L-Gas Market Conversion Review

Summer Report 2021

Task Force Monitoring L-Gas Market Conversion

Ministry of Economic Affairs and Climate Policy

Foreword

This is the fourth 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 heating season (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), 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 elsewhere in the L-gas system.

However the household appliances still need Groningen-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.

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.

Whilst Groningen gas production has halved from 341.8 TWh (or 35 bcm) in GY 2014/15 to 170.9 TWh (or 17.5 bcm[3]) in GY 2018/19, the production of pseudo G/L-gas more than doubled during the same period of time. This trend accelerated through the GY 2019/20, as Groningen gas production more than halved year-on-year, falling by 86.72 TWh year-on-year, from 171.12 TWh in GY 2018/9 to 84.4 TWh. This trend continued through the 2020/21 heating season[4], with Groningen gas production falling by 16.3% (or 8.8 TWh) year-on-year, from 53.6 TWh to 44.8 TWh. During the 2020/21 heating season, total pseudo L-gas production increased by 2.1% year-on-year, from 204.4 TWh in 2019/20 to 208.7 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 82% in GY 2019/20 and accounted for 82% through the 2020/21 heating season. During the same period, the utilization rate of nitrogen blending facilities has increased steadily to average at 100% of firm capacity during the GY 2019/20 and at 102% of firm capacity through the 2020/21 heating season. 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 N_2 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, it is set to provide almost 95% of the upward production flexibility by GY 2022/23 necessary to meet demand in a cold GY in the L-gas region. Nitrogen blending alone will account for over 83% of L-gas produced in the Netherlands in GY 2022/23 and is expected to provide over 87% of the upward production flexibility necessary to meet demand in a cold GY.

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 Min. EZK to decide

[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).

[4] The heating season (or gas winter) lasts from 1st October until 31st of March.

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.

Despite an increase in heating degree days year-on-year, total consumption of Dutch L-gas declined by 3.3% (10.6 TWh) from 325.4 TWh in the 2019/20 heating season to 314.8 TWh in the 2020/21 gas winter. This decline in L-gas consumption was largely driven by the continued implementation of the market conversion programs in the respective L-gas markets in GY 2019/20, which reduced demand for L-gas during the consecutive heating season. 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 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 47.2 TWh in GY 2020/21 to 0 in Belgium by GY 2024/25, from 39.5 TWh to 0 in France by GY 2029/30 and from 154.4 TWh to 0.3 TWh in Germany also 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.

In GY 2020/21 over 900,000 gas connections and appliances are expected to be 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.

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.

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. Moreover, a new nitrogen plant at Zuidbroek, planned to start operations from 1st of April 2022 with a capacity of 180,000 m^3/h N_2, will be able to produce between 68 TWh and 97 TWh of additional pseudo L-gas. The outbreak of Covid-19 and consequent lockdowns did up until now not have an impact on the commissioning date of the nitrogen plant. However, the project slack has been exhausted. Uncertainty around the evolution of the Covid-19 and its implications for the conversion planning and construction of the Zuidbroek facility remains a key risk factor. Due to the current developments, there is a real risk of delay on the commissioning date of the Zuidbroek facility. The risk to have a delay of over half a year is low.

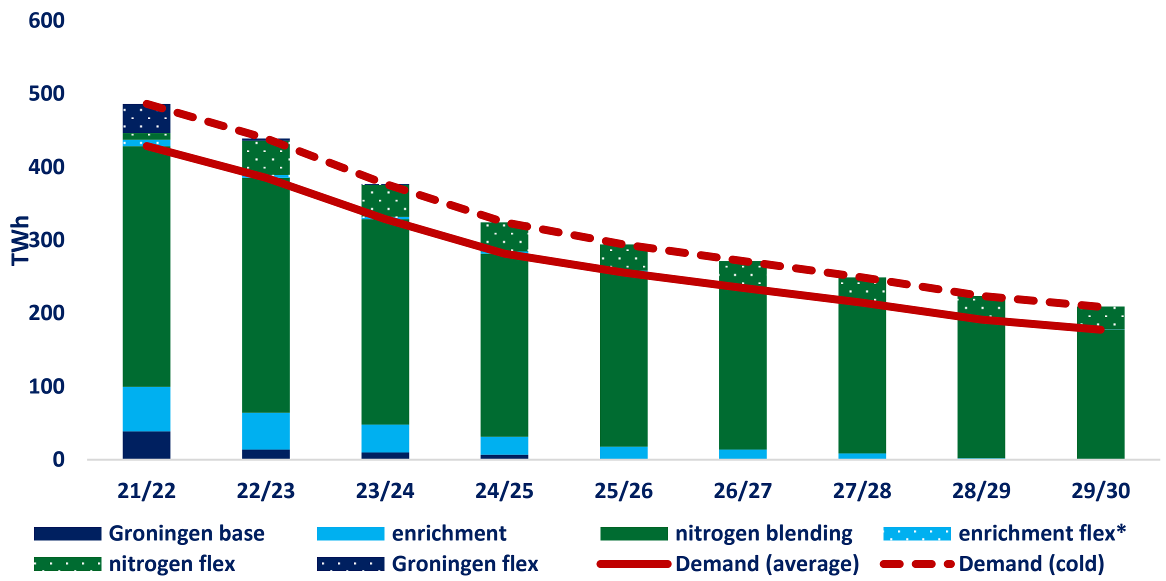
The increase of H-gas conversion capacity via nitrogen blending in the Netherlands, the allowed Groningen production and the market conversion from L-gas to H-gas in Germany, Belgium, France as well as in the Netherlands will ensure the security of pseudo L-gas supply to consumers in all markets both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

GTS concluded in her advice of January 2021 and June 2021, that for the base case a minimum production from the Groningen field is needed until GY 2025/2026. Based on the sensitivity analysis performed by GTS, a realistic bandwidth for the closure of the Groningen field is between mid-2025 and mid-2028. The Government of the Netherlands wants to close the Groningen field as quickly as possible. An important which is being considered

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

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.

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.

The Netherlands' position as a net importer of natural gas is particularly visible during the heating season. Net imports of natural gas rose by more than four-fold in the 2019/2020 heating season compared with the same period of the previous GY to 4.6 bcm (or 45 TWh) and remained at a similar level through the 2020/21 heating season.

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

Based on TYNDP2020 dataset, ENTSOG performed several additional disruption case calculations to investigate if sufficient H-gas supply can be delivered to the northwest European markets in an average year and for high demand situations. The results show that there is sufficient transport capacity during disruptions in an average year. Compared to TYNDP2018 (disruptions) calculations the configuration at European level has improved thanks to increased potential from suppliers (specifically extra LNG volume delivered to existing LNG terminals), new import routes in Europe (see TYNDP2020), and the reduced gas demand in France and the UK. The planned increase in capacity on the German/Dutch border raises the flexibility towards the Netherlands.[7]

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). For this 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. 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 assesments, preventive action and emergency plans are made.

[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] For additional details, please refer to the Winter Report 2021 of the Task Force Monitoring L-Gas Market Conversion, Annex VII.

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. Consumption of Dutch L-gas decreased by 3.3% (or 10.6 TWh) from 325.4 TWh in the 2019/20 heating season to 314.8 TWh during the 2020/21 gas winter. The decline in Dutch L-gas consumption occurred despite an increase of 3% in heating degree days and has been primarily driven by the continued implementation of the market conversion programs in the respective L-gas markets, which reduced demand for L-gas. 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 Gas Year.

3. Groningen gas production fell by 16.3% (or 8.8 TWh) year-on-year, from 53.6 TWh in the 2019/20 heating season to 44.8 TWh during the 2020/21 gas winter. This has been possible due to higher L-gas production via nitrogen blending, which increased by 6.8% and drove up the utilization rate of the nitrogen blending facilities to 102% 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. L-gas storage played a key role in allowing lower Groningen production, with net withdrawals accounting for over 18% of the region's total L-gas demand during the 2020/21 heating season.

