L-Gas Market Conversion Review

Winter Report 2022

Task Force Monitoring L-Gas Market Conversion

Ministry of Economic Affairs and Climate Policy

Foreword

This is the fifth edition of the report monitoring the conversion of the low calorific gas (L-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 through the previous Gas Year (2020/21) and looks forward to the coming gas years with regard to the observed and expected demand for Dutch L-gas and conversion progress of gas installations.

The current report provides an update on the progress of the conversion programs, with a special focus on conversions through the Gas Year 2021/22. The estimated volume effect of the 2021 conversions (40 TWh) was the highest of all gas years so far, due to the particularly high conversion rates in Germany and Belgium.

The report is compiled by the International Energy Agency (IEA), the European Network of Transmission System Operators for Gas (ENTSOG), Gasunie Transport Services (GTS), and the Netherlands Ministry of Economic Affairs and Climate Policy (Min. EZK), under the umbrella of 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 Benelux Secretariat-General. The report is published semi-annually. The Netherlands will use this report to inform the Dutch Parliament on the progress of reducing the demand for Groningen gas.

Executive summary

The Government of the Netherlands announced in March 2018 its decision to terminate natural gas production from the Groningen field as soon as possible but not later than 2030, 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 State Supervision of the Mines after an earthquake occurred on 22 May 2019, with the objective of accelerating the termination by Gas Year[1] (GY) 2022/23 for average weather conditions. From mid-2022, gas from the Groningen field (Groningen gas) should only be needed in case of a colder than average winter and in case of a severe disruption in the L-gas system.

However, the household appliances still need L-gas in the Netherlands (max. Wobbe 44.4 MJ/m3) and L-gas in Germany, Belgium, France (max Wobbe 46.5 MJ/m3). Without Groningen gas, so called "pseudo L-gas" is needed to secure the supply in the L-gas market region.

Overall, it can be concluded that the L-gas market conversion is progressing well and that the security of L-gas supply is being ensured by increasing 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. Despite the recently communicated delay regarding the completion of the Zuidbroek II nitrogen facility and adjusted demand expectations for the remaining L-gas areas in Germany.

Pseudo L-gas can be principally produced as follows:

- 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 L-gas specifications (46.5 MJ/m3);
- enrichment: adding H-gas to (pseudo) Groningen-gas[2] until the upper Wobbe-limit of the L-gas specifications (46.5 MJ/m3) is reached.

As a result, Groningen gas production has halved from 341.8 TWh (or 35 bcm[3]) in GY 2014/15 to 171.1 TWh (or 17.5 bcm) in GY 2018/19. This trend accelerated through the GY 2019/20 as Groningen gas production more than halved year-on-year, falling by 86.72 (8.87 bcm) TWh year-on-year, from 171.1 TWh (17.5 bcm) in GY 2019 to 84.4 TWh (8.64 bcm).

Whilst Groningen gas production has halved from 341.8 TWh (or 35 bcm) in GY 2014/15 to 171.1 TWh (or 17.5 bcm) in GY 2018/19, the production of pseudo G/L-gas more than doubled during the same period of time. This trend continued through the GY 2020/21, with Groningen gas production further declining by over 10% to 75.8 TWh (7.76 bcm). During the GY 2020/21, total pseudo L-gas production increased by 2.9% (or 10.75 TWh) in the GY 2020/21 up to 383.9 TWh.

Consequently, the share of pseudo L-gas in total Dutch L-gas production grew from just above 30% in GY 2014/15 to close to 84% in GY 2020/21. During the same period, the utilization rate of nitrogen blending facilities has increased steadily to average at 100% of firm capacity during the GY 2020/21. The utilization rate of above 100% indicates the use of back-up nitrogen capacity to produce higher volumes of pseudo L-gas.

Higher pseudo L-gas production has been made possible with the expansion of the nitrogen blending capacity by 80,000 m3/h N2 at the Wieringermeer conversion facility, starting from 23rd December 2019. This has translated into an additional 48.9 TWh/year of pseudo L-gas production capability.

Pseudo L-gas is playing an increasingly important role in reducing Groningen gas production, with its share expected to increase from 65% in GY 2018/2019 to over 95% of L-gas produced in the Netherlands in GY 2022/23. Moreover, in the GY 2023/24, pseudo L-gas will account to 100% (or 336 TWh) of L-gas produced in the Netherlands and is set to provide the entire upward production flexibility necessary to meet demand in a cold GY. Nitrogen blending alone will account for over 90% % (or 305 TWh) of L-gas produced in the Netherlands and expected to provide over 90% of the upward production flexibility necessary to meet demand in a cold GY.

[1] A Gas Year (GY) starts on 1 October and ends on 30 September.
[2] 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.
[3] Volumetric data is expressed in Normal cubic meters (Nm^3), under reference conditions of temperature (0 °C) and pressure (101.325 kPa).

Pseudo L-gas is exported to neighboring markets in Belgium, France and Germany, where it serves dedicated L-gas consumers –who will be converted to other sources of energy, most notably H-gas, as a result of the Groningen phase-out.

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

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 (pseudo) Groningen-gas, as well as the overall security of supply developments within the L-gas market region. It provides the analysis needed by the Ministry of Economic Affairs and Climate Policy to decide on the allowed Groningen production in the coming Gas Year 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.

Total consumption of Dutch L-gas increased by 0.9% (or 4.1 TWh) from 459 TWh in Gas YearGY (GY) [4] 2019/20 to 463 TWh inGY 2020/21 (although staying 4.1% or 19.9 TWh below the consumption level of GY 2018/19).

The increase in Dutch L-gas consumption happened despite the continued implementation of the market conversion programs in the respective L-gas markets and was largely due to colder than average temperatures across northwest Europe. In the GY 2020/21 there were 2261 degree days, 10% higher than the 2057 degree days recorded during the previous Gas Year.

In GY 2019/20 conversion totaled to 21.22 TWh, with 18.1 TWh taking place in Germany, 1.92 TWh in Belgium, 1.2 TWh in France and 0 in the Netherlands. In GY 2020/21 conversion totaled to 40 TWh, with 31.5 TWh taking place in Germany, 7.53 TWh in Belgium, 1.2 TWh in France. In the Netherlands one industry has been converted to H-gas.

In the ten consecutive years, between GY 2019/20 and 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.[5] Consequently, L-gas demand met with imports from the Netherlands is expected to fall from 44.6 TWh in GY 2020/21 to 0 in Belgium by 2024/25, from 39.2 TWh to 0 in France and from 143.3 TWh to 0.3 TWh in Germany by GY 2029/30 both in an average and cold GY.

To make the transition successful, the following criteria should be met:

- the remaining L-gas demand is met with an adequate amount of L-gas supply, including pseudo L-gas production, and sufficient transport capacity to ensure security of supply at any time;
- H-gas supply to the Netherlands and the Northwest European markets needs continued monitoring as it is used as feedstock to produce pseudo L-gas;
- new nitrogen and conversion facilities come into operation without delays;
- there are no significant delays in converting appliances from L- to H-gas;
- the continuation of the Dutch TTF market structure (e.g. commercially one gas quality).

The Covid-19 induced lockdowns had only a minor impact on the overall schedule of the conversion programs in 2020 and no impact in 2021.

In GY 2020/21 over 900,000 gas connections and appliances were converted – the highest number through the market conversion programme so far. The estimated volume effect of the 2021 conversions (40 TWh) is almost the double of the 2020 conversions (21.2 TWh) and is the highest of all gas years so far, due to the particularly high conversion rates in Germany and in Belgium. 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. Furthermore, the high rates can be explained by optimization opportunities which are only possible for specific areas in Belgium.

Notably, the optimization of the conversion planning in Belgium is expected to allow for higher conversions in the GYs 2022/23 and 2023/24, indicating a potential reduction of Belgium's L-gas imports from the Netherlands to 0 by GY 2024/25 instead of GY 2029/30.

The analysis of the conversion programs, provided in Chapter 3 of the Report, shows an alignment with the expected L-gas demand in each market and for each gas year.

To meet this declining L-gas demand against an even faster decreasing Groningen production, the Netherlands will increase the production of pseudo L-gas, primarily by means of additional nitrogen blending.

[4] A Gas Year starts on 1st October and ends on 30 September. The heating season (or gas winter) lasts from 1st October until 31st of March.
[5] GTS (2017), Netwerk Ontwikkelingsplan 2017.

Additional purchase of nitrogen allowed to expand the nitrogen blending capacity by 80,000 m^3/h N_2 at the Wieringermeer conversion facility from 215,000 to 295,000 m^3/h starting from 23rd December 2019. This translated into an additional 48.9 TWh of pseudo L-gas production capability.

To substitute the decreasing production from the Groningen field, the production of pseudo L-gas has to increase. This will be supported by the new nitrogen plant at Zuidbroek, which is currently under construction and will be able to produce 180,000 m3/h N2. This will increase the level of pseudo L-gas production by almost 100 TWh.

The construction of the new nitrogen plant was impacted by the outbreak of Covid-19 and consequent lockdowns and disruptions in supply chains. The planned commissioning date of the nitrogen plant is postponed from April 2022 to August 2022.

The German L-gas transmission system operators (TSOs) reported December 2021 to this Taskforce that the German L-gas production is lower than expected and that the current estimate for L-Gas demand in Germany for the current and subsequent gas years has increased. The current estimate for the ongoing gas year amounts to approximately 7 TWh. An estimate of additional 4 TWh as a one-off effect for the ongoing gas year is related to storage level fluctuations.

The capacity requirement does not change and the German conversion to H-gas is still going according to plan.

The current estimate is based on several reasons:

1) German L-gas production is usually lower than the forecast of the gas producers.

2) The assumed energy efficiency (approx. 1% on an annual basis) incorporated in the former planning process was not realized.

3) Storage facilities in Germany and all over Europe started in the ongoing gas year with a low filling level and may therefore not operate in a volume-neutral way, as expected.

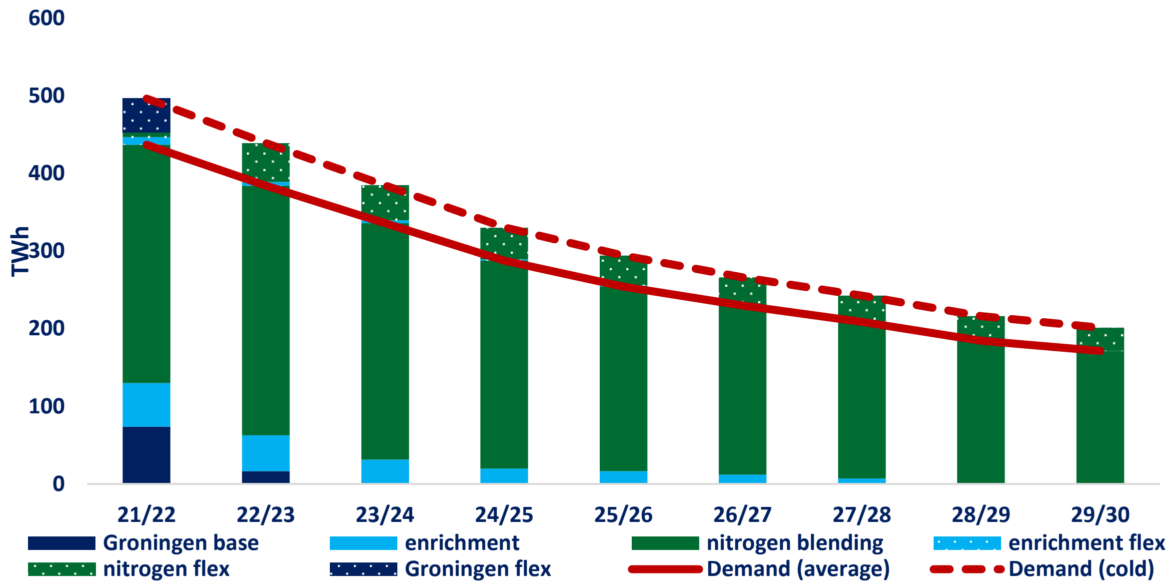
The items mentioned under 1) and 2) also have an impact on the coming gas years and will lead to a higher expected gas demand for L-gas in the coming gas years.

The increase of H-gas conversion capacity via nitrogen blending in the Netherlands, the allowed Groningen production and the market conversion from L-gas to H-gas in Germany, Belgium, France as well as in the Netherlands will ensure the security of pseudo L-gas supply to consumers in all markets both in an average and in a cold year.

GTS concluded in her advice of January 2022 that the earliest date to close the Groningen field is October 2023 if it would be decided to convert UGS Grijpskerk to L-gas. Without conversion of Grijpskerk the earliest date to close the Groningen field Groningenfield is October 2025. The Government of the Netherlands wants to close the Groningen field as quickly as possible. An important factor which is being considered can be the storage of L-gas instead of H-gas in UGS Grijpskerk. This can speed up the closure of the Groningen field to mid-2023 or mid-2024, as concluded by GTS in June 2021. The final decision on this measure will be taken at the start of 2022. Anyhow, in the period 2021-2025 L-gas supply flexibility will be entirely provided by the nitrogen blending facilities, enrichment, the L-gas storages and the Groningen field until its final closure.

GTS has indicated to the Dutch Ministry that a higher production level might be needed because of the delay in the commissioning of the new nitrogen facility and possibly additional demand from Germany, according to current projections. The current level of allowed Groningen production for GY 2021/22 is 38.1 TWh in an average year. GTS estimates that a Groningen production level of 74.2 TWh in an average year might be needed in order to make sure that the demand is covered and that the gas storages Norg and Grijpskerk are adequately filled before the next gas year. In case the filling of Grijpskerk with L-gas would be postponed with one year the required Groningen production level would be 58.6 TWh in an average year. The Dutch Secretary of State will make a decision about this before 1st of April 2022.

L-gas supply-demand balance projection in an average and cold year[6] (GY 21/22-GY 29/30)



As a consequence of a declining domestic production and the subsequently growing need for H-gas to feed the nitrogen facilities to deliver it as pseudo L-gas to L-gas consumers, the Netherlands almost doubled their H-gas imports from 28.8 bcm (or 281.4 TWh) in GY 2013/14 to 57 bcm (or 556.9 TWh) in GY 2017/18. In fact, the Netherlands became a net importer of natural gas in GY 2017/18 for the first time in the country's history. Net gas imports of natural gas rose by almost 90% year-on-year in the GY 2019/20 up to 17.7 bcm. Net imports declined by 16% (or 2.8 bcm) year-on-year to 14.85 bcm in GY 2020/21.

Consequently, the security of L-gas supply is becoming intimately linked to the deliverability of H-gas into the Netherlands.

The deliverability of H-gas supply to the Netherlands and the Northwest European markets is monitored and assessed continuously within the framework of the Gas SoS Regulation (Regulation EU 2017/1938). ENTSOG carries out union wide simulations of gas supply and infrastructure disruption scenarios for the risk groups set up in annex 1 of the regulation and updated in SOS 2021 report to include projects expected to be commissioned before the year 2023[7]. These risk groups are formed on the basis of common gas supply sources (i.e. eastern gas supply, North Sea gas supply, etc). Within these groups common risk assessments, preventive action and emergency plans are made. Different scenarios are assessed in the report and specially Scenario 10 and 11 concern L-Gas infrastructure. In both scenarios, Dutch domestic demand can be supplied and exports to Germany, Belgium and France can be maintained. The other disruption scenarios (for H-Gas) don't show any specific risk of demand curtailment for Netherlands.

