	0	0
2028/29	0	0	0
2029/30	0	0	0

2.3 Indication of the demand for L-gas from the Netherlands in France until GY 2029/30 (TWh)

	Cold		Average
Gas Year	**TWh**	**GWh/d**	**TWh**
2023/24	24.8	216.5	22.7
2024/25	18.6	165.4	17.0
2025/26	13.5	113.5	12.3
2026/27	7.5	54.6	6.9
2027/28	2.6	11.8	2.3
2028/29	0.3	3.0	0.2
2029/30	0	0	0

2.4 Indication of the demand for L-gas in the Netherlands until GY 2029/30 (TWh)

	Cold		Average
Gas Year	**TWh**	**GWh/d**	**TWh**
2023/24	247.9	2917	213.0
2024/25	230.4	2732	197.9
2025/26	221.4	2677	189.5
2026/27	216.7	2637	185.5
2027/28	212.1	2601	181.5
2028/29	207.5	2565	177.5
2029/30	202.9	2529	173.5

Annex III: Expected market conversion volume until GY 2029/30

3.1 Expected market conversion volume in Germany until GY 2029/30 (TWh)

Gas year	Volume converted [TWh]	Number of installations [thousands]
2022/23	26.0	552
2023/24	18.3	503
2024/25	23.4	516
2025/26	19.3	510
2026/27	21.9	561
2027/28	26.0	447
2028/29	10.3	172
2029/30	0	0

3.2 Expected market conversion volume in Belgium until GY 2029/30 (TWh)

Gas year	Volume converted [TWh]	Number of installations [thousands]
2022/23	5.8	365
2023/24	17.4	467
2024/25	0	0

3.3 Expected market conversion volume in France until GY 2029/30 (TWh)

Gas year	Volume converted [TWh]	Number of installations [thousands]
2022/23	4.0	122
2023/24	9.0	177
2024/25	5.5	212
2025/26	5.3	279
2026/27	6.4	197
2027/28	4.9	183
2028/29	2.2	37
2029/30	0	0

Annex IV: Expected L-gas production

4.1 Indication of the L-gas production in the Netherlands from Groningen until GY 2023/24 (TWh)

Gas year	Cold	Average
2022/23	28	28
2023/24	0	0

4.2 Indication of the L-gas production in Germany until GY 2029/30 (TWh)

Gas year	Cold	Average
2022/23	29.5	29.5
2023/24	24.3	24.3
2024/25	22.5	22.5
2025/26	20.8	20.8
2026/27	19.1	19.1
2027/28	15.5	15.5
2028/29	14.4	14.4
2029/30	13.2	13.2

Annex V: L-gas storage in northwest Europe

5.1 Working gas volume and daily withdrawal capacity of L-gas storage sites in Germany, France and the Netherlands

	Working gas (TWh)	Withdrawal rate (GWh/d)
Germany		
UGS EWE – Zone L[22]	6.0	188.2
Empelde	2.2	73.9
Epe L-Gas (RWE)	1.9	98.5
Epe L-Gas (UES)	2.1	288
France		
Gournay	13.4	215
the Netherlands		
EnergyStock	3.0	252

[22] This includes the storage UGS Nüttermoor

Norg (Langelo)	49.0	742
Alkmaar	5.0	357
Epe Nuon	3.0	117
Epe Eneco	1.0	95
Epe RWE Gas Storage West GmbH	3.0	119
Peakshaver	1.0	312
Grijpskerk	12.0	620

5.2 Net withdrawals of L-gas storage sites in Germany, France and the Netherlands through the heating seasons of GY 2020/21, GY 2021/22 and GY 2022/23 in TWh

	2020/21	2021/22	2022/23
The Netherlands	42	35	34
France	9.8	9.1	8.5
Germany	11.2	5.7	6.6

Annex VI: Climatological context

L-gas is predominantly used in the residential sector for space heating, therefore L-gas gas demand is strongly correlated with the temperature and wind. This is also the reason why the allowed Groningen production is determined by the number of degree days in a year. The definition of the degree days is given in the Dutch Gas Act. As stated in the Dutch Gas Act, both the temperature and wind are measured at weather station the Bilt.

The number of degree days can be calculated by

$D = \Sigma \max[(14 - Teff),0]$

Where:

D = the number of degree days

14 = heating limit (the so-called "stookgrens")

Teff = daily average effective temperature

$Teff = T - (V/1,5)$

Where:

T = daily average temperature

V = daily average wind speed

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