4. Despite being heavily impacted by the outbreak of Covid-19 and consequent lockdowns, the planned commissioning date of the nitrogen plant is still April 2022. However, there is a real risk of delay on the commissioning date of the Zuidbroek facility. The risk of having a delay of more than half a year, however, is low. The Zuidbroek nitrogen plant is planned to start operations from 1st of April 2022 with a capacity of 180,000 m3/h N2 and will be able to produce between 68 TWh and 97 TWh of additional pseudo L-gas.

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.

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, between GY 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. For capacity reasons the Groningen field may be needed for security of supply. Based on the sensitivity analysis performed by GTS, a realistic bandwidth for the closure of the Groningen field is between mid-2025 and mid-2028. When UGS Grijpskerk is used to store L-gas instead of H-gas this 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 increasingly become more dependent on the flow of the increasing H-gas volumes into the Netherlands. Based on ENTSOG's simulations for 2020, 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 elsewhere 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 which 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 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.

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.

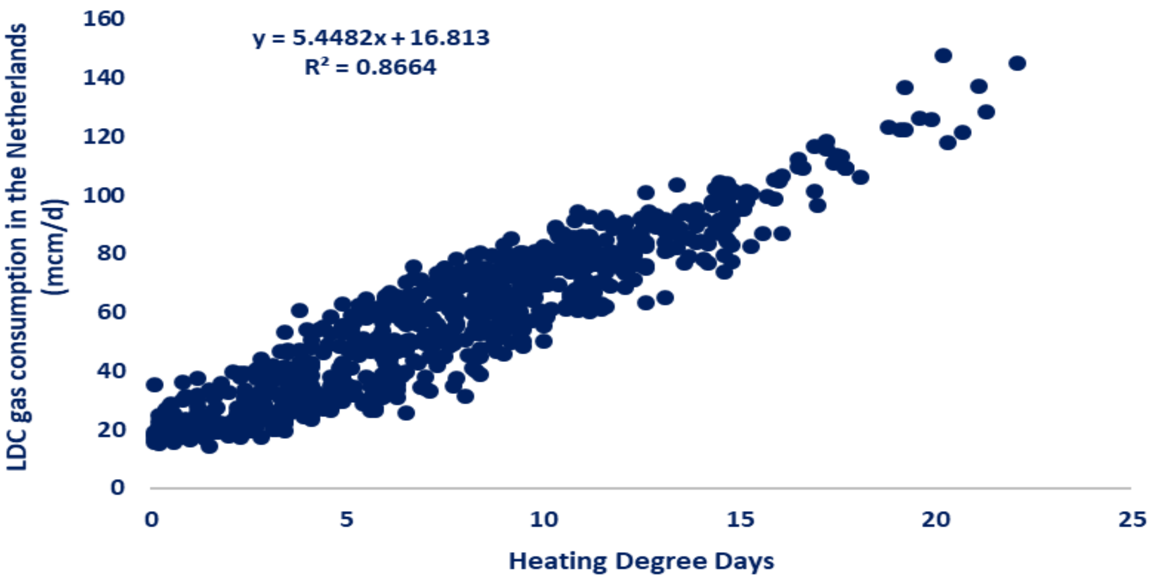
2. L-Gas demand[9]

2.1 Recent demand trends

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 (GY)[10].

It is important to note, that there is particularly a strong correlation between the number of heating degree days (HDD) and L-gas consumption, given its predominant use for space heating purposes. This correlation in well demonstrated through the influence of HDDs on daily Local Distribution Network (LDC) consumption in the Netherlands. LDC demand is largely met by L-gas in the Netherlands.

Figure 2.1 Correlation between HDDs and daily LDC consumption in the Netherlands (January 2018-March 2021)



Despite an increase in HDD by 3% year-on-year[11], total consumption of Dutch L-gas declined by 3.3% (10.6 TWh) from 325.4 TWh in the 2019/20 heating season to 314.8 TWh in 2020/21 (and by 6% or 20.1 TWh when compared with 2018/19 heating season). This decline in L-gas consumption was largely driven by the continued implementation of the market conversion programs in the respective L-gas markets in GY 2019/20, which naturally reduced demand for L-gas during the consequent heating season.

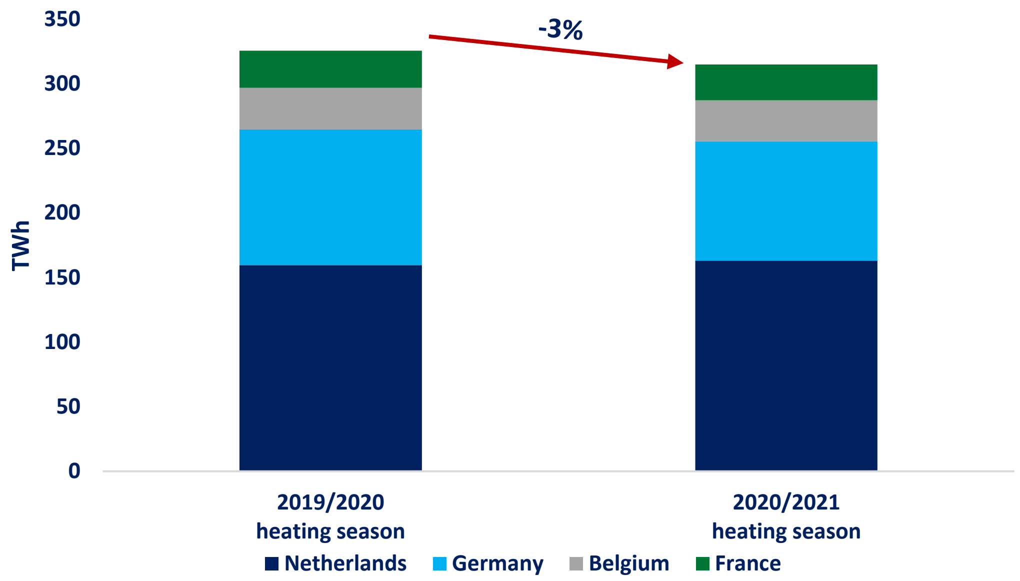
In GY 2018/19 conversion totaled to 15.76 TWh, with 13.5 TWh taking place in Germany, 1.37 TWh in Belgium, 0.888 TWh in France and 0 in the Netherlands. In GY 2019/20 conversion totaled to 21.22 TWh, with 18.1 TWh taking place in Germany, 1.92 TWh in Belgium, 1.2 TWh in France and 0 in the Netherlands.

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 HDDs which drive space heating requirements or wind speeds which can have an impact on gas-to-power demand.

In contrast to Dutch L-gas demand, H-gas demand increased by 6.5% (or over 60 TWh) from 964 TWh during the 2019/20 heating season to 1027.5 TWh through the 2020/21 gas winter. This growth has been partly supported by the higher HDDs supporting space heating requirements, stronger demand from the power sector and an increase in H-gas demand resulting from the L-gas to H-gas conversion programs in Belgium, France and Germany.