[6] 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 Report. 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.

[7] SOS report 2021 is available at Entsog website: https://www.entsog.eu/security-of-supply-simulation#sos-regulation

Key findings

1. Based on the received data of the expected consumers demand for Dutch L-gas in Germany, France and Belgium, and on the achieved results with regards to the market conversion in the three countries, GTS can make a detailed assessment of the necessary volumes of L-gas for the coming year and the years after that. As a result, a more precise assessment can be made of the necessary production from the Groningen field.

2. Total consumption of Dutch L-gas increased by 0.9% (or 4.1 TWh) from 459 TWh in Gas Year (GY) 2019/20 to 463 TWh in GY 2020/21. The increase in Dutch L-gas consumption happened despite the continued implementation of the market conversion programs in the respective L-gas markets and was largely due to colder than average temperatures across northwest Europe. The analysis of the conversion programs, provided in this Report, shows an alignment with the expected L-gas demand in each market and for each GYear.

3. Gas production from Groningen further declined in GY 2020/21, falling by over 10% to 75.8 TWh. This has been possible due to higher L-gas production via nitrogen blending, which increased by 5.6% and drove up the utilization rate of the nitrogen blending facilities to an average close to 100% of their firm capacity during the 2020/21 gas winter. Higher pseudo L-gas production was also possible with the expansion of the nitrogen blending capacity at the Wieringermeer conversion facility, starting from 23rd December 2019.

4. The construction of the Zuidbroek nitrogen plant was impacted by the outbreak of Covid-19 and consequent lockdowns and disruptions in supply chains. The nitrogen plant is planned to be fully operational in August 2022, instead of April 2022 The Dutch Secretary of State will make a decision on the adjusted Groningen production before 1st of April 2022.

5. The Covid-19 induced lockdowns had only a minor impact on the overall schedule of the conversion programs. In the GY 2020/21 over 900,000 gas connections and appliances are expected to be converted –the highest number through the market conversion program so far. The estimated volume effect of the 2021 conversions (40 TWh) is almost the double of the 2020 conversions (21.2 TWh) and is the highest of all gas years so far, due to the particularly high conversion rates Germany and in Belgium. The estimated volume effect of the conversions during GY 2021/22 is 28.7 TWh, almost 29% lower than the volume effect of the GY 2020/21 conversions. In terms of volume impact, conversions are expected to reach their peak in GY 2022/23 and 2023/24 at an average of over 45 TWh.

6. Notably, the optimization of the conversion planning in Belgium is expected to allow for higher conversions in the GYs 2022/23 and 2023/24, indicating a potential reduction of Belgium's L-gas imports from the Netherlands to 0 by GY 2024/25.

7. 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. In the ten consecutive years, betweenGY 2019/20 and GY 2029/30, combined L-gas exports from the Netherlands to Belgium, France and Germany are expected to be gradually reduced to 0.

8. Together with the increase in nitrogen capacity, the allowed Groningen production and the structural decrease in L-gas demand in the region, the facilities of GTS combined with the L-gas facilities from others (most notably the L-gas storages) will be able to meet the decreasing L-gas demand, when the precondition of sufficient H-gas is supplied towards the Netherlands is met. This will allow to stop production from Groningen by GY 2022/23 volume wise. For capacity reasons the Groningen field may be needed for security of supply. When UGS Grijpskerk is used to store L-gas instead of H-gas the closure can be mid-2023 or mid-2024. The Government of the Netherlands wants to close the Groningen field as quickly as possible. A final decision on the storage Grijpskerk is expected to be taken at the start of 2022.

9. Due to the continuously increasing demand for H-gas for the conversion capacity, the Netherlands has become a net importer of gas in 2018. Because of these developments, the security of supply of L-gas has become increasingly more dependent on the flow of the increasing H-gas volumes into the Netherlands. Based on ENTSOG's SoS simulations for 2021, there is enough import and cross-border capacity to satisfy H-gas global needs for the Netherlands and the L-gas area (even when considering the most severe demand cases with a 2 week cold spell and peak day) through the GY 2029/20.

Contents

1. Introduction

The Government of the Netherlands announced in March 2018 its decision to terminate natural gas production from the Groningen field as soon as possible, in order to guarantee safety in the area of Groningen against the risk of earthquakes resulting from natural gas 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 State Supervision of the Mines after an earthquake occurred on May 22, with the objective of accelerating the termination by Gas Year (GY) 2022/23 for average weather conditions. From mid-2022, Groningen gas should only be needed in case of a colder than average winter and in case of a severe disruption in the L-gas system. 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.

L-gas is consumed in the Netherlands and exported to neighboring markets in Belgium, France and Germany, where it serves dedicated L-gas consumers – who will be converted to other sources of energy, most notably H-gas as a result of the Groningen phase-out. 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 export markets in Belgium, France and Germany. The four countries have been working together since 2012 on the phasing-out of L-gas consumption, 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 that requires the Ministry of Economic Affairs and Climate Policy of the Netherlands (Min. EZK) to report twice a year on concrete measures to reduce the demand for Groningen gas and their foreseen impact[8]. 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 L-gas, as well as the overall security of supply developments within the low-calorific market region. It provides the analysis needed by the Min. EZK to decide on the allowed Groningen production for the coming GY 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 months, 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 21st February, 8 April, on 19 June, on 21 September 2020 and most recently on 11 February, 16 April and 25 June 2021 and 24 September 2021.

The current report provides an update on the progress of the conversion programs, with a focus on the planned conversions through the GY 2021/22. Over 900,000 of gas connections and appliances are expected to be converted in GY 2021/22 –the highest number through the market conversion program.

The estimated volume effect of the 2021 conversions (40 TWh) is the highest of all gas years so far, due to the particularly high conversion rates in Germany and Belgium.

[8] The Parliament's resolution followed the decision made by the Dutch Council of State on July 3, 2019, which annulled the Min. EZK's decision on the allowed Groningen production in the Gas Year 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 demand[9]

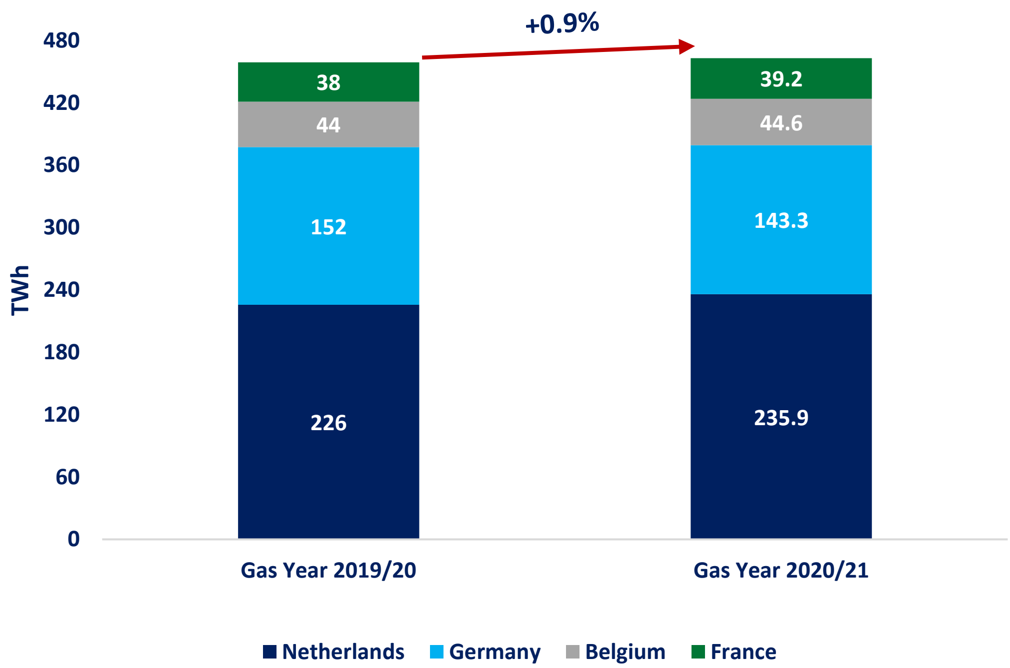
2.1 Recent demand trends

Total consumption of Dutch L-gas increased by 0.9% (or 4.1 TWh) from 459 TWh in Gas Year (GY)[10] 2019/20 to 463 TWh in GY 2020/21 (although staying 4.1% or 19.9 TWh below the consumption level of GY 2018/19).

The increase in Dutch L-gas consumption happened despite the continued implementation of the market conversion programs in the respective L-gas markets and was largely supported by colder than average temperatures across northwest Europe.

In GY 2019/20 conversion totaled to 21.22 TWh, with 18.1 TWh taking place in Germany, 1.92 TWh in Belgium, 1.2 TWh in France and 0 in the Netherlands. In GY 2020/21 conversion totaled to 40 TWh, with 31.5 TWh taking place in Germany, 7.53 TWh in Belgium, 1.2 TWh in France and 0 in the Netherlands.

Figure 2.1 Consumption of L-gas from the Netherlands in GY 2019/20 and GY 2020/21



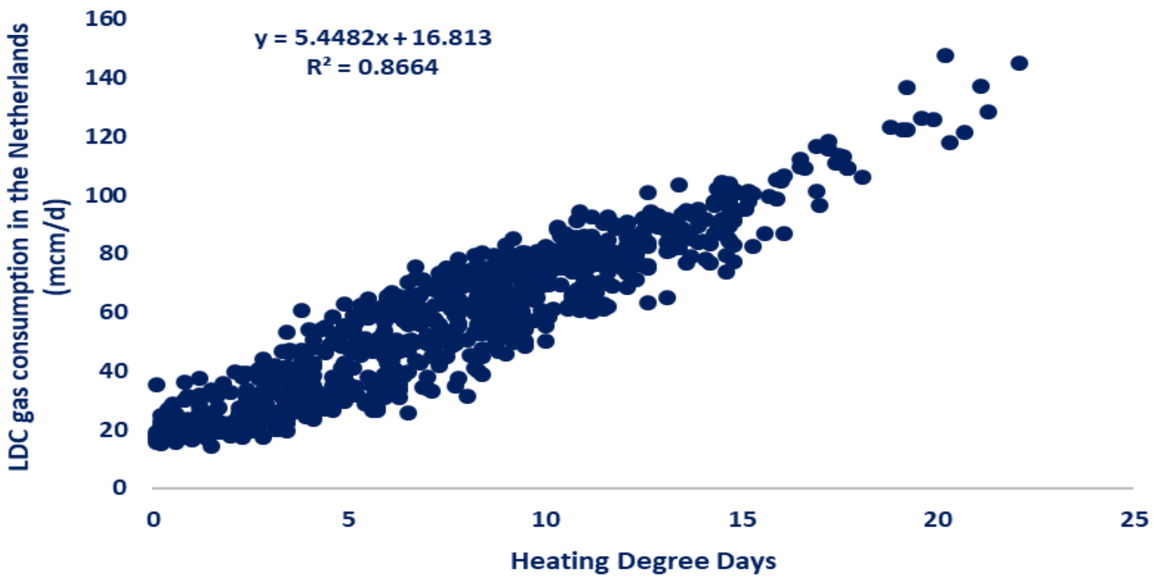
It is important to highlight that market conversion volumes do not necessarily translate into the same amount of L-gas consumption change as other demand side factors also have an influence on the overall L-gas demand. This includes heating degree days (HDDs) which drive space heating requirements or wind speeds which can have an impact on gas-to-power demand.

L-gas is predominantly consumed in the residential and commercial sectors for space heating purposes. Consequently, L-gas demand shows a significant seasonal profile, with over two-thirds of consumption occurring through the heating season of the Gas Year. It is important to note, that there is particularly a strong correlation between the number of HDDs and L-gas consumption, given its predominant use for space heating purposes.

[9] Demand is an ex ante concept, referring to expected energy quantities being consumed. Consumption is an ex post concept, referring to energy quantities which have been already consumed. The two terms are used in an interchangeable manner in this Report.

[10] A GY starts on 1st October and ends on 30 September. The heating season (or gas winter) lasts from 1st October until 31st of March.

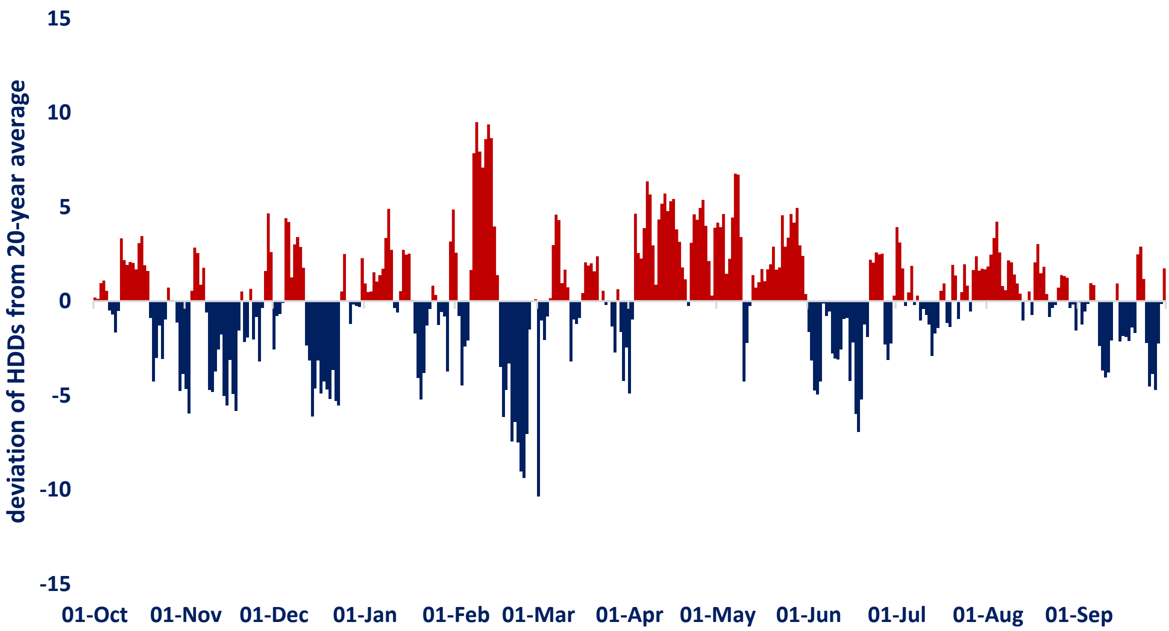
Figure 2.2 Correlation between HDDs and daily LDC consumption in the Netherlands (January 2018-March 2021)



In GY 2020/21 there were 2261 degree days, 10% higher than the 2057 degree days recorded during GY 2019/20 and 8% higher compared to the average of heating degree days recorded between GY 2017/18 and GY 2019/20.[11]

According to the recordings of the De Bilt weather station in the Netherlands, temperatures were unseasonably cold during the spring of 2021, with April and May being the coldest since 1986 and 2010 respectively. This naturally extended the heating season into Q2 2021 and provided upward support to Dutch L-gas demand which increased by over 25% (or 19.5 TWh) year-on-year during this period.

Figure 2.3 Deviation of HDDs in GY 2020/21 from their 20-year average as per measurements of the De Bilt weather station

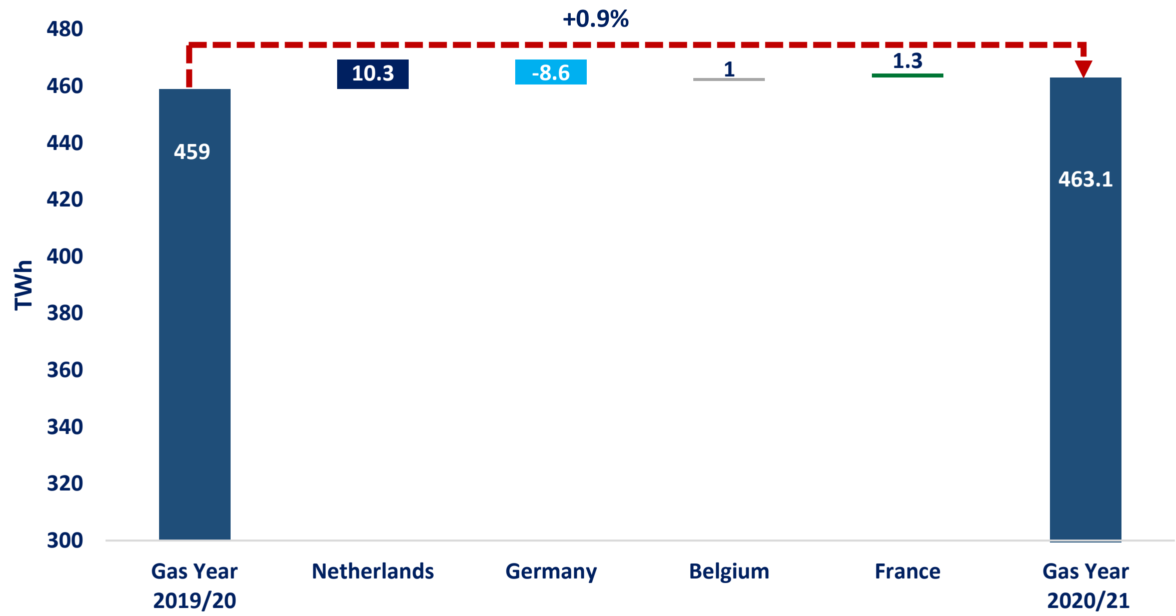


As shown in Figure 2.3, Dutch L-gas consumption increased in all markets, with the notable exception of Germany, where it declined by 5.7% (or 8.6 TWh) as the effect of the ongoing market conversion outweighed the weather-

[11] For further details on the climatological context, please refer to Annex VI of the current Report.

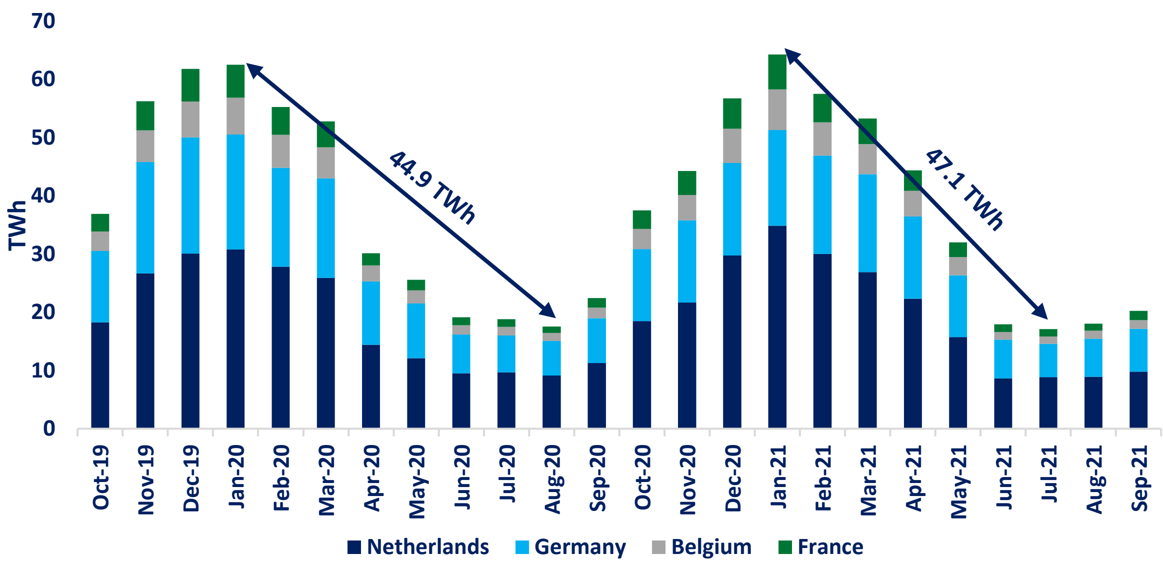
induced increase in demand. In the Netherlands, L-gas demand rose by 4.6% (or 10.3 TWh), accounting alone for over 80% of the gross increase in GY 2020/21. In Belgium and France L-gas demand increased by 2.4% (or 1 TWh) and 3.5% (or 1.3 TWh), respectively.

Figure 2.3 Change in Dutch L-gas consumption in 2019/20 vs 2020/21 Gas Years



Whilst total Dutch L-gas consumption increased by 0.9%, peak monthly consumption increased by 2.8% (or 1.7 TWh) inGY 2020/21 compared to the previous GY. Consequently, the demand swing (represented by the arrows in Figure 2.4) increased by 4.9% (2.2 TWh). This has been largely driven by the climatological context and the colder winter temperatures during January 2021. This highlights that the seasonal demand swing and flexibility requirements of the L-gas system are not declining at the same pace as total L-gas demand from the Netherlands.

Figure 2.4 Dutch L-gas monthly consumption October 2019 – October 2021



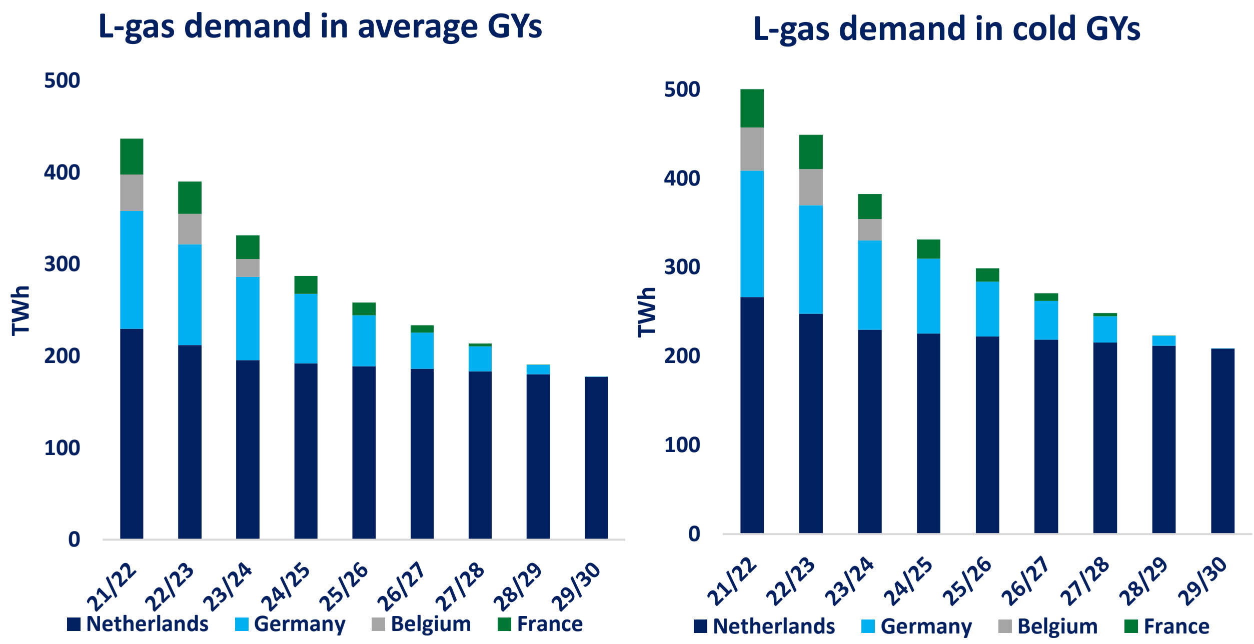
2.2 The expected annual demand for L-gas from the Netherlands until GY 2029/30

In the ten consecutive years, between GY 2019/20 and GY 2029/30, combined L-gas exports from the Netherlands to Belgium, France and Germany are expected gradually reduce at an average rate of approximately 10% per year.[12] As a consequence, L-gas demand met with imports from the Netherlands is expected to fall from 44.6

[12] GTS (2017), Netwerk Ontwikkelingsplan 2017.

TWh in GY 2020/21 to 0 in Belgium by 2024/25, from 39.2 TWh to 0 in France and from 143.3 TWh to 0.3 TWh in Germany[13] by GY 2029/30 both in an average and cold GY[14].

Figure 2.5 Expected annual demand for Dutch L-gas (TWh)



3. L-gas market conversion volume

The gas infrastructure operators of Belgium, France and Germany have made arrangements to undertake extensive conversion programs, 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 realized 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.

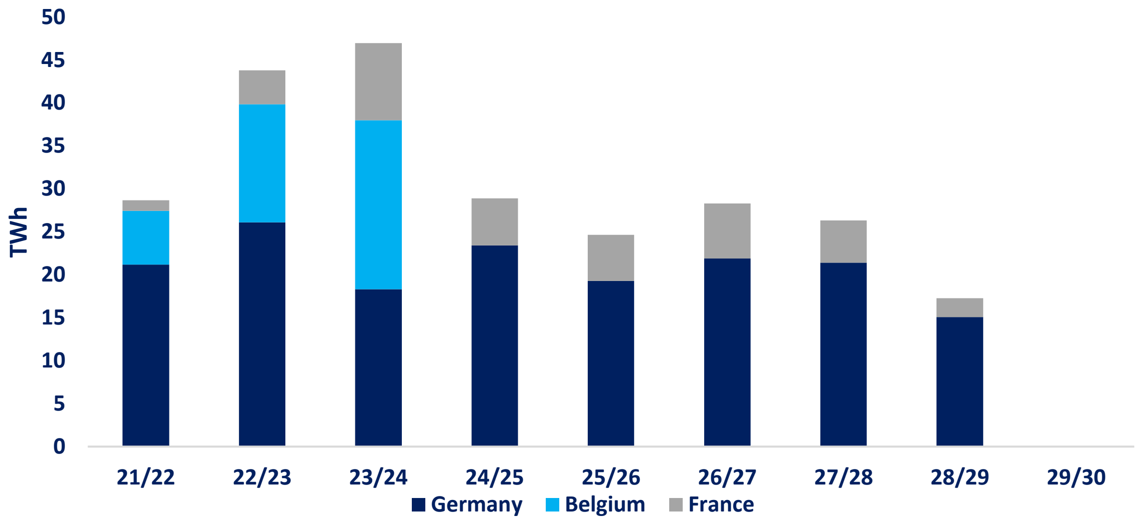
The current report provides an update on the progress of the conversion programs, with a special focus on the conversions through the GY 2021/22. Over 950,000 gas connections and appliances are expected to be converted inGY 2021/22 –the highest number through the market conversion programme so far.

The estimated volume effect of the 2021 conversions (40 TWh) is almost the double of the 2020 conversions (21.2 TWh) and is the highest of all gas years so far, due to the particularly high conversion rates Germany and in Belgium. The estimated volume effect of the conversions during GY 2021/22 is 28.7 TWh, almost 29% lower than the volume effect of the GY 2020/21 conversions. In terms of volume impact, conversions are expected to reach their peak in GYs 2022/23 and 2023/24 at an average of over 45 TWh.

The optimization of the conversion planning in Belgium is expected to allow for higher conversions in the GYs 2022/23 and 2023/24, indicating a potential reduction of Belgium's L-gas imports from the Netherlands to 0 byGY 2024/25.

Figure 3.0 Volume effect of actual and planned conversions between GY 2021/22 and GY 2029/30 (TWh, based on average temperatures).

[13] 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 be supplied via the Netherlands (Haanrade / Thyssengas).
[14] 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 Report. 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.



3.1 Germany

Legislative changes and conversion costs

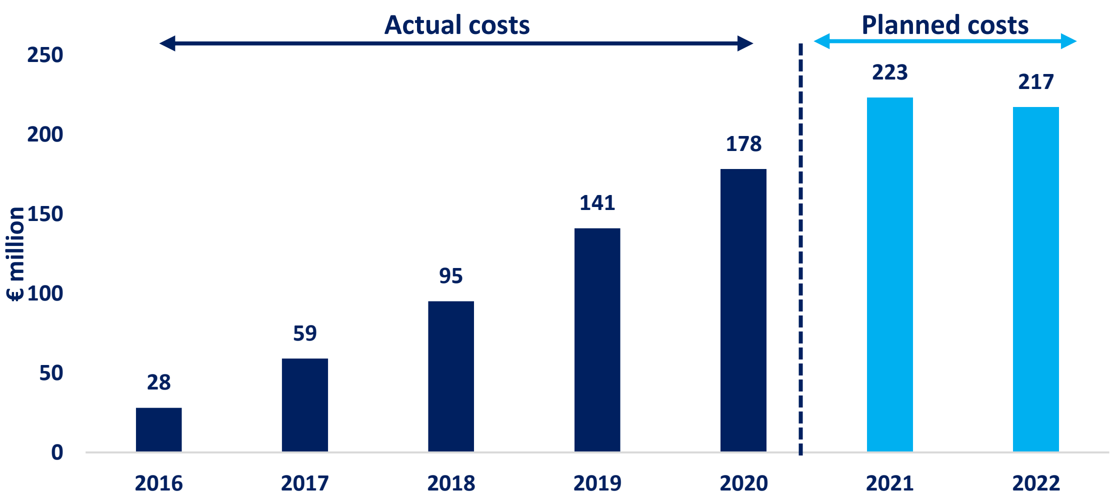
In order to implement the market conversion in Germany some 5.3 million gas appliances need a physical adaptation. A sophisticated timetable for the conversion process was put into place in 2014 and legal changes have been introduced. As of 2017, the Basic Energy Law (Energiewirtschaftsgesetz) had been revised substantially in order to serve as the basis for the market conversion from L- to H-gas. § 19a of the Basic Energy Law 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 socialized (as an integral part of the gas grid fee). In addition, at a later stage the Basic Energy Law 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 approx. € 4 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 – 2020 and the planned costs for the years 2021 – 2022 are displayed in the illustration below, altogether totaling to € 941 million.

Figure 3.1.1 Actual and planned costs for the adaption of appliances, 2016-21 (€ 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.

The German TSO GTG Nord had built a new blending facility at the Dutch border in order to reduce the need for Groningen gas by potentially up to 6 TWh a year, cf. below.

Conversions from 2015 to 2021[15]

In total, 1.55 million appliances have been successfully converted from L- to H-gas between 2015 and 2021, which is approx. 30% of all German L-Gas appliances.

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 realized 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.