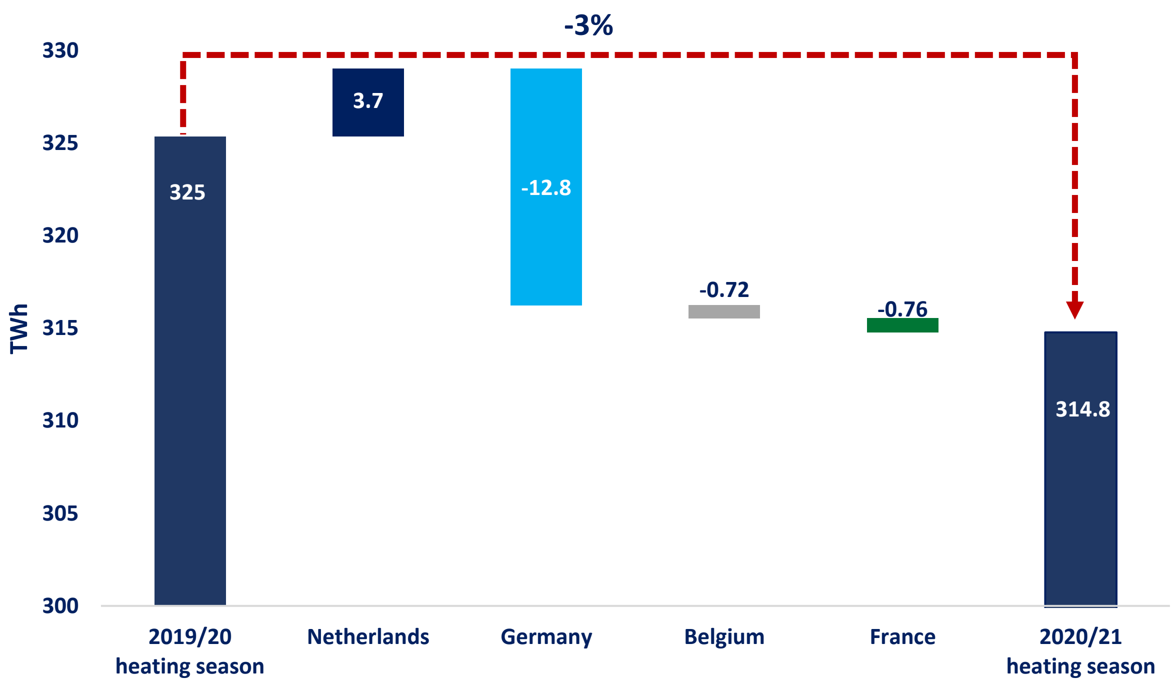
[9] Demand is an ex ante concept, referring to expected energy quantities being consumed. Consumption is an ex post concept, referring to energy quantities which have been already consumed. The two terms are used in an interchangeable manner in this Report.
[10] A Gas Year starts on 1st October and ends on 30 September. The heating season (or gas winter) lasts from 1st October until 31st of March.
[11] For more detail regarding the climatological context, please refer to Annex VI of the current report.

Figure 2.2 Consumption of L-gas from the Netherlands through the 2019/20-2020/21 heating seasons



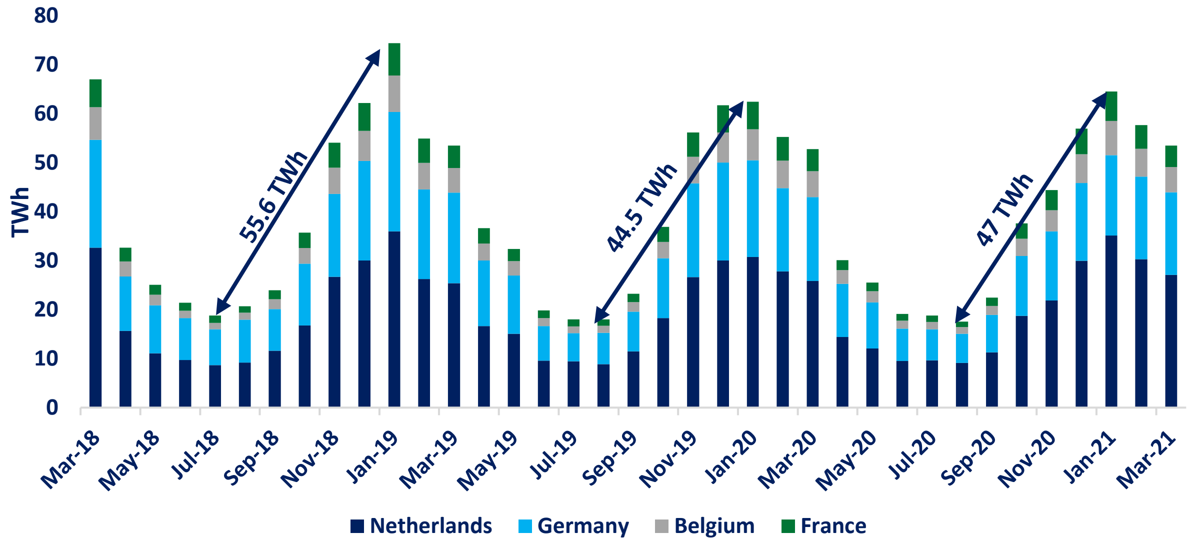
As shown in Figure 2.3 Germany accounted for close to 90% of the net decline in Dutch L-gas consumption through the 2020/21 heating season, followed by France (5.4%) and Belgium (5%). In contrast, L-gas consumption increased in the Netherlands, where there is currently only limited market conversion program in place and higher HDDs supported higher L-gas consumption. Regarding year-on-year comparisons, Germany recorded a reduction of 12.1%, France 2.7%, Belgium 2.2%, whilst L-gas consumption increased in the Netherlands by 2.3%.

Figure 2.3 Change in Dutch L-gas consumption in 2019/20 vs 2020/21 heating season



Whilst total Dutch L-gas consumption decreased by over 3%, peak monthly consumption increased by 3.3% (2 TWh) in the 2020/21 heating season compared to the previous heating season and consequently the demand swing (represented by the arrows in Figure 2.4) increased by 5.6% (2.5 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.

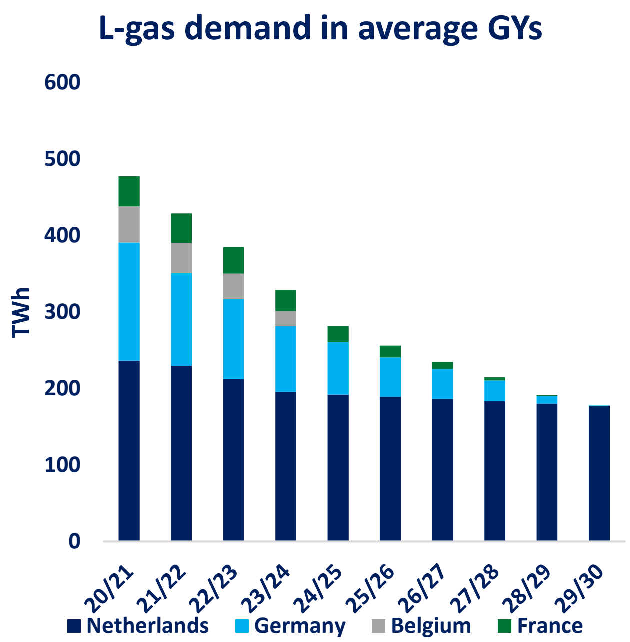
Figure 2.4 Dutch L-gas monthly consumption March 2018 – March 2021

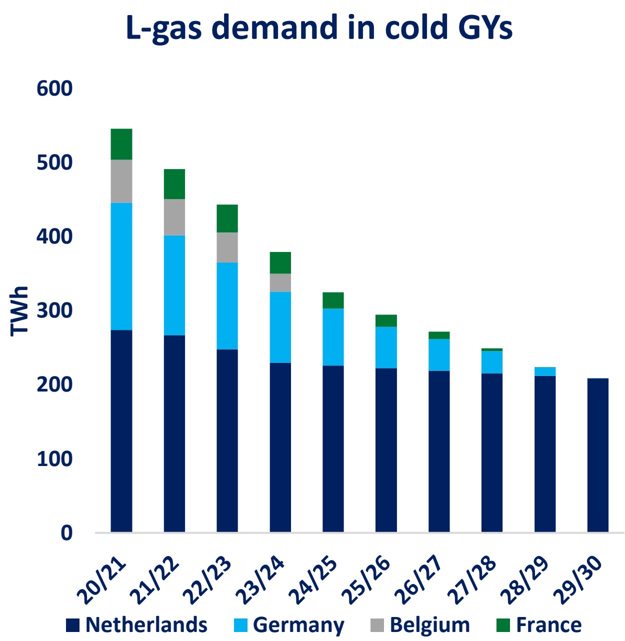


2.2 The expected annual demand for L-gas from the Netherlands until GY 2029/30

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 to be gradually reduced 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 47.2 TWh in GY 2020/21 to 0 in Belgium by 2024/25, from 39.5 TWh to 0 in France and from 154.4 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)





[12] GTS (2017), Netwerk Ontwikkelingsplan 2017.
[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. L-gas market conversion volume

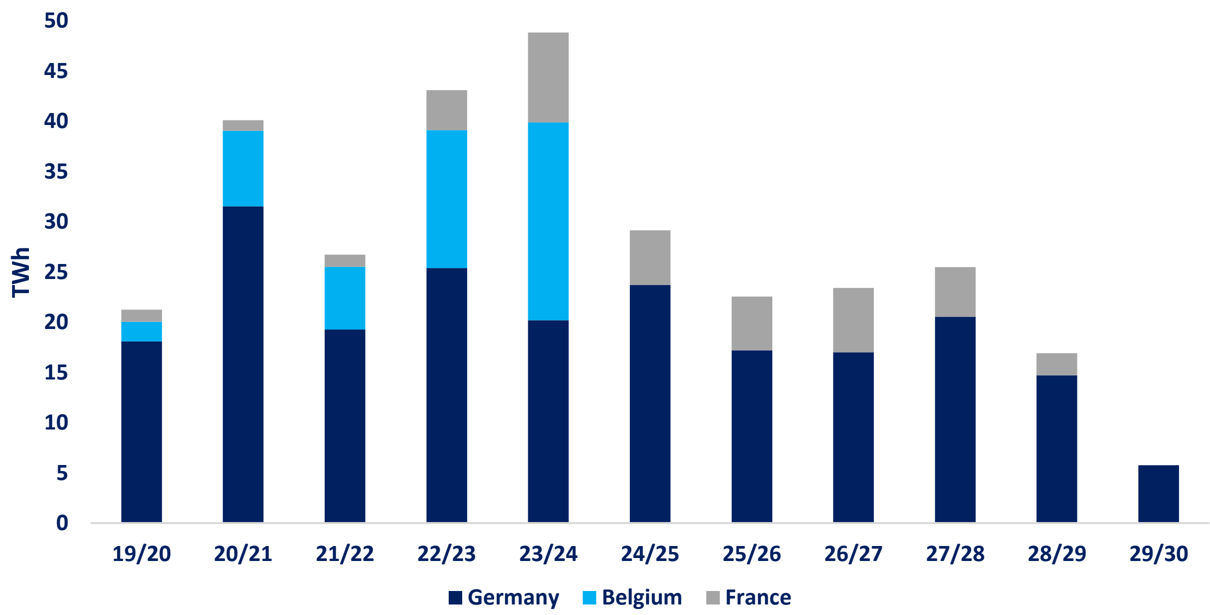
The gas infrastructure operators of Belgium, France and Germany have made arrangements to undertake extensive conversion programs, mainly switching L-gas consumers to H-gas, to reduce the L-gas supply from the Netherlands: by the gas GY 2029/30, their imports of L-gas will be reduced to close to zero.

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 900,000 gas connections and appliances are expected to be converted in GY 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. 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.

Figure 3.0 Volume effect of actual and planned conversions between GY 2019/20 and GY 2029/30 (TWh, based on average temperatures).



3.1 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 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.

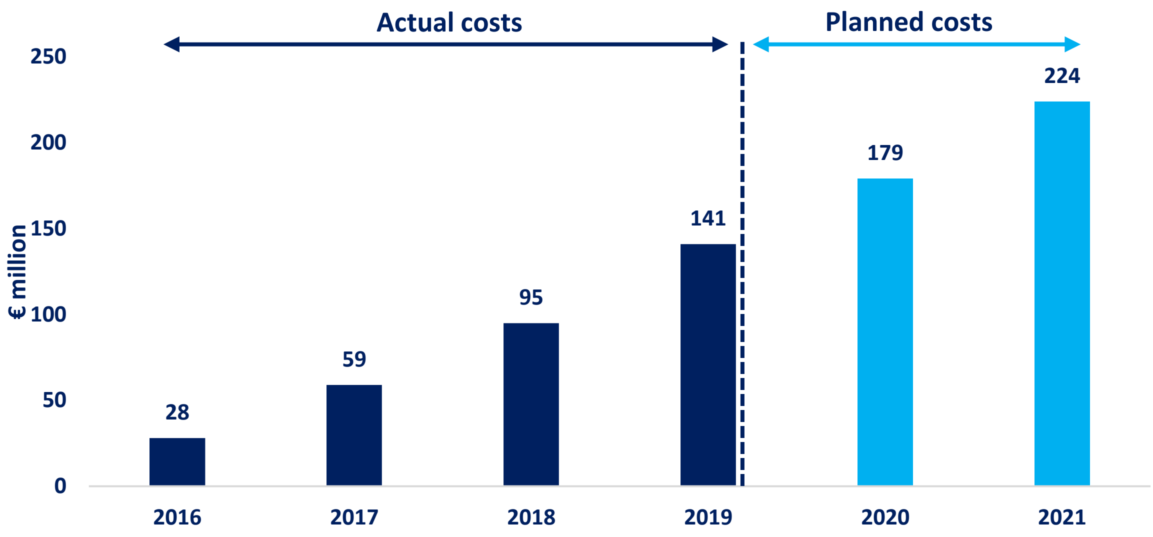
The total costs for the conversion from L- to H-gas in Germany are estimated at approx. EUR 4 billion. The conversion costs can be split into two different cost categories: (1) costs for adapting the customers' appliances from L- to H-gas and (2) costs for grid expansion.

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 EUR 600 under certain circumstances.

The actual costs for the adaption of appliances from the years 2016 – 2019 and the planned costs for the years 2020 – 2021 are displayed in the illustration below, altogether totaling to € 726 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 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 up to 6 TWh a year, cf. below.

Conversions from 2015 to 2020[15]

Approximately 300,000 appliances have been converted from L- to H-gas in the years 2015 – 2018. 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).

The rapid spread of Covid-19 in Germany had only resulted in minor changes to the original conversion plans for 2020. As foreseen in the Summer Report 2020 of the Task Force Monitoring L-Gas Market Conversion, only an amount of 6,000 appliances (0.05 GW) out of 395,000 appliances had been rescheduled from 2020 to 2021. This, however, did not result in any changes in the import assumptions from the Netherlands in terms of volume or capacity due to the limited size of the conversion area.

Temporary delays that have accumulated during the first wave of Covid-19 in spring 2020 had mainly been compensated during summer 2020. Further compensation has been achieved by conducting conversion steps later in the year than originally planned, despite higher risks for the involved end customers if their heating

[15] 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.