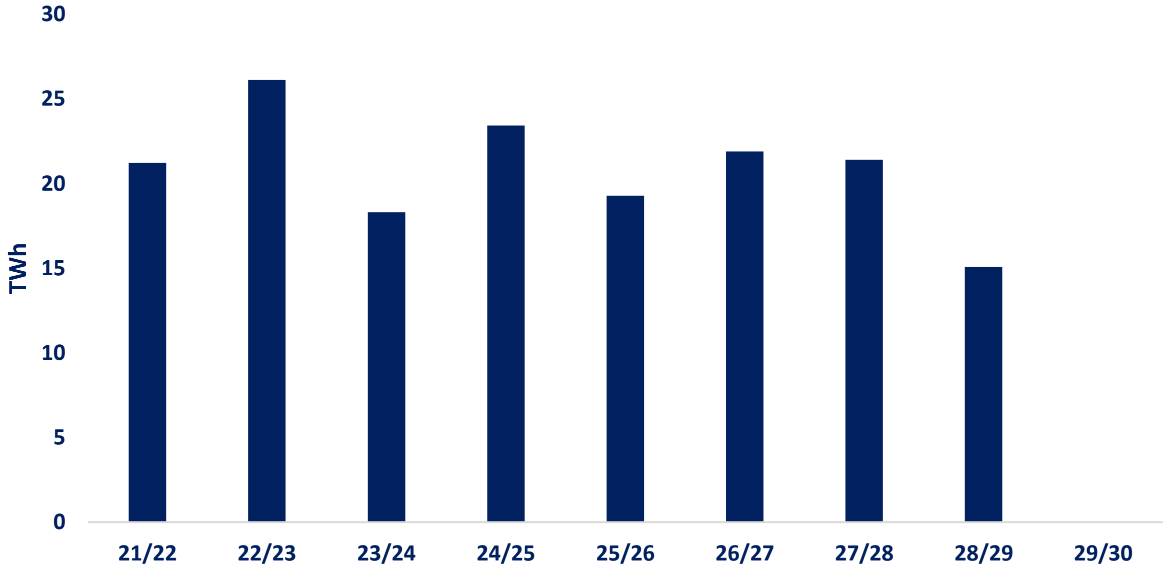
As the advanced changes had been made years before the due date, they continue to be a relief for the Groningen production in the years to come.

In 2019, 10 areas with 319,000 appliances in total have been converted as planned. Conversion relates to a capacity of 4 GWh/h and a volume of 13.5 TWh.

In 2020, 7 areas with 389,000 appliances have been converted. Conversion relates to a capacity of 5.15 GWh/h and an estimated volume effect of approximately 18.1 TWh (average year).

In 2021, 15 areas with 571,000 appliances have been converted. Conversion relates to a capacity of 9.5 GWh/h and an estimated volume effect of 31.5 TWh (average year). The estimated volume effect of the 2021 conversion is the highest effect of all gas years. 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 3.1.2 Estimated volume effect of market conversion per Gas Year (TWh)



Conversions in 2022

In 2022, 495,000 installations are to be converted, leading to an estimated volume effect of 21.2 TWh.

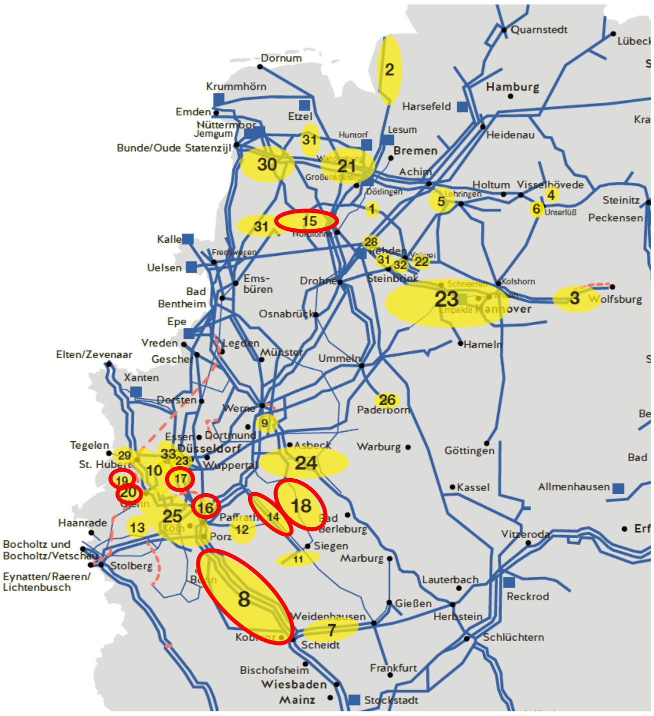
[15] For further details please refer to the previous reports of the Task Force Monitoring L-Gas Market Conversion

The conversion plan for 2022 is displayed in the table below and on the Map 3.1.

Table 3.1 Market conversion in Germany in 2022

Nr.	Conversion Area	TSO	# of installations	Month
16	Bergisches Land*	OGE	0	June
16	Bergisches Land	TG	2.000	June
17	Düsseldorf	TG	6.000	May
17	Düsseldorf	OGE	10.000	May
20	Mönchengladbach	TG	65.000	March
20	Mönchengladbach	TG	0	October
8	Mittelrhein	OGE	31.000	August
8	Mittelrhein	OGE	20.000	September
8	Mittelrhein	OGE	32.000	September
8	Mittelrhein	OGE	33.000	April
8	Mittelrhein	OGE	61.000	May - July
8	Mittelrhein	OGE	25.000	October
14	Oberbergisches Land	OGE	3.000	June
14	Oberbergisches Land	TG	1.000	May
15	EWE-Zone Teil III	GTG	56.000	February - July
15	EWE-Zone Teil III	GTG	28.000	September - November
18	Südwestfalen	OGE	44.000	April
18	Südwestfalen	OGE	4.000	May
18	Südwestfalen	OGE	24.000	June
18	Südwestfalen	OGE	22.000	August
18	Südwestfalen	OGE	5.000	September
19	Viersen-Meerbusch	OGE	9.000	June
19	Viersen-Meerbusch	OGE	11.000	September
19	Viersen-Meerbusch	OGE	4.000	September
19	Viersen-Meerbusch	TG	2.400	September
SUM			**495.000**	

Map 3.1 Conversion areas in 2022



Conversions until GY 2029/30 – optimization of the conversion planning

In Germany, over 3.26 million of gas appliances will still need to be converted between GY 2022/23 and GY 2028/29, translating into a total volume of 145 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 this Winter Report has been additionally accelerated against the planning presented in the past report. 110,000 appliances will be adapted in 2027 instead of 2030 and further 22,000 appliances in 2026 instead of 2029. Market conversion in Germany will thus end in 2029 instead of 2030. Furthermore, the conversion of one industrial customer that accounts for approximately 2 TWh p.a. will also be accelerated (2022 instead of 2024).

Adjustment of demand estimates

While the accelerated conversion schedule itself leads to a reduced demand in L-Gas in Germany, this effect is compensated by a new demand prognosis showing an increased volume demand in relation to the previous planning.

The assumptions for gas demand consider inter alia energy efficiency measures and use of natural gas for electricity generation as well as for industrial purposes. Historical data undermines that the slight reduction of natural gas demand in terms of efficiency gains that was incorporated in the previous planning, did not yet materialize. The current gas market situation with relatively high gas prices being observed however is not reflected in the above-mentioned demand assumptions. Generally, any prognosis for future gas demand is subject to numerous, market based influencing factors difficult to predict.

Considering both the accelerated conversion schedule and the adjusted demand assumptions, an additional L-gas volume demand in the magnitude of 2 – 6 TWh p.a. results until gas year 2026/27. Afterwards, the L-Gas demand is reduced by 2 – 5 TWh p.a. against the previous planning. The demand figures above refer to the total L-gas demand of Germany, thereby also influencing the import of L-gas from the Netherlands to Germany.

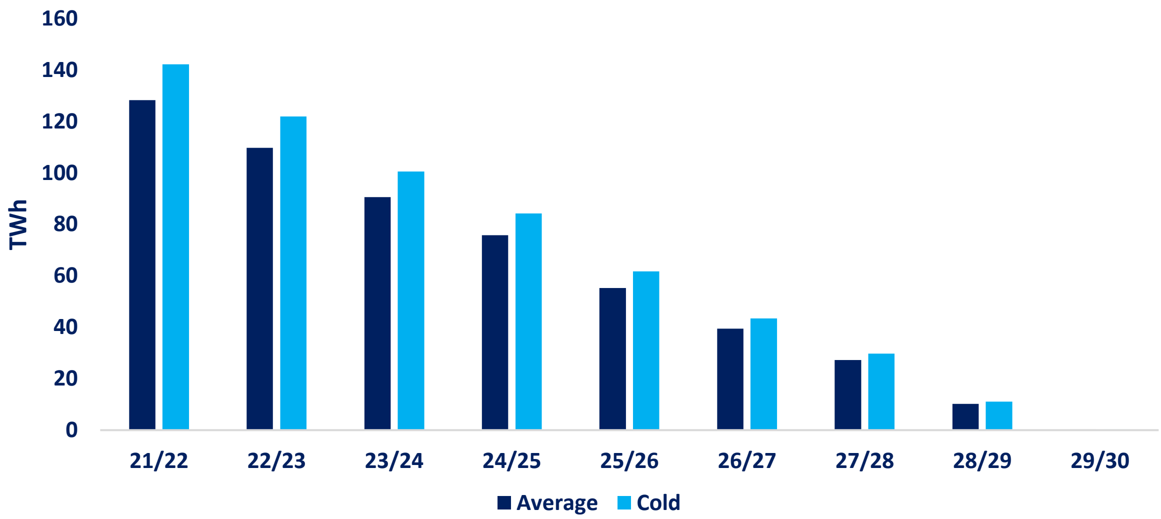
Another effect comes from the German domestic L-Gas production: The newest outlook given by the German Federal Association of Natural Gas, Petroleum and Geoenergy (BVEG) leads to an additional decrease of German L-Gas production of 2.5 – 3 TWh p.a. against the previous planning.

All currently observed trends lead to an increase of the estimated L-gas import volumes from the Netherlands to Germany until 2025/26 in the magnitude of 4 – 7 TWh p.a.

For the ongoing gas year 2021/22, an additional effect may have to be taken into account: the German L-gas storages have not completely been filled in the last injection season, which lowered the import volumes from the

Netherlands in the past gas year. This effect, however, might be reversed in the ongoing gas year, bearing the risk of an additional L-gas import volume of 4 TWh.

Figure 3.1 Germany's L-gas imports from the Netherlands (GY 2021/22-GY 2029/30) for average and cold GYs



3.2 France

Legislative changes and conversion costs[16]

In France, almost 1.3 million of gas consumers have to be converted between GY 2019/20 and GY 2029/30, translating into a total volume of 43.4 TWh/y.

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 in GY 2018/19 and 2020

A pilot phase has been decided to test the conversion process. During GY 2018/19 the conversion of the L-gas network was carried out in the Doullens area (6,000 consumers), the Gravelines area (10,000 consumers) and the Grande Synthe area (19,000 consumers). Then the Dunkerque area (42,000 consumers) was successfully converted on 27-28 October 2020. This area is number four in France, the biggest and last of the pilot phase.

The second wave of Covid-19 did not have any significant impact on conversion activities because:

- The TSO's network modifications for the conversion of the Dunkerque sector were achieved by the end of 2019;
- The second wave in France occurred after the conversion of the Dunkerque sector on 27-28 October;
- Inventory activities for the sectors to be converted in 2021 were mostly achieved at the end of October and they could be finalized at the end of November;
- Preparatory works on the transmission network were not suspended during the second lockdown in November.

Conversions in 2021

The initial plan for 2021 was the conversion of Calais and St Omer areas respectively in September and October 2021 representing 54,000 customers and translating into an annual consumption of 1.2 TWh under average weather conditions.

[16] For further details please refer to the Winter Report 2020 of the Task Force Monitoring L-Gas Market Conversion and to the Winter Report 2021 of the Task Force Monitoring L-Gas Market Conversion.

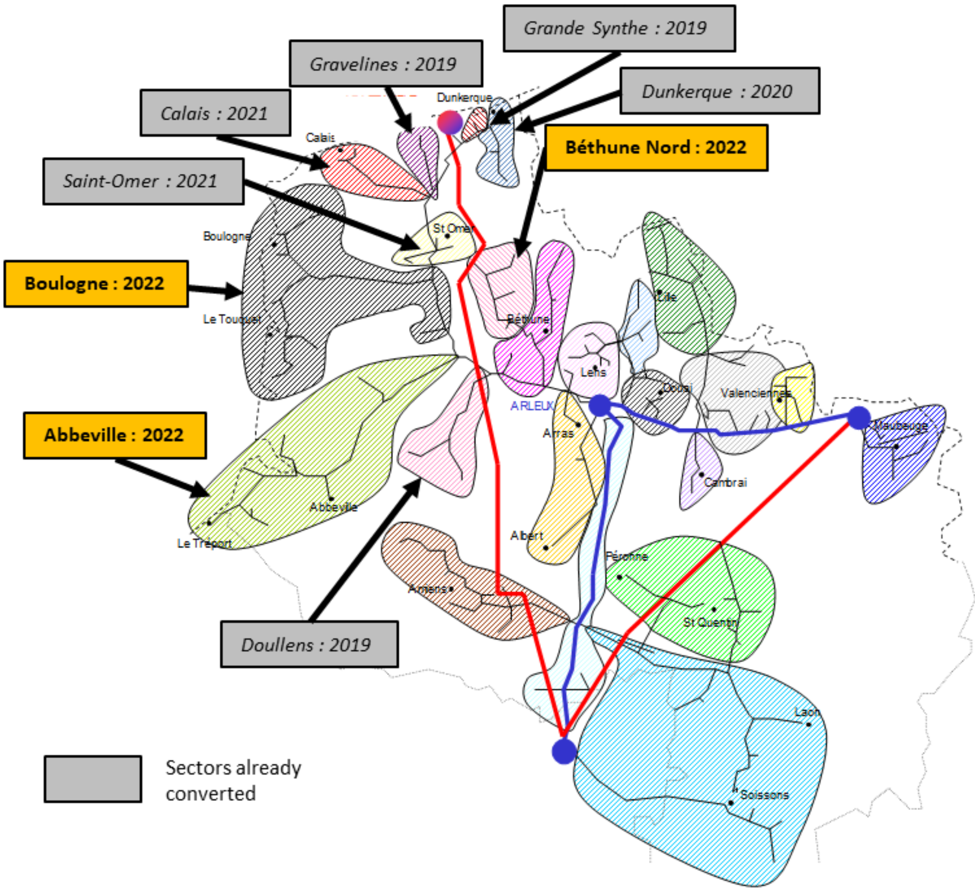
The Calais and St Omer sectors were successfully converted on 21st September and 12th October as planned.

These two areas are the first to be converted after the pilot phase. Their conversion has been achieved according to plan despite the difficulties encountered as a result Covid 19 control measures.

During the year 2021, preparation for conversions planned in 2022 and further was also realized. Inventory of appliances by the DSO was achieved for Boulogne, Abbeville and Bethune Nord areas (122,000 customers), which are to be converted in 2022 and the inventory of appliances in the areas which will be converted in 2023 (212,000 customers) has begun in July.

On the TSO side the network modifications for the conversion of Calais and St Omer areas were achieved on time. In particular, the two GRTgaz projects planned in 2021 have been completed.

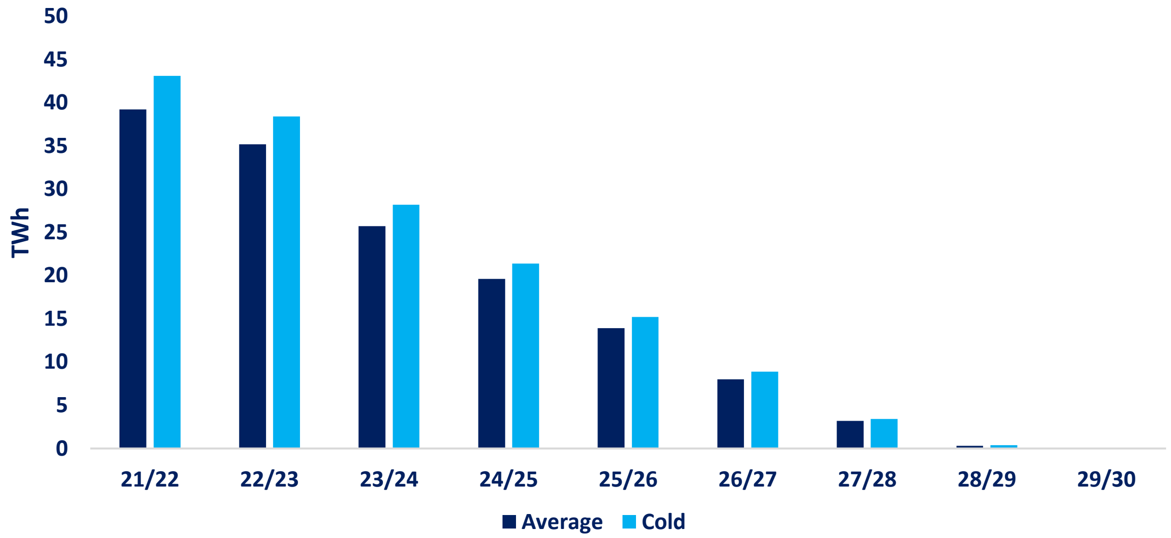
Map 3.2 Market conversions in France in 2019-2022



Conversions until GY 2029/30

In France, over 1.26 million of gas consumers will need to be converted between GY 2021/22 and GY 2029/30, translating into a total volume of 38.5 TWh/y. 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 3.2 France's consumers demand for L-gas from the Netherlands (GY 2021/22-GY 2029/30) for average and cold GYs



3.3 Belgium

Conversions up to 2021[17]

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 1st June 2020 to 1st September 2020.

Conversions in 2021

On 1 June 2021, 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. The areas converted in 2021 are displayed in Map 3.3 below (yellow areas). The converted areas have been: Strombeek Marly, Willebroek-Puurs-KODB, Boom, Rumst, Reet, Schelle, Braine-Le-Comte and Anderlecht (southern part of Brussels).

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 planning foresees that the Belgian L/H conversion should be completed on September 1, 2024 (instead of June 1, 2029, as previously planned). The areas to be converted year each year are shown in Map 3.3.

For 2022 and 2023, respectively 250,000 and 365,000 connections will be migrated, leaving a remaining 465,000 connections to be migrated after 2023.

[17] For further details please refer to the Winter Report 2020 of the Task Force Monitoring L-Gas Market Conversion.

Map 3.3 Indicative market conversion planning in Belgium

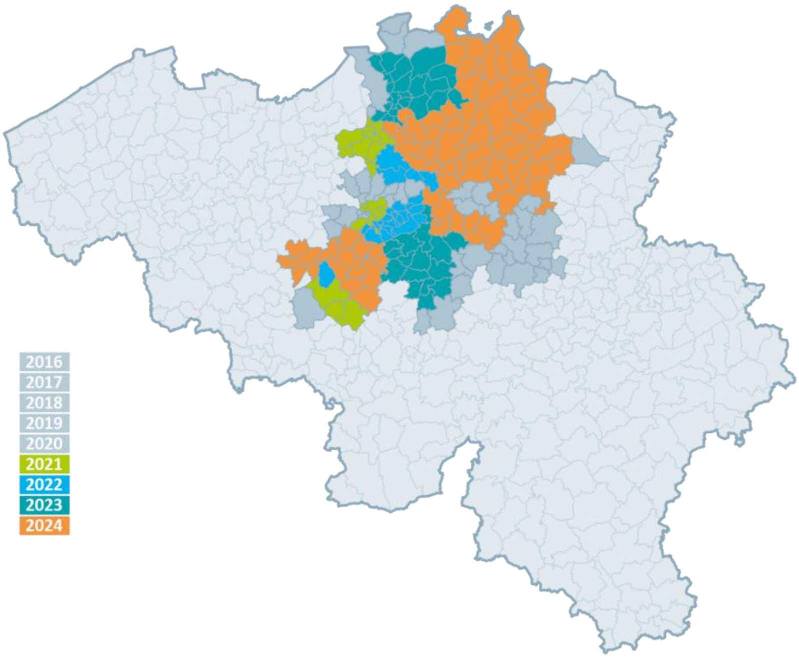
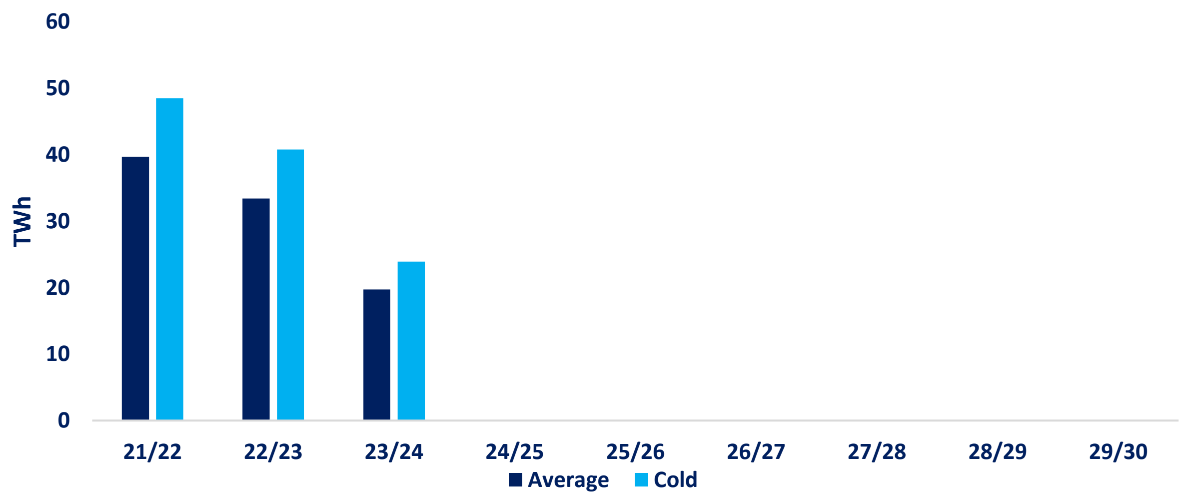


Figure 3.3 Belgium's L-gas imports from the Netherlands (GY 2021/22-GY 2029/30) for average and cold GYs



3.4 The Netherlands

Contrary to other L-gas consuming countries, the Netherlands has decided not to enter into a large scale conversion operation. Instead, a new, large nitrogen facility is being built which, together with the already existing nitrogen facilities and some underground storage facilities, will be able to provide enough L-gas (volume and capacity) to meet Dutch demand in the years to come. For more details, please refer to Chapter 4 of the Report.

The legislative framework has, however, been adapted in order to limit future L-gas consumption. The Dutch Gas Act has already been adapted to prevent future L-gas consumption growth by prohibiting the connection of newly built houses and buildings to the gas grid. The new legislation concerning the conversion of industrial customers (adopted on 20 June 2020) specifies that industrial customers consuming more than 100 million cubic meters (mcm) annually are not allowed to use L-gas after October 2022. As a consequence, Dutch demand for L-gas is expected to decrease by at least 3 bcm (~30 TWh), equating to the consumption of the nine largest users. In

August 2021 the first of the nine users has been converted from G-gas to H-gas. Three additional industries are planned to be converted by 1 October 2022. There is a delay for five of the nine users. According to GTS this will have zero impact on the Groningen production and the closing date of the field.

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.

4. L-gas production

4.1 L-gas production in the Netherlands: recent trends

Following a number of earthquakes in the province of Groningen, linked to the natural gas extraction in the area, the Dutch authorities have imposed successive caps on Groningen's gas production starting from 2014. Consequently, Groningen gas production has halved from 341.8 TWh (or 35 bcm) in GY 2014/15 to 171.1 TWh (or 17.5 bcm) in GY 2018/19. This trend accelerated through the GY 2019/20 as Groningen gas production more than halved year-on-year, falling by 86.72 TWh (8.87 bcm) year-on-year, from 171.1 TWh (17.5 bcm) in GY 2019 to 84.4 TWh (8.64 bcm). Gas production from Groningen further declined in GY 2020/21, falling by over 10% to 75.8 TWh (7.76 bcm).

Groningen gas has a notably lower calorific value compared to the average European natural gas fields, which means that it cannot simply be 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.[18]

In line with the declining natural L-gas production from the Netherlands, the production of pseudo L-gas more than doubled between GY 2014/15 and GY 2019/20.

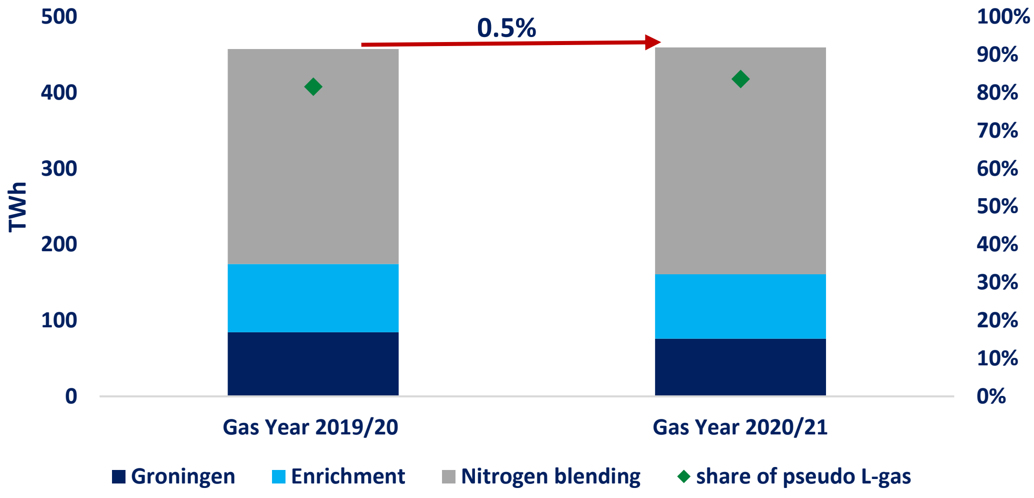
Total pseudo L-gas increased by 2.9% (or 10.75 TWh) in the GY 2020/21.

It is important to highlight that this has been entirely driven by a higher L-gas production via nitrogen blending increasing by 5.6% (or 15.74 TWh), while pseudo L-gas obtained via enrichment decreased by 5.5% (or 5 TWh).

As a consequence, despite higher pseudo L-gas production via nitrogen blending, the utilization rate of nitrogen blending facilities remained close to the average of the GY 2019/20, at 100% through the GY 2020/21. The utilization rate of above 100% indicates the use of back-up nitrogen capacity to produce higher volumes of pseudo L-gas.

Total nitrogen usage for pseudo L-gas production increased by 5.5% year-on-year, from 3.35 bcm during GY 2019/20 to 3.53 bcm in 2020/21.

Figure 4.1 L-gas supply in the Netherlands through the 2019/20 - 2020/21 Gas Years



[18] In the process of nitrogen blending nitrogen 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.

Altogether, L-gas production in the Netherlands increased by 0.5% (or 2.2 TWh) year-on-year, from 457.5 TWh during in GY 2019/20 to 459.7 TWh in GY 2020/21. As such, the increase in L-gas production has been smaller than the year-on-year increase in L-gas consumption (4.1 TWh) resulting in higher withdrawal from L-gas storage sites (see Chapter 5).

4.2 The impact of decreasing Groningen production on the Dutch gas market

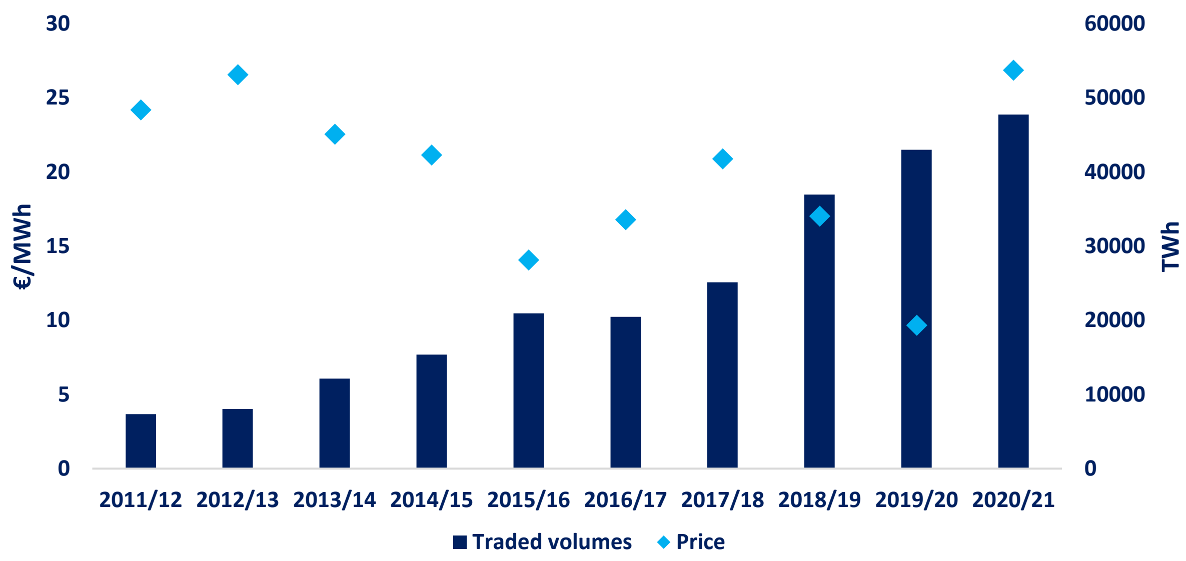
It is important to highlight that reduced gas production in the Netherlands did not appear to have any impact on the level of wholesale gas prices nor on the traded volumes on Dutch gas hub, the Title Transfer Facility (TTF). In fact, gas prices on the TTF are reflective of broader regional and global supply-demand dynamics and as such depend less on the levels of natural gas production in the Netherlands.

Following the steep drop through GY 2019/20, natural gas prices on TTF recovered strongly through the GY 2020/21, increasing by 48% year-on-year to an average of €26.9/MWh –its highest level for any GY since TTF has been launched in 2003. Prices averaged at of over €65/MWh in September 2021, before exploding to above €100/MWh in Q4 2021.

It is important to highlight that this strong growth in gas prices was driven by factors non-related neither to clean energy policies nor to lower Groningen gas production. Global gas demand was stronger than expected, due to a cold and long heating season in the Northern Hemisphere, followed by droughts and summer heatwaves. In terms of supply, gas faced several constraints, including a heavier than usual summer maintenance, feedgas supply issues, LNG plant outages which further tightened up the market.

As a consequence of strong demand growth in the Asia Pacific region, the price spread between Asian LNG spot prices and TTF widened from USD 0.6/mmbtu during the GY 2019/20 to USD 1.8/mmbtu in the GY 2020/21. Consequently, LNG cargoes have been increasingly diverted towards the more lucrative northeast Asian markets, weighing on LNG imports into Europe[19] which fell by close to 20% (or over 260 TWh) year-on-year during GY 2020/21. This, in turn, provided further upward pressure to natural gas prices across European gas hub, including TTF. Despite the all-time high prices, pipeline deliveries from Russia to Europe fell by close to 25% year-on-year in Q4 2021.