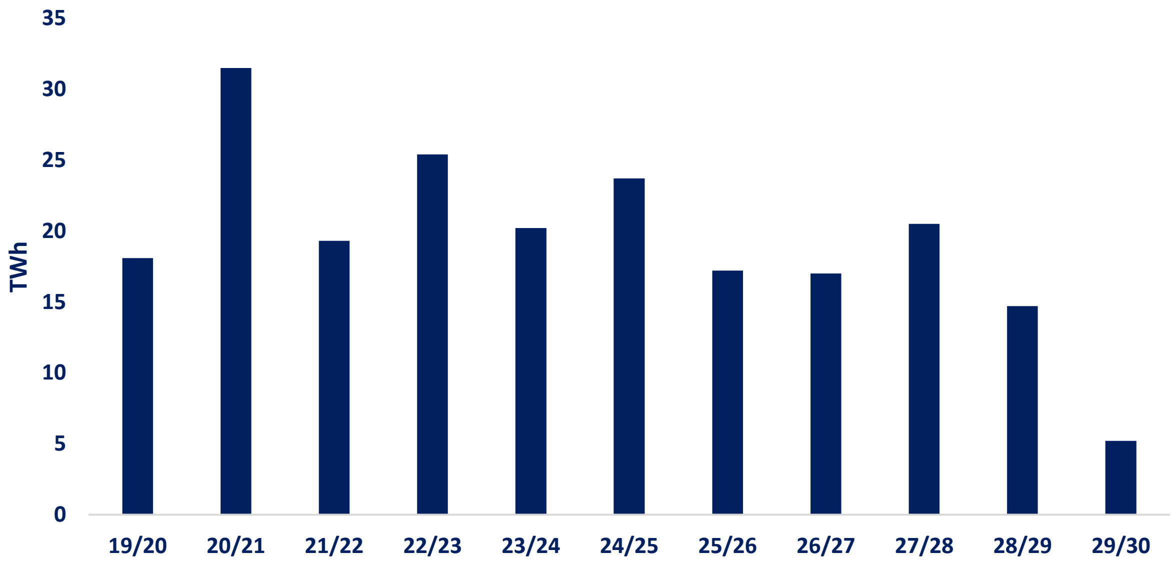
installation should malfunction during the switchover process. The last conversion steps in Germany for the year 2020 have successfully been conducted by November 2020.

Conversions in 2021

The planned conversion of 2021 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.

An above-average effect on volume results in particular from the conversion area (15) "Rhineland", and besides that also from the conversion areas (13) "Middle Rhine" and (3) "East Hannover/ Wolfsburg".

Figure 3.1.2 Estimated volume effect of market conversion per Gas Year (TWh)



The conversion progress is on schedule on as planned. COVID-19 did not have any impacts on the implementation of the conversion steps. Out of the 571,000 installations to be converted in 2021, more than 400,000 have been completed by the end of August. The conversion steps already implemented include a major power plant in the area of Düsseldorf as well as several large industrial customers (among others metal and chemical industries). Furthermore, the conversion of the first L-Gas storage to H-gas has been completed successfully.

Grid expansion required for the L-/H-Gas conversion steps in 2021 are commissioned in time. Most importantly, the ZEELINK pipeline has started its regular operation in May 2021. ZEELINK is a newly built 216 km H-gas pipeline project required for several conversion steps from July 2021 onwards (in particular for the area of Düsseldorf / Rhineland), as well as for many conversion steps in the following years.

The conversion plan for 2021 is displayed in the table below and on the Map 3.1.

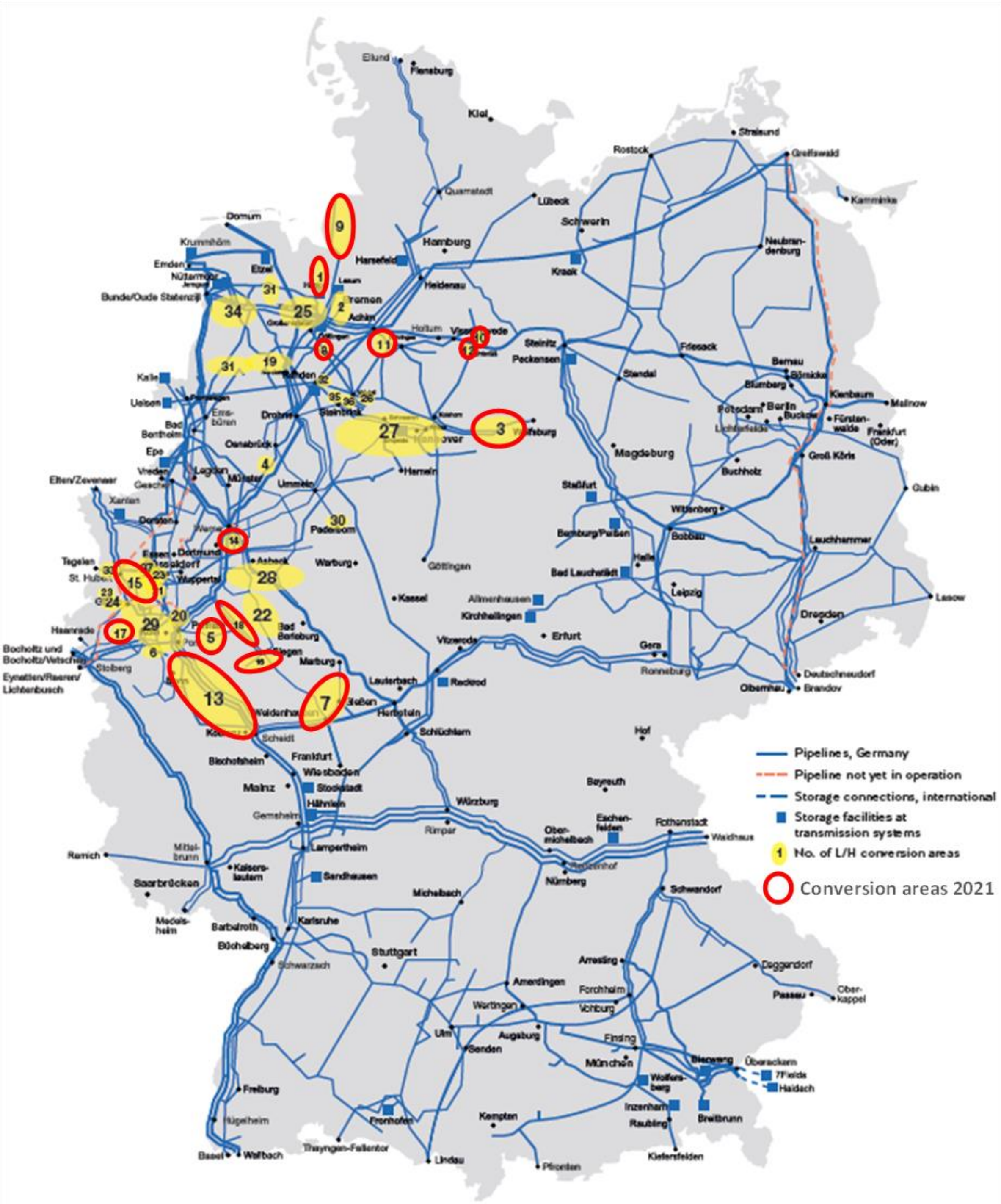
Table 3.1 Market conversion in Germany in 2021

Area (number in map)	**Area in the Gas NDP 2020–2030**	TSO	Number of appliances (planned)	Technical conversion month (planned)
5	Aggertal pipeline	Thyssengas	14,000	April
5	Aggertal pipeline	Thyssengas	17,000	June
5	Aggertal pipeline	Thyssengas	11,000	August
17	Bergheim 1	Thyssengas	14,000	October
3	East Hannover/ Wolfsburg	GUD	8,000	March