Figure 4.2 TTF gas prices and traded volumes per Gas Years (2011/12-2020/21)



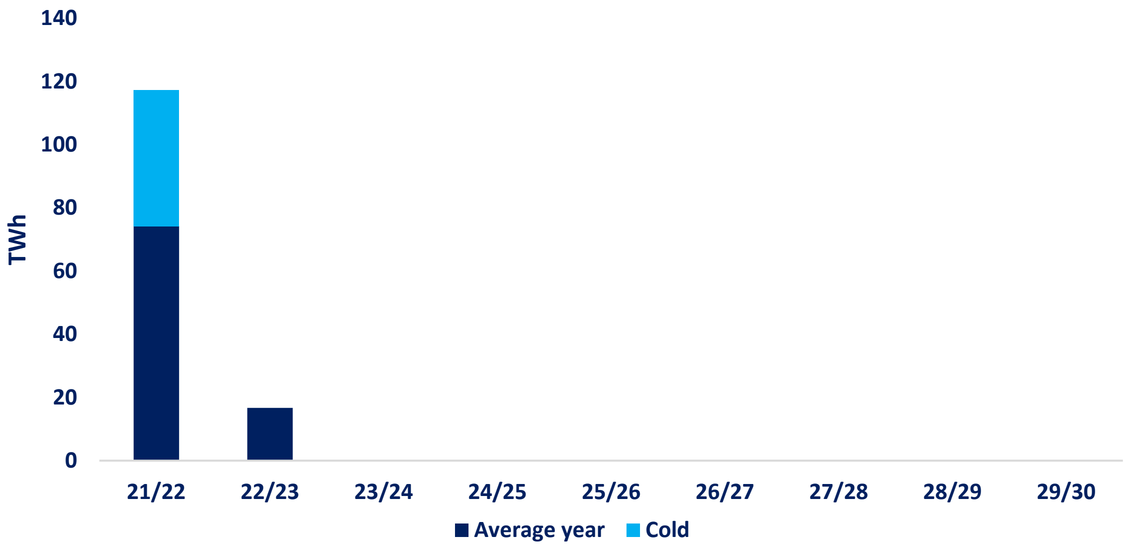
During the same period of time, traded volumes on TTF rose by 11% to over 47 600 TWh, reinforcing TTF's position as Europe's leading gas hub. Importantly, the liquidity of the hub improved as well, as certified by the improving churn ratio[20], increasing from 83 in GY 2019/20 to close to 98 in GY 2020/21.

4.3 Indication of the L-gas production in the Netherlands for the period GY 2021/22 – GY 2029/30

[19] The European Union, Turkey and the United Kingdom.
[20] The churn is the ratio between the traded volumes on a hub and the physical deliveries of the hub. A higher churn ratio suggests a more liquid and developed hub.

The Groningen production cap for the GY 2021/22 has been set at 38.1 TWh for an average GY, 50% below its cap for the previous GY 2020/21 (set at 76.2 TWh). For a cold gas year the cap for the GY 2021/22 was set at 73.3 TWh. GTS has, however, indicated to the Dutch Ministry that a higher production level might be needed because of the delay of the nitrogen facility at Zuidbroek and the higher volume needed by Germany. According to GTS an additional volume of about 36.1 TWh from the Groningen field is needed for current gas year in order to be able to secure supply, and to fill the gas storages Norg and Grijpskerk. This leads to a total of 74.2 TWh. In case the filling of Grijpskerk with L-gas would be postponed with one year, the required additional Groningen production level would be 20.5 TWh? in an average year (leading to a total of 58.6 TWh). The Dutch Secretary of State will decide on the allowed Groningen production in the gas year 2021/2022 before 1 of April 2022.

Figure 4.3 Indication of the L-gas production from Groningen in an average and cold gas year (GY 2021/22-2029/30)



It is currently being investigated what this means for the date by which the gas production from Groningen can come to a full stop, i.e. no production even in the case of a cold GY. In this investigation two factors play a role: volume and capacity/flexibility. For the analysis of this report a scenario elaborated by GTS, based on her advice in January 2022 concerning the required Groningen production, has been used. From Figure 4.3, it becomes clear that Groningen has to produce with an minimal flexible production, to meet L-gas demand in the case of eventual extreme cold GYs and in case of a severe disruption elsewhere in the L-gas system. The Groningen field produces from the GY 22/23 (and if needed onwards) at its minimum. This minimum production is necessary in order to produce the required capacity in case of extreme cold and/or an outage in the L-gas system. GTS concluded in her advice of January 2022, that for the base case (including conversion of Grijpskerk) the minimum production from the Groningen field is needed until the GY 2022/2023. Without the conversion of Grijpskerk the earliest date to close the Groningen field is October 2025. The final decision on the conversion of Grijpskerk will be taken before 1st of April 2022. .

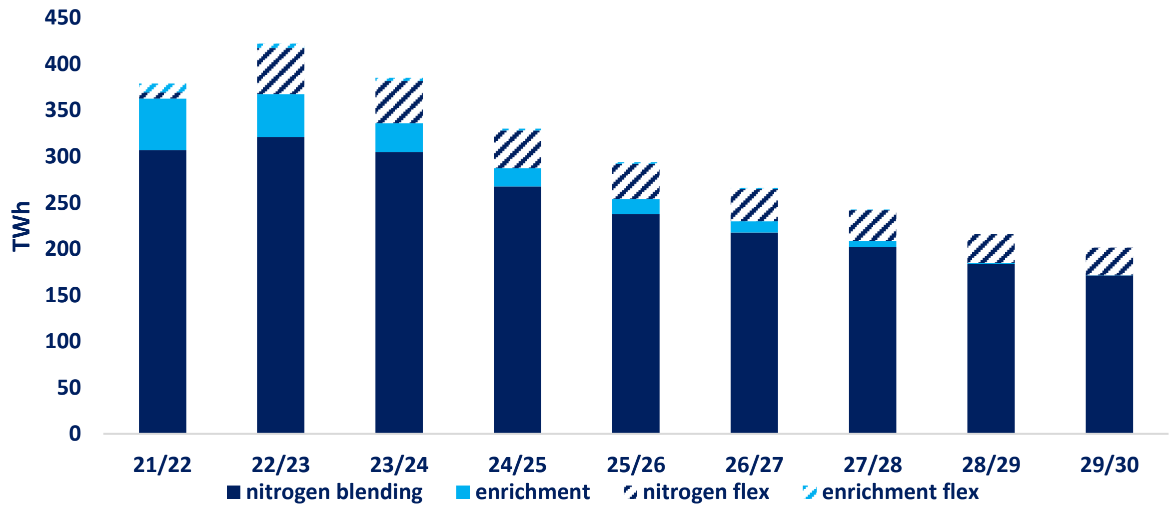
To substitute the decreasing production from the Groningen field, the production of pseudo L-gas has to increase. This will be done by means of additional nitrogen blending with (imported) H-gas. This will be supported by the new nitrogen plant at Zuidbroek, which is currently under construction and will be able to produce 180,000 m3/h N2. This will increase the level of pseudo L-gas production by almost 100 TWh per year. .

The construction of the new nitrogen plant was impacted by the outbreak of Covid-19 and consequent lockdowns and disruptions in supply chains. The planned commissioning date of the nitrogen plant is postponed from April 2022 to August 2022.

The Government of the Netherlands wants to close the Groningen field as quickly as possible. An important measure to be taken can be the storage of L-gas instead of H-gas in UGS Grijpskerk. Once completely converted to L-gas (through multiple leaning cycles), Grijpskerk will take over the current back-up role of the Groningen field. From that point on, the Groningen field is not necessary anymore and will be closed.It is being investigated what the consequences are of the delay in the construction of the new nitrogen plant at Zuidbroek for the starting date of the conversion of Grijpskerk. The Secretary of State decides on the before 1st April 2022.

In the GY 2023/24, pseudo L-gas will account to 100% (or 336 TWh) of L-gas produced in the Netherlands and is set to provide the entire upward production flexibility necessary to meet demand in a cold GY. Nitrogen blending alone will account for over 90% % (or 305 TWh) of L-gas produced in the Netherlands and expected to provide over 90% of the upward production flexibility necessary to meet demand in a cold GY.

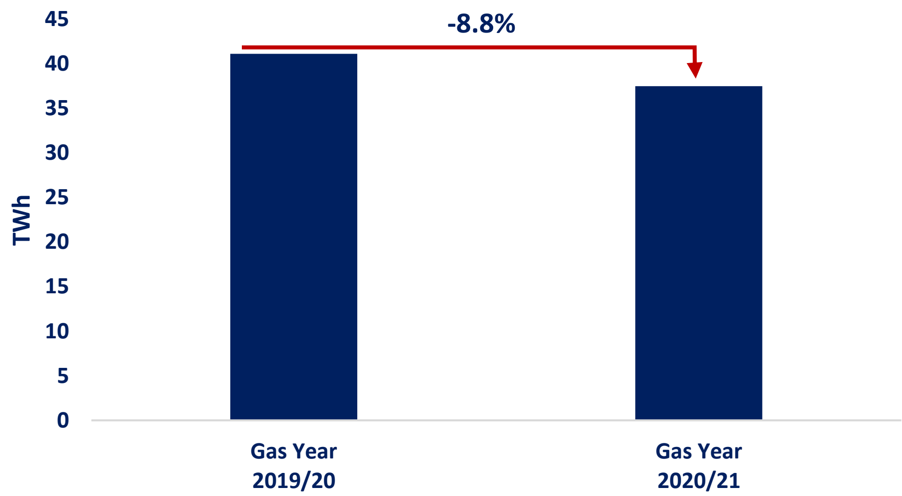
Figure 4.4 Indication of pseudo L-gas production during an average and cold gas year in the Netherlands (GY 2021/22-2029/30)



4.4 Expected L-gas production outside Netherlands for the period GY 2019/20 – GY 2029/30

In Germany, L-gas production decreased by close to 8.8% (or 3.6 TWh) from 41.1 TWh in the GY 2019/20 to 37.5 TWh GY 2020/21. This has been driven by lower total L-gas consumption (mainly as a result of the conversions already undertaken) and did not result in an increase of L-gas imports from the Netherlands (see Chapter 1).

Figure 4.5 L-gas production in Germany in 2019/20 and 2020/21 GYs

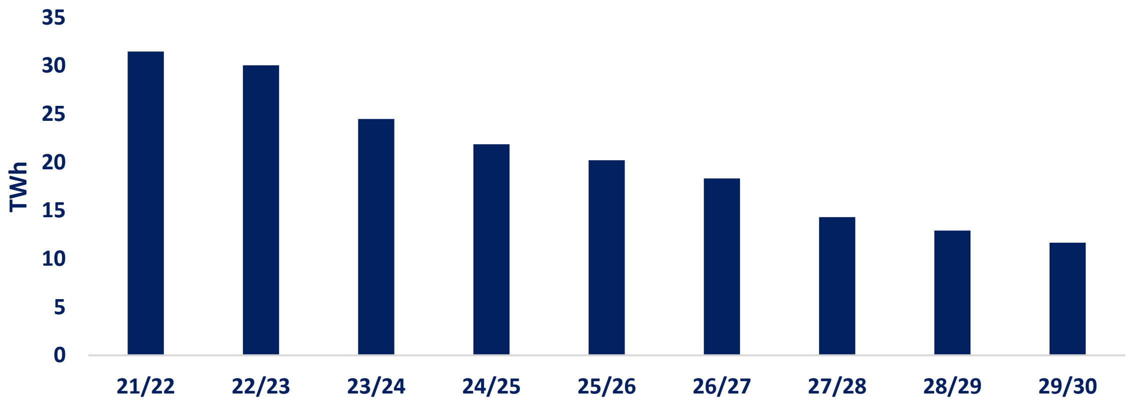


In Germany, L-gas production is expected to decrease at an annual average rate of ~12% from 37.5 TWh in GY 2020/21 to 11.7 TWh by GY 2029/30. There is one peak nitrogen/H-gas blending facility in Germany, in Rehden, supplying only limited volumes of converted L-gas.

In 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 a potential 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 and the actual calorific values delivered by GTS. Thus, the facility can be 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 or France. The French nitrogen/H-gas blending 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 Belgium, in Lillo, supplying only limited volumes of converted L-gas.

Figure 4.6 Indication of the L-gas production in Germany (GY 2021/22-2029/30) in TWh



5. Storage of L-gas

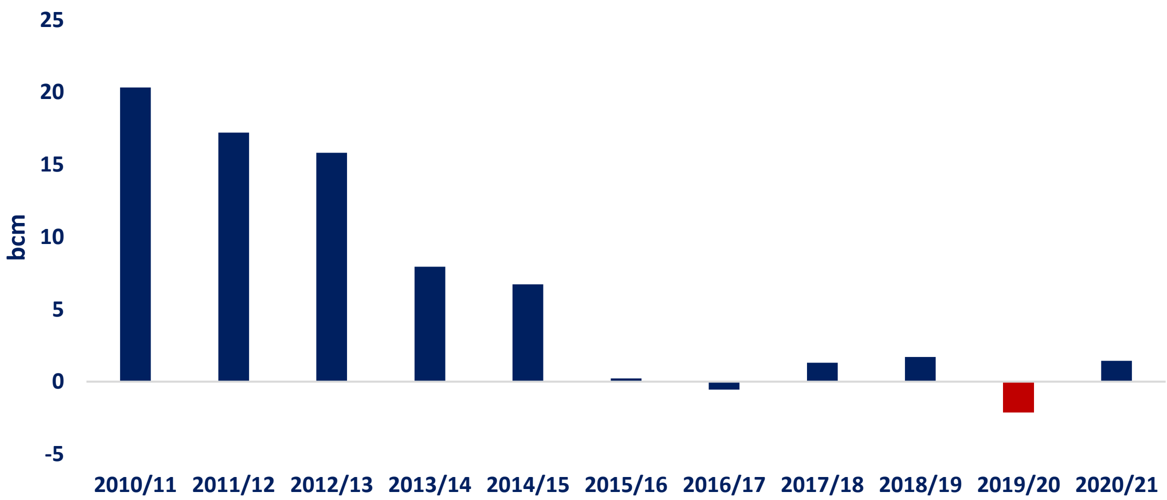
Natural gas storage plays a key role in meeting both seasonal and more short-term demand requirements, providing additional flexibility to the gas system.

Given the high seasonal profile of L-gas demand (see Chapter 2), storage capacity is required to ensure the adequate deliverability of L-gas supply.

It is important to note that in the past the Groningen field had a significant seasonal swing –the difference in output during the heating and summer season- providing supply flexibility to the entire system. As shown in the figure below, the production swing of Groningen has practically disappeared by 2015/16.

This in turn, is increasing the importance of L-gas storage in meeting both seasonal and short-demand variations.

Figure 5.1 Seasonal swing in Groningen gas production (2010/11-2020/21)



5.1 Available storage volume of L-gas (in TWh) per country

Total L-gas storage capacity in Northwest Europe amounts to 95.7 TWh, with a total withdrawal capacity of 2 959 GWh/d.

Most of L-gas storage is located in the Netherlands[21] (65 TWh or 68%) and Germany (17.5 TWh or 18%). There is one L-gas storage facility in France with a capacity of 13.4 TWh. There is no L-gas storage in Belgium, which relies on L-gas storages located in the Netherlands.