3	East Hannover/ Wolfsburg	GUD	36,000	April
3	East Hannover/ Wolfsburg	GUD	12,000	June
3	East Hannover/ Wolfsburg	GUD	9,000	July
3	East Hannover/ Wolfsburg	GUD	6,000	September
3	East Hannover/ Wolfsburg	GUD	22,000	October
1	EWE-Zone part I	GTG	6,000	November
8	EWE-Zone part II	GTG	31,000	February-August
8	EWE-Zone part II	GTG	3,000	October
9	North Bremen/ Osterholz Scharmbeck/ Bremerhaven/ Cuxhaven	GUD	9,000	July
9	North Bremen/ Osterholz Scharmbeck/ Bremerhaven/ Cuxhaven	GUD	13,000	May
9	North Bremen/ Osterholz Scharmbeck/ Bremerhaven/ Cuxhaven	GUD	43,000	June
9	North Bremen/ Osterholz Scharmbeck/ Bremerhaven/ Cuxhaven	GUD	12,000	September
9	North Bremen/ Osterholz Scharmbeck/ Bremerhaven/ Cuxhaven	GUD	9,000	October
10	Unterlüß-Gockenholz*	GUD	0	October
11	Verden	GUD	13,000	October
12	Munster Gockenholz area	Nowega	6,000	October
7	Middle Hesse	OGE	6,000	March
7	Middle Hesse	OGE	18,000	May
7	Middle Hesse	OGE	27,000	June
7	Middle Hesse	OGE	18,000	August
13	Middle Rhine	OGE	45,000	April
13	Middle Rhine	OGE	21,000	June
13	Middle Rhine	OGE	8,000	May-August
13	Middle Rhine	OGE	18,000	September
13	Middle Rhine	OGE	15,000	October
14	Oberaden*	OGE	0	June/ September
18	Oberbergisches Land	Thyssengas	10,000	September
15	Rhineland	OGE	22,000	July
15	Rhineland	OGE	21,000	July
15	Rhineland	Thyssengas	13,000	July
15	Rhineland	OGE	0	September
15	Rhineland	Thyssengas	0	July
15	Rhineland	Thyssengas	0	September
16	Westerwald/ Sieg	OGE	19,000	September
16	Westerwald/ Sieg	OGE	16,000	July
	Total		**571,000**	

**no distribution networks*

Map 3.1 Conversion areas in 2021

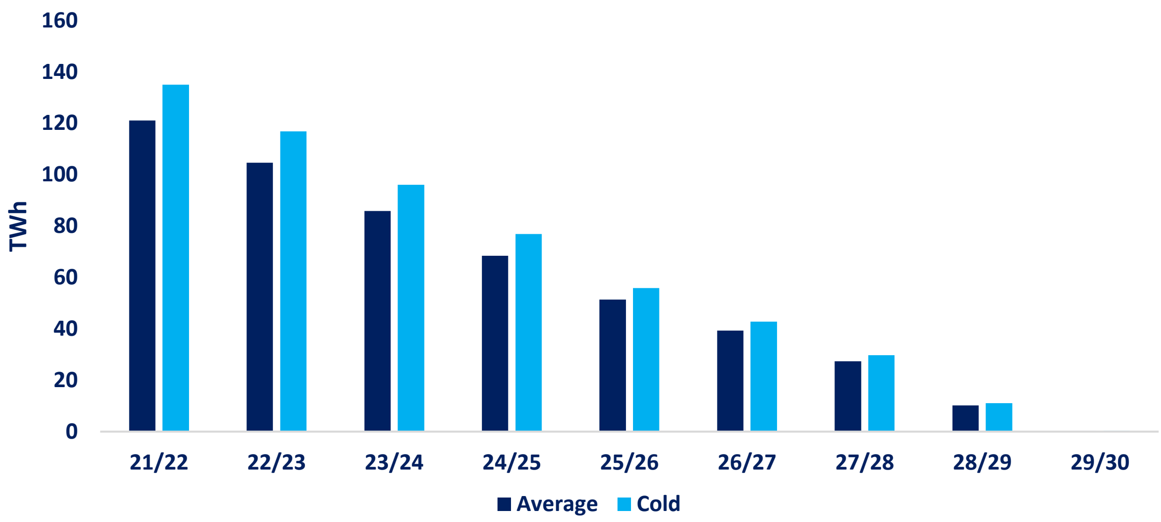


Conversions until GY 2029/30

In Germany, over 3.7 million of gas appliances will still need to be converted between GY 2021/22 and GY 2029/30, translating into a total volume of 164 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.

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 EUR 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 converted on April 9, 2019, rural area with a majority of individual housing) and the Gravelines area (10,000 consumers converted on September 17, 2019, urban area with collective housing).

The initial plan for 2020 was the conversion of Dunkerque sector in October 2020 representing 42,000 customers and translating into an annual consumption of 1 TWh under average weather conditions. The Dunkerque sector was successfully converted on 27-28 October 2020 instead of 13 October as previously planned. This sector is number four in France, the biggest and last of the pilot phase. On the TSO side the network modifications for the conversion of the Dunkerque sector were achieved by the end of 2019 and therefore the Covid-19 crisis had no consequence on that part of the program.

The status in France at the end of November 2020 is that the second wave of Covid-19 did not have any significant impact on conversion activities because:

- 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.

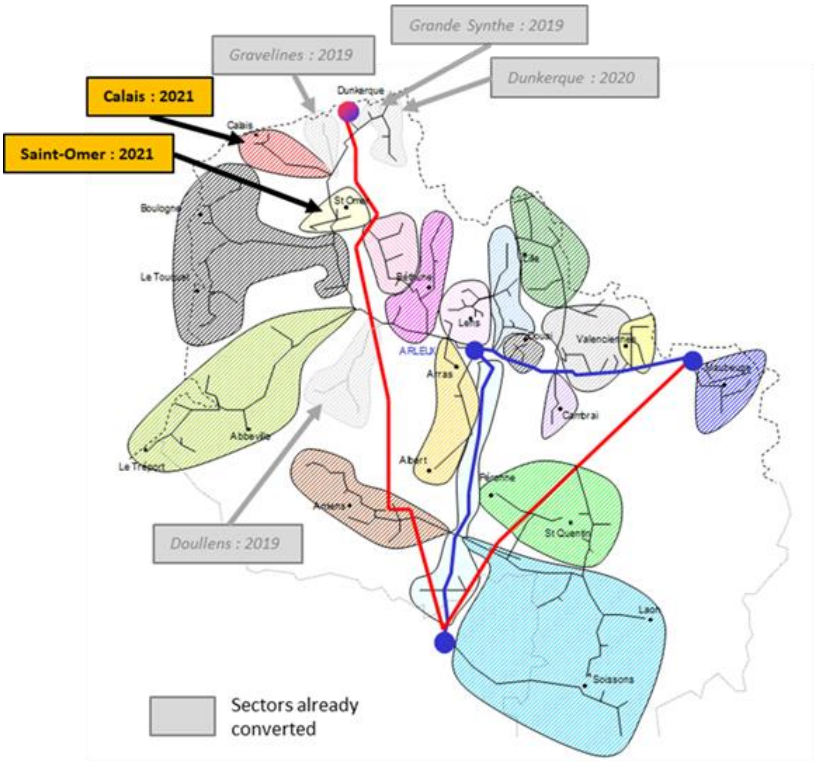
Conversions in 2021

The initial plan for 2021 was the conversion of Calais and St Omer sectors respectively in September and October 2021 representing 54 000 customers and translating into an annual consumption of 1.2 TWh under average weather conditions. No delays have been reported by the beginning of September 2021.

[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 inventory of gas appliances in the areas which will be converted in 2022 (122 000 connections) have begun in February 2021. Network modifications by the TSO for the conversion of these areas are underway and online with commissioning in September. Nevertheless, the timing of the conversion remains dependent on the evolution of the health crisis. The market conversion areas are displayed on Map 3.2.