[21] This includes three of the Epe storage sites, which are physically located in Germany, but are incorporated in the Dutch gas network.

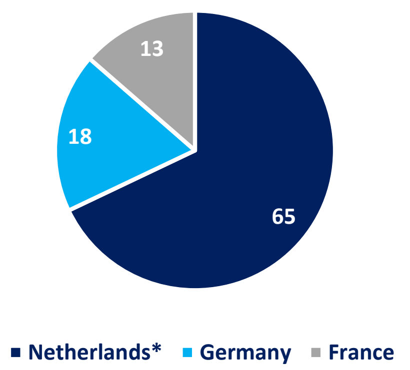
Over two-thirds of withdrawal capacity is concentrated in the Netherlands, followed by Germany (25%). France's Gournay storage facility accounts for almost 8% of L-gas withdrawal capacity in northwest Europe. For more details on L-gas storage, please refer to Annex IV of the Report.

It is important to highlight that Northwest Europe's largest L-gas storage site, Norg, has been used to store pseudo L-gas instead of gas coming from the Groningen field since 1st April 2020. This allows for a more optimal utilization of nitrogen blending plants, as the facility can be filled with pseudo L-gas that the market cannot absorb during the summer season (April-September) of the GY.

As previously noted, it is currently investigated if the Grijpskerk storage (27.7 TWh working capacity) could be switched to store L-gas gas. A final decision on the conversion date is planned before April 2022.

In Germany, the Lesum L-gas storage site has been converted into full H-gas storage service in 2021, resulting in a decline of 1.55 TWh L-gas storage capacity (and 52 GWh/d withdrawal capacity). Moreover, a volume of 70 million m^3 has been converted to store H-gas at the Huntorf storage site in Germany.

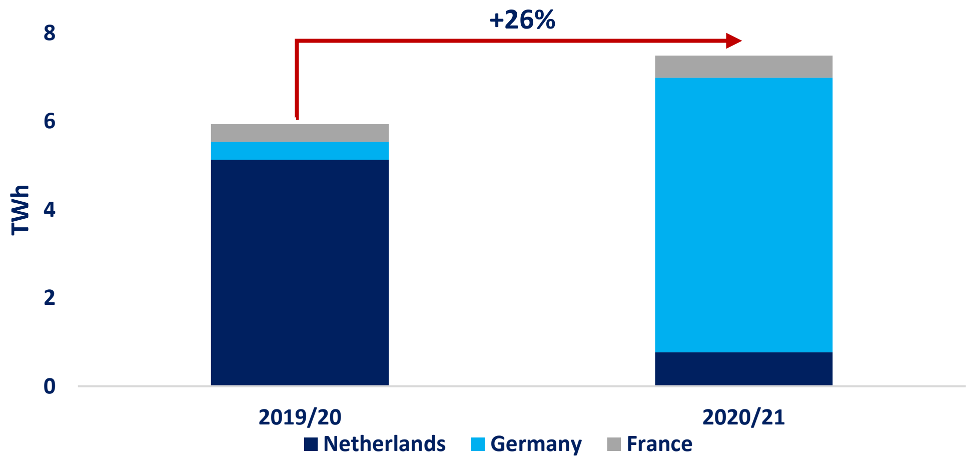
Figure 5.2 L-gas storage distribution by markets (TWh)



5.2 The role of L-gas storage during GY 2020/21

As total L-gas demand[22] increased (5.1 TWh), while total L-gas production declined (1.5 TWh), the reliance on storage increased in GY 2020/21. Consequently, net storage withdrawals increased by over 25% 7.5 TWh in GY 2020/21. Germany alone accounted for over 77% of the increase in net storage withdrawals.

Figure 5.3 L-gas storage net withdrawals during the 2019/20 and 2020/21 GYs



5.3 L-gas storage outlook

The evolving supply and demand outlook for L-gas will have implications on L-gas storage capacity through the medium-term.

[22] Including non-Dutch L-gas.

In Germany, following the conversion of the Lesum facility, the Nüttermoor L-Gas storage site (0.43 TWh) will be converted to H-gas by 2024. Following a partial reconversion in 2021, the Speicherzone L-Gas (EWE) storage facility will be converted to H-gas by 2027, resulting in a decline of 9.1 TWh of working L-gas storage capacity. The Empelde and Epe L-gas storage sites are expected to undergo a partial conversion starting by 2024, and a final conversion to H-gas by 2029. As such, after 2029 L-gas working storage capacity in Germany will not be required any more.

In France, the Gournay (13 TWh) storage facility is expected to be removed from the L-gas network by April 2026.

In the Netherlands, the Grijpskerk H-gas storage facility is expected to be converted to L-gas. Once completely converted (through multiple leaning cycles) Grijpskerk could provide provide 22.7 TWh of additional working L-gas storage working capacity, with a withdrawal rate of 445 GWh/d.

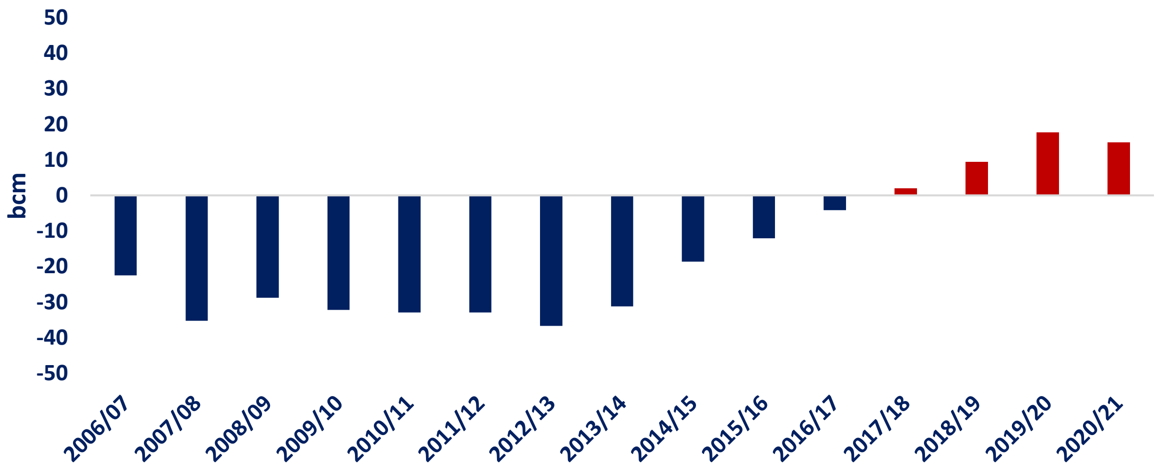
The Dutch government has an agreement with NAM and its shareholders to maintain Norg as a storage at least until the gas year 2026/2027. No decision was taken on a possible blowdown.

6. H-gas imports into the Netherlands

As a consequence of its declining domestic production (see Chapter 5), the Netherlands almost doubled its natural gas imports since 2014, from 259 TWh to 507.5 TWh in 2018 to become a net importer of natural gas for the first time in its history.

Net imports of natural gas rose by almost 90% year-on-year in the GY 2019/20 up to 17.7 bcm. Net imports declined by 16% (or 2.8 bcm) year-on-year to 14.85 bcm inGY 2020/21.

Figure 6.1 Net natural gas imports of the Netherlands per Gas Year (2006/07-2020/21)



More than half of the imported H-gas is being converted to L-gas to supply L-gas consumers both in the Netherlands and in the export markets. Consequently, the security of L-gas supply is becoming intimately linked to the deliverability of H-gas into the Netherlands.

The Netherlands has three main entry points. Norwegian natural gas is imported via the Emden terminal in Germany which feeds into the Dutch gas grid and has an entry capacity of 352 TWh/y. Russian imports to the Netherlands need to transit via Germany through the Bunde/Oude Statenzijl interconnection, with an entry capacity of 184 TWh/y. LNG from the global gas market can be imported via the Gate LNG Terminal, which has an annual send-out capacity of 168 TWh/y. Following an open season, Gate terminal took an investment decision to increase send-out capacity by 0.5 bcm/y. The additional send-out capacity is planned to become available as of 1 October 2024.

There are also two import interconnectors with Belgium: Zelzate and Zebra, with a combined entry capacity of over 143 TWh/y. Zebra has recently been acquired by GTS and will be integrated into the GTS network.

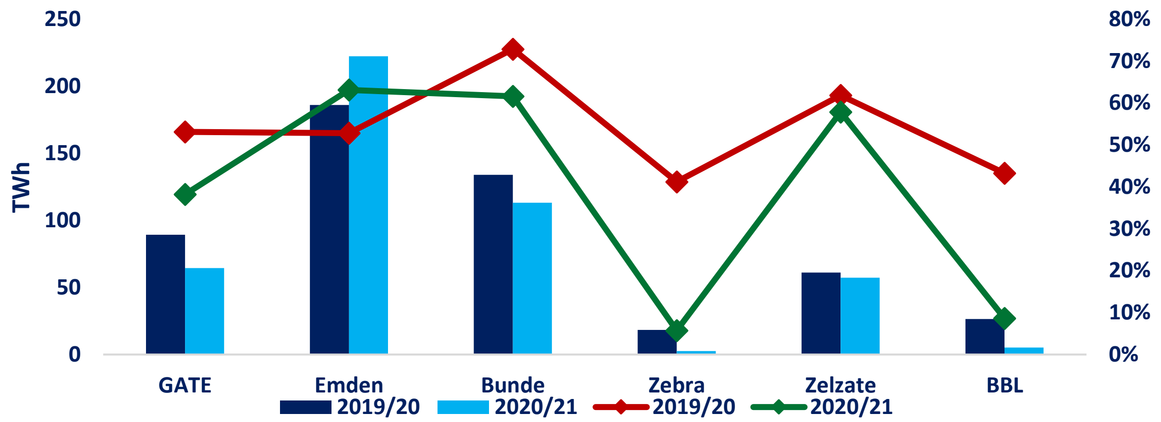
Moreover, the BBL pipeline – connecting the Netherlands and the United Kingdom – became bidirectional on 1 July 2019, enabling natural gas imports into the Netherlands with an annual capacity of 61.32 TWh/y.

Data from ENTSOG's Transparency Platform indicates that total H-gas entry flows to the Netherlands decreased by close to 10% (or over 50 TWh) year-on-year in GY 2020/21. This has been primarily due to the lower entry flows from the Gate terminal, which fell by 28% (-25 TWh) as LNG imports to the Netherlands declined sharply.

Consequently, the utilization rate of the Gate terminal fell from 53% through the GY 2019/20 to 38% duringGY 2020/21.

Figure 6.2 provides a comparison of the imported volumes and the utilization rates[23] of the importing facilities through the last two heating seasons.

Figure 6.2 Natural gas imports to the Netherlands by main entry points and utilization rates in the 2019/20 and 2020/21 Gas Years



** the columns represent imported volumes in TWh. the lines show the utilization rates of the given entry point*

Imports via the Bunde/Oude Statenzijl interconnection point with Germany decreased only slightly, by 15.5% (or 20.7 TWh), driving down the utilization rate to 62% in GY 2020/21, down from 73% through the previous Gas Year.

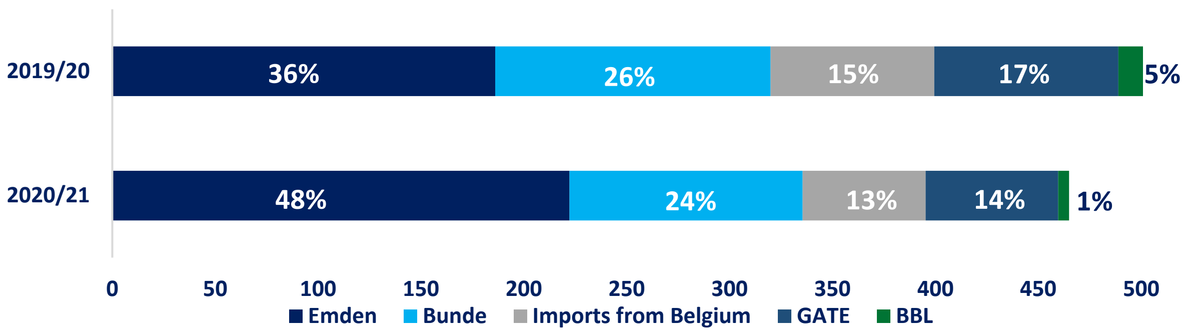
Import flows via the BBL pipeline fell by 80% (or 21 TWh) in GY 2020/21 compared to GY 2019/20, as the National Balancing Point (NBP, the gas hub of the United Kingdom) was trading on average at a premium of USD 0.15/mmbtu compared to TTF (vs $0.02/mmbtu premium in GY 2019/20).

Import flows from Belgium through Zebra and Zelzate fell by 25% (or 19.75 TWh) in GY 2020/21 compared to the previous GY. Consequently, their combined utilization rate fell from 55% in GY 2019/20 to 42% inGY 2020/21. It should be noted that LNG imports via the Zeebrugge terminal in Belgium and the Dunkerque terminal in France decreased by 35% (or 45.45 TWh) year-on-year through the GY 2020/21, potentially weighing on export flows towards the Netherlands.

Lower LNG imports and reduced pipeline flows were compensated by a strong increase in Norwegian deliveries via Emden, rising by 19.5% (or 36.2 TWh) year-on-year in the 2020/21 heating season. As a consequence, the utilization rate of Emden rose to 63% during the GY 2020/21, up from 53% a year earlier.

Figure 6.3 shows H-gas imports to the Netherlands by main entry points through the last two Gas Years. The share of Emden in H-gas imports rose from 36% during GY 2019/20 to 48%, the share of Bunde/Oude Statenzijl declined from 26% to 24%, whilst the share of Gate fell from 15% to 13% and the share of imports from Belgium dropped from 17% to 14%. The share of BBL declined from 5% to close to 1%.

Figure 6.3 Natural gas imports to the Netherlands by main entry points in the 2019/20 and 2020/21 Gas Years



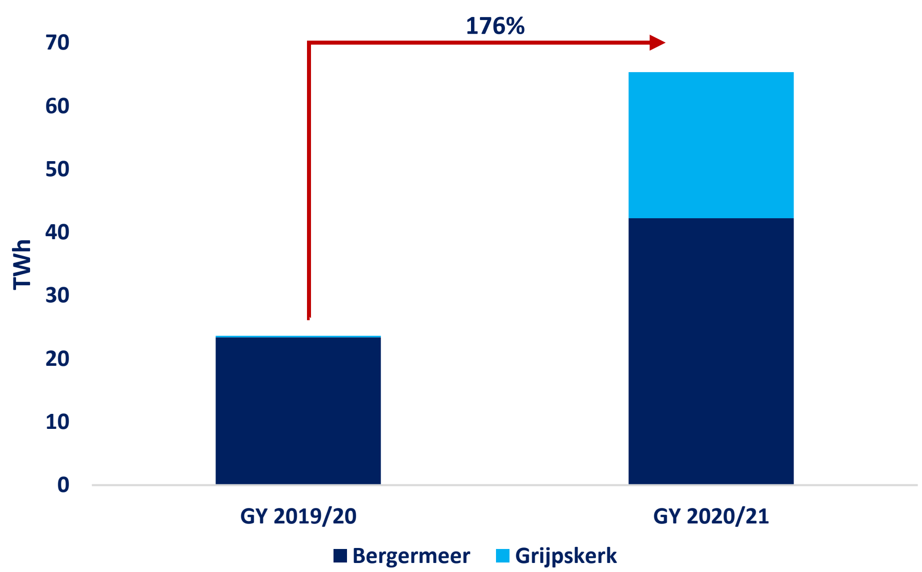
[23] Actual import flows divided by firm capacity of the entry point (Lesser Of Rule applied).