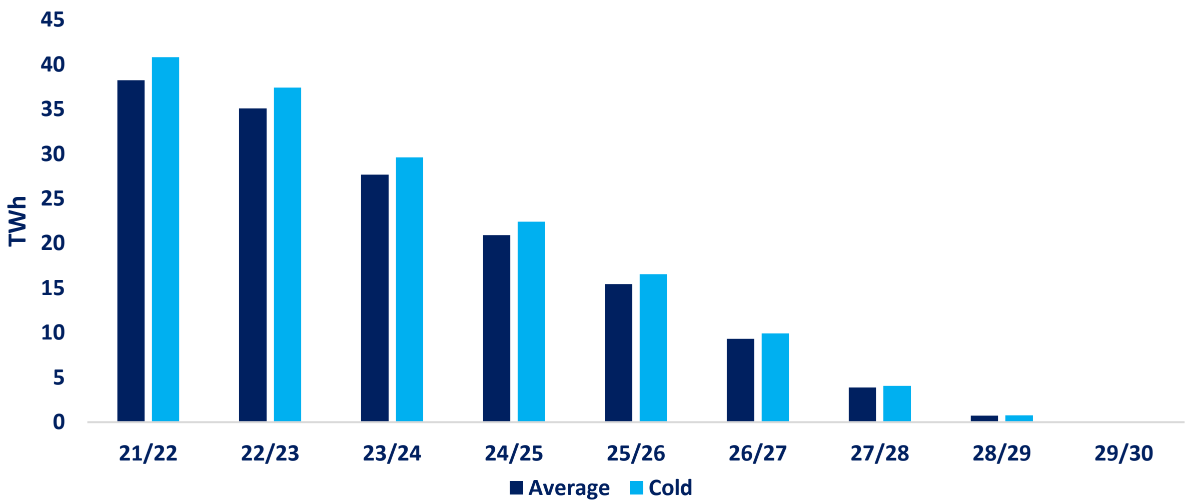
Map 3.2 Market conversions in France in 2019-2021



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).

Remainder of the conversion – optimization of the conversion planning

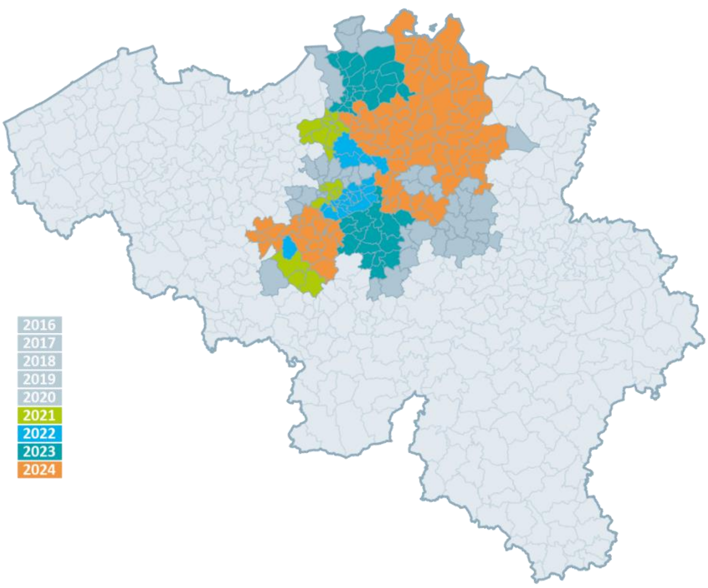
The successful completion of the L/H conversion phases to date led the Belgian gas network operators (TSO and DSOs) to identify ways of converting larger L-gas market areas to H-gas each year, thereby reducing the total duration of the conversion program. The new indicative planning foresees that the Belgian L/H conversion should be completed on September 1, 2024 (instead of June 1, 2029, as previously planned). The areas to be converted year by year are shown in Map 3.3.

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 planned for conversion in 2023.
- The L-gas areas previously planned for conversion in 2025, 2026 and 2027 are now scheduled in 2024.

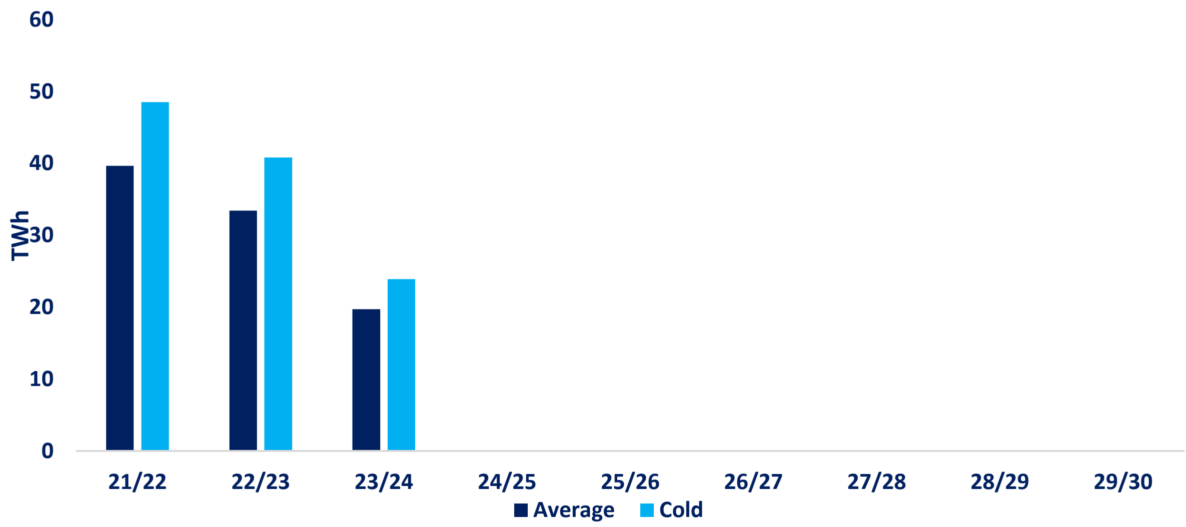
It is important to note that this new planning is still subject to confirmation. The conversion phases of 2022 (June 1) and 2023 (June 1) are formally validated, but the last conversion steps of 2024 (June 1 and September 1) still have to be confirmed by the end of calendar year 2021.

Map 3.3 Indicative market conversion planning in Belgium



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

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 June 20, 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.

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 an increasing 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 year-on-year, from 171.12 TWh in GY 2019 to 84.4 TWh.

This trend continued through the 2020/21 heating season, with Groningen gas production falling by 16.3% (or 8.8 TWh) year-on-year, from 53.6 TWh to 44.8 TWh.

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 18/19.

During the 2020/21 heating season, total pseudo L-gas production increased by 2.1% (or 4.3 TWh) year-on-year, from 204.4 TWh to 208.7 TWh. Consequently, the share of pseudo L-gas in total Dutch L-gas production grew from 79% in the 2019/20 heating season to 82% in 2020/21.