When considering these entry points, the annual spare import capacity of the Netherlands rose by close to 13% year-on-year to 444 TWh in the GY 2020/21, comparing to 388.9 TWh of gas consumption.

Data from ENTSOG's Transparency Platform indicates that H-gas exit flows from the Netherlands fell by 10% (or 8 TWh) year-on-year during the GY 2020/21. This has been largely driven by lower exit flows towards Germany, with flows declining by 62% (or ~38 TWh). Exit flows towards Belgium rose by 5% (or 0.8 TWh), due to higher volumes via Zelzate. Exit flows to the United Kingdom via the BBL pipeline rose by more than twelve times, driven by the wider NBP-TTF price spread.

It is important to highlight that H-gas storage facilities played a key role in the H-gas supply-demand balance of the Netherlands during the 2020/21 heating season. While H-gas import flows declined by over 50 TWh, exit H-gas flows fell by 8 TWh and the domestic demand (including for pseudo L-gas production) of H-gas increased by 8.7 TWh year-on-year during the GY 2020/21. The resulting 50.6 TWh supply-demand gap in H-gas has been largely filled by higher storage withdrawals from H-gas storage sites in the Netherlands. Data from GIE indicates that the combined net withdrawals from the Bergermeer and Grijpskerk H-gas storage facilities rose to 43 TWh year-on-year in the GY 2020/21 heating season, whilst H-gas from storage sites in Germany connected to the Dutch grid provided additional H-gas volumes. As a consequence of strong withdrawals, and lower injections during the summer season (April-September), Bergermeer and Grijpskerk inventory levels stood 27% and 49.9% of working storage capacity respectively on the 1st October 2021 (the beginning of GY 2021/22). This is 61% (or 43 TWh) below their 5-year average.

Figure 6.4 Withdrawals from H-gas storage sites in the Netherlands during the 2019/20 and 2020/21 Gas Years

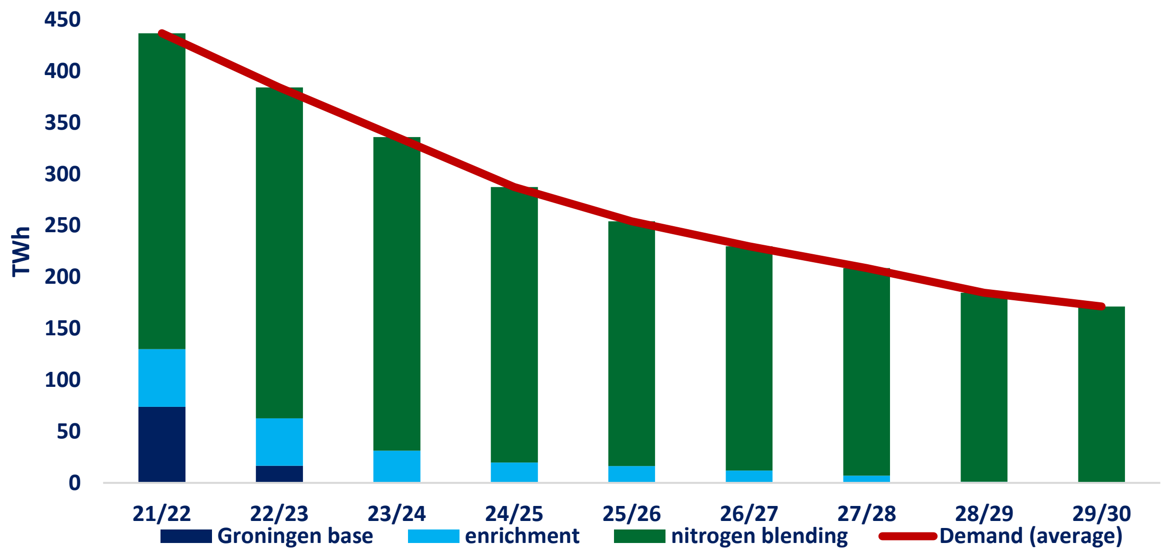


7. Conclusion & implications for Groningen production until 2029/30

Overall, it can be concluded that the L-gas market conversion is progressing well and that security of L-gas supply is being ensured by increasing of 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. The increase of 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, 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 cold year.

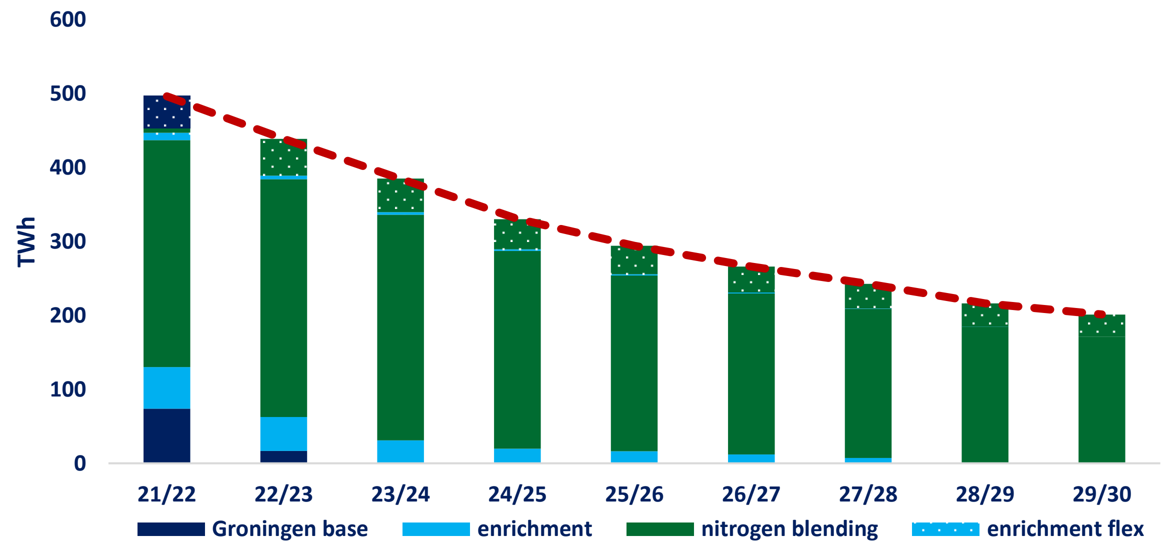
Through the market conversion period, the role of enrichment will decline in line with the decreasing Groningen production. Hence, nitrogen blending facilities will have an increasing role in meeting L-gas demand through the next ten GYs.

Figure 7.1 L-gas supply-demand balance in an average year (GY 2021/22-GY 2029/30)



However, it may be necessary to maintain flexible Groningen production until October 2023 (when Grijpskerk is converted), to meet L-gas demand in the case of extreme cold days. In the consecutive GYs L-gas supply flexibility will be entirely provided by L-gas enrichment and by the nitrogen blending facilities.

Figure 7.2 L-gas supply-demand balance in a cold year[24] (GY 2021/22-GY 2029/30)



[24] Please refer to footnote 6 on page 4 of the current Report.

Annex

Annex I: Consumers demand for L-gas from the Netherlands through the 2018/19 and 2020/21 gas years

1.1 Consumers demand for L-gas from the Netherlands[25] in the GY 2018/2019 in TWh

Gas year 18/19	Germany	France	Belgium	Netherlands
October 2018	12.6	3.1	3.2	16.8
November 2018	16.9	5.1	5.4	26.7
December 2018	20.3	5.7	6.2	30.1
January 2019	24.4	6.6	7.5	36.0
February 2019	18.3	4.9	5.4	26.3
March 2019	18.5	4.6	5.1	25.4
April 2019	13.4	3.1	3.4	16.7
May 2019	11.9	2.5	3.0	15.1
June 2019	7.1	1.6	1.6	9.6
July 2019	5.7	1.4	1.4	9.5
August 2019	6.4	1.3	1.4	8.9
September 2019	8.1	1.7	1.9	11.5
Total 18/19	163.7	41.59	45.44	232.43

1.2 Consumers demand for L-gas from the Netherlands in the GY 2019/2020 in TWh

Gas year 19/20	Germany	France	Belgium	Netherlands
October 2019	12.2	3.0	3.4	18.3
November 2019	19.1	5.0	5.5	26.7
December 2019	20.0	5.6	6.2	30.0
January 2020	19.7	5.7	6.3	30.8
February 2020	17.0	4.8	5.6	27.8
March 2020	17.1	4.5	5.3	25.9
April 2020	10.9	2.1	2.8	14.4
May 2020	9.4	1.8	2.3	12.1
June 2020	6.6	1.4	1.6	9.5
July 2020	6.3	1.3	1.5	9.7
August 2020	5.9	1.1	1.4	9.2
September 2020	7.7	1.7	1.8	11.3
Total 19/20	151.9	37.9	43.6	225.6

1.3 Consumers demand for L-gas from the Netherlands in the GY 2020/2021 in TWh

Gas year 20/21	Germany	France	Belgium	Netherlands
October 2020	12.3	3.2	3.5	18.5
November 2020	14.1	4.1	4.3	21.7
December 2020	15.9	5.2	5.9	29.7
January 2021	16.4	6.0	7.0	34.9
February 2021	16.9	4.9	5.7	30.0
March 2021	16.8	4.4	5.2	26.9
April 2021	14.1	3.5	4.4	22.3
May 2021	10.6	2.5	3.2	15.7
June 2021	6.6	1.4	1.3	8.7
July 2021	5.7	1.3	1.3	8.9
August 2021	6.5	1.2	1.4	8.9
September 2021	7.3	1.6	1.5	9.8
Total 19/20	143.3[26]	39.2	44.6	235.9

[25] 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.

[26] The import figures above do not account for the import via the storage "NUON Epe Gasspeicher". The injection for this storage is only possible from the Netherlands, withdrawals are possible from Netherlands and Germany. In the gas year 18/19 the additional export from the Netherlands to Germany via the Nuon storage accounted for 0,48 TWh, which is reflected in chapter 6.2 "Injected and withdrawn storage volume".

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
	TWh	GWh/d	TWh
21/22	142.2	917	128.3
22/23	122.0	802	109.8
23/24	100.6	686	90.6
24/25	84.3	674	75.8
25/26	61.8	458	55.3
26/27	43.4	343	39.4
27/28	29.7	228	27.3
28/29	11.1	115	10.2
29/30	0.3	2	0.3

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

	Cold		Average
	TWh	GWh/d	TWh
21/22	48.5	347.0	39.7
22/23	40.8	264.8	33.4
23/24	23.9	157.54	19.7
24/25	0.0	0.0	0.0
25/26	0.0	0.0	0.0
26/27	0.0	0.0	0.0
27/28	0.0	0.0	0.0
28/29	0.0	0.0	0.0
29/30	0.0	0.0	0.0

2.3 Indication of the consumers demand for L-gas from the Netherlands in France[27] until GY 2029/30 (TWh)

	Cold		Average
	TWh	GWh/d	TWh
21/22	43.1	339.3	39.2
22/23	38.4	303.1	35.2
23/24	28.2	231.5	25.7
24/25	21.4	181.5	19.6
25/26	15.2	125.8	13.9
26/27	8.9	60.9	8.0
27/28	3.4	15.1	3.2
28/29	0.4	0.0	0.3
29/30	0.0	0.0	0.0

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

	Cold		Average
	TWh	GWh/d	TWh
21/22	266.7	2960	229.7

[27] The expected demand for France does not take into account the quantity of L-gas blended in the H-gas network (2.5 TWh during gas year 2018-2019 for both technical and commercial blending). Moreover, commercial blending may occur due to the oversize of the L-gas supply contract between Engie and GasTerra.
The above forecasts for peak daily demands (in GWh/d) correspond to final L-gas consumers in France and they can be supplied both by Taisnières B (Belgium/France interconnection point) and Gournay storage.
The above forecasts for peak daily and annual L-gas demands (in GWh/d and TWh) are based on an evaluation of peak daily and annual demands for each geographical sector to be converted for each year of the conversion period. For each year residual L-gas demand is the sum of gas demand for geographical sectors which are not yet converted to H-gas according to the current provisional conversion planning in France.

22/23	247.9	2889	211.9
23/24	229.8	2777	195.6
24/25	225.6	2745	192.1
25/26	222.2	2719	189.1
26/27	218.8	2692	186.2
27/28	215.4	2666	183.3
28/29	212.0	2639	180.3
29/30	208.6	2613	177.4

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]
21/22	21.2	495
22/23	26.1	552
23/24	18.3	503
24/25	23.4	516
25/26	19.3	508
26/27	21.9	561
27/28	21.4	311
28/29	15.1	308
29/30	0.0	0

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

Gas year	Volume converted [TWh]	Number of installations [Thousands]
21/22	6.24	336
22/23	13.73	374
23/24	19.70	494
24/25	0.0	0.0
25/26	0.0	0.0
26/27	0.0	0.0
27/28	0.0	0.0
28/29	0.0	0.0
29/30	0.0	0.0

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

Gas year	Volume converted [TWh]	Number of connections [Thousands]
21/22	1.2	54
22/23	4	122
23/24	9	177
24/25	5.5	212
25/26	5.3	279
26/27	6.4	197
27/28	4.9	183
28/29	2.2	37
29/30	0.0	0

Annex IV: Indication of the L-gas production until GY 2029/30

4.1 Indication of the L-gas production in the Netherlands from Groningen until GY 2029/30 (TWh)

	Cold	*Average*
21/22	71	30
22/23	4	1
23/24	2	1
24/25	1	0
25/26	0	0
26/27	0	0
27/28	0	0
28/29	0	0
29/30	0	0

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

	Cold	*Average*
21/22	31.5	31.5
22/23	30.0	30.0
23/24	24.5	24.5
24/25	21.9	21.9
25/26	20.2	20.2
26/27	18.3	18.3
27/28	14.3	14.3
28/29	12.9	12.9
29/30	11.7	11.7

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		
Nüttermoor L-Gas	0.43	24
Speicherzone L-Gas (EWE)	9.1	259
Empelde	2.12	73
Epe L-Gas (innogy)	1.75	98
Epe L-Gas (UES)	4.29	288
France		
Gournay	13	223
the Netherlands		
EnergyStock	3	252
Norg (Langelo)	59	742
Alkmaar	5	357
Epe Nuon	3	117
Epe Eneco	1	95
Epe Innogy	3	119
Peakshaver	1	312

5.2 Net withdrawals (in TWh) of L-gas per country in GY 2018/19, GY 2019/20 and GY 2020/21

	2018/19	2019/20	2020/21
The Netherlands	-3	5	1
France	0.5	0.4	0.5
Germany	-3.8	0.4	6.2

Annex VI: Climatological context

GTS will make an analysis of the climatological context in the L-gas region. GTS will use the temperature measurements of the measurement station in De Bilt to determine this context. This will then be used to analyse the difference between the expected demand in an average year and the realized demand using GTS' degree day method.

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

In GY 2020/21 there were 2,261 degree days, 10% higher than the 2,057 degree days recorded during GY 2019/20 and 8% higher compared to the average of heating degree days recorded between GY 2017/18 and GY 2019/20.

Contributors

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