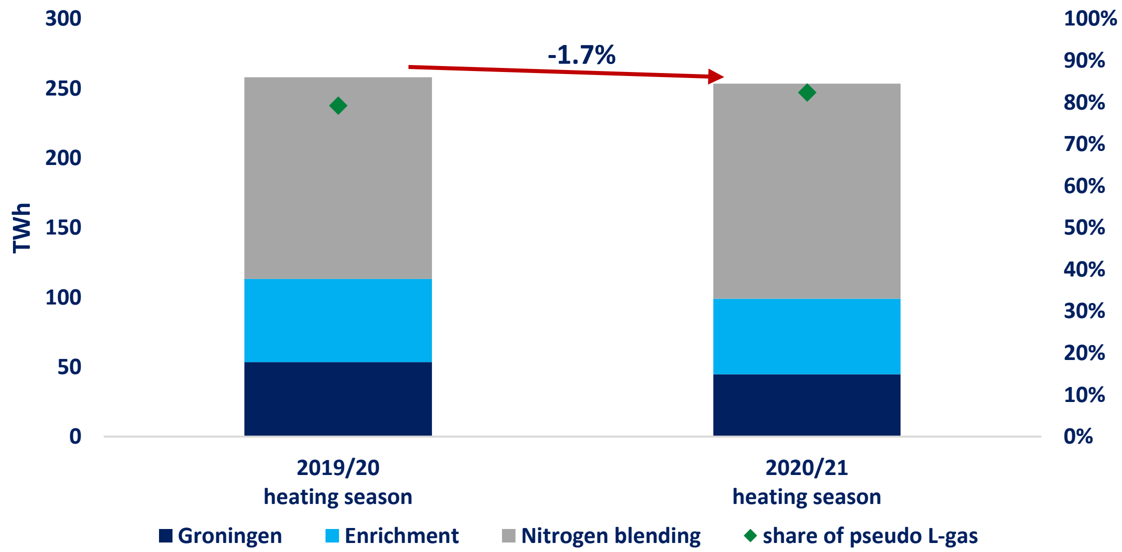
It is important to highlight that this has been entirely driven by a higher L-gas production via nitrogen blending increasing by 6.8% (or 9.8 TWh) while pseudo L-gas obtained via enrichment decreased by 9.2% (or 5.5 TWh).

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.

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 2019/20 heating season, at 102% through the 2020/21 gas winter. 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 close to 11% year-on-year, from 1.72 bcm during the 2019/20 heating season to 1.91 bcm in 2020/21.

Figure 4.1 L-gas supply in the Netherlands through the 2019/20 - 2020/21 heating seasons



Altogether, L-gas production in the Netherlands have fallen by 1.7% (or 4.4 TWh) year-on-year, from 258 TWh during the 2019/20 heating season to 253.6 TWh in 2020/21. As such, the decline in L-gas production has been smaller than the year-on-year reduction in L-gas consumption (-10.6 TWh) resulting in lower 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).

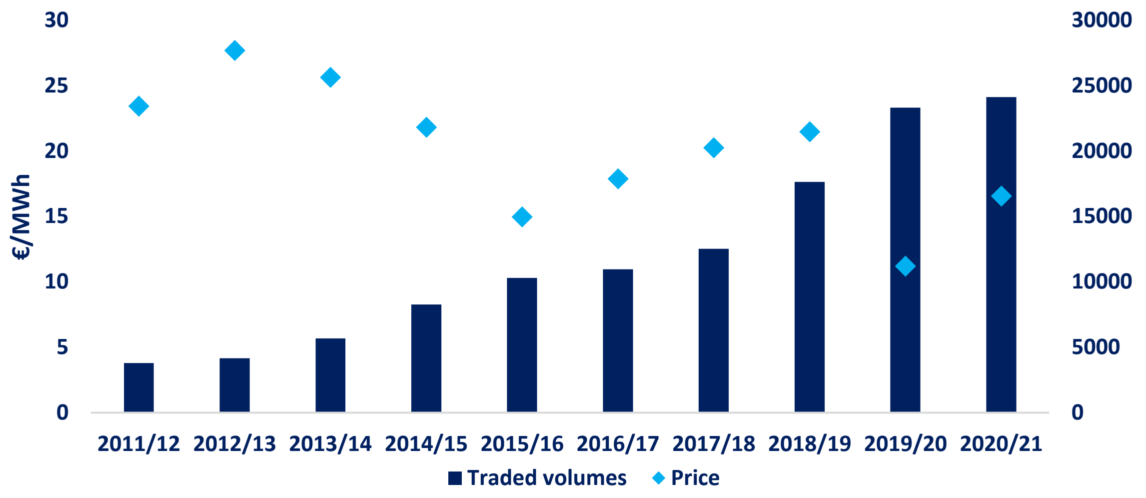
In fact, gas prices on the TTF are reflective of broader regional and global supply-demand dynamics and as such depend less on the levels of natural gas production in the Netherlands.

Following the steep drop through GY 2019/20, natural gas prices on TTF recovered strongly through the 2020/21 heating season, increasing by 48% year-on-year to an average of €16.6/MWh. However, this strong growth in gas prices was largely driven by factors non-related to Groningen gas production. Colder winter temperatures, a

[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.

tighter global LNG market, lower wind power generation and recovery in economic activity all supported TTF spot prices during the 2020/21 heating season. Moreover, 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 0.67/mmbtu during 2019/20 heating season to USD 2.6/mmbtu in 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 30% (or over 220 TWh) year-on-year during the 2020/21 heating season. This in turn provided further upward pressure to natural gas prices across European gas hub, including TTF.

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

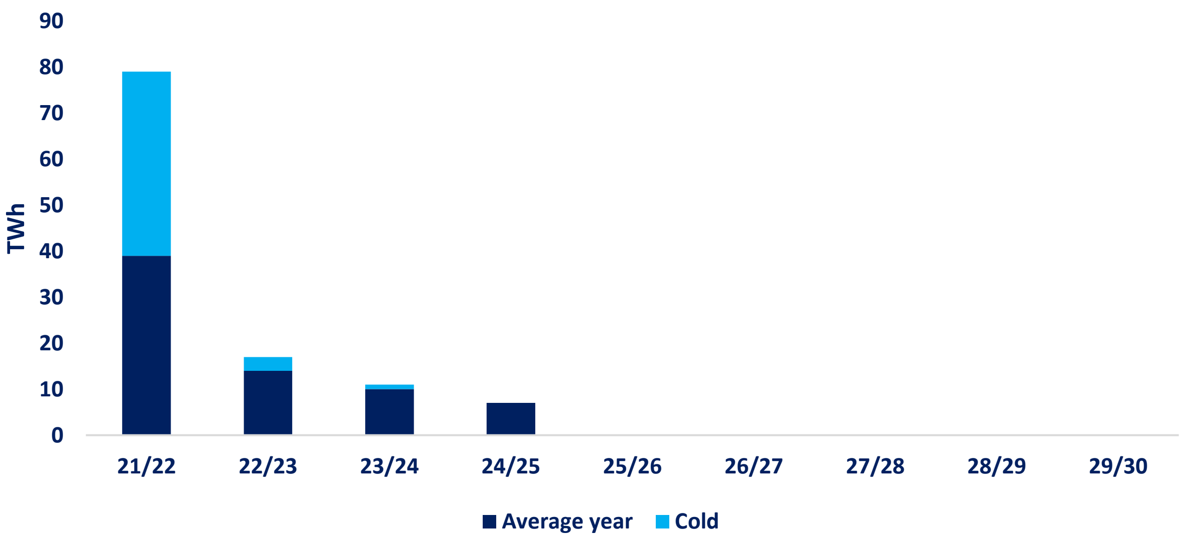


During the same period of time, traded volumes on TTF rose by 3.5% to over 24,000 TWh, reinforcing TTF's position as Europe's leading gas hub. Importantly, the liquidity of the hub improved as well, as certified by the improving churn ratio[20], increasing from 75 in 2019/20 heating season to 78 in 2020/21.

4.3 Indication of the L-gas production in the Netherlands for the period GY 2019/20 – GY 2029/30

The Groningen production cap for the GY 2020/21 has been set at 8.1 bcm (or 78.25 TWh) for an average GY, 31% below its cap for the previous GY 2019/20 (set at 11.8 bcm or 114 TWh). The production cap for the GY 2021/22 was set at 3.9 bcm (or 37.7 TWh) for an average GY and at 7.5 bcm (or 73.3 TWh) for a cold GY.

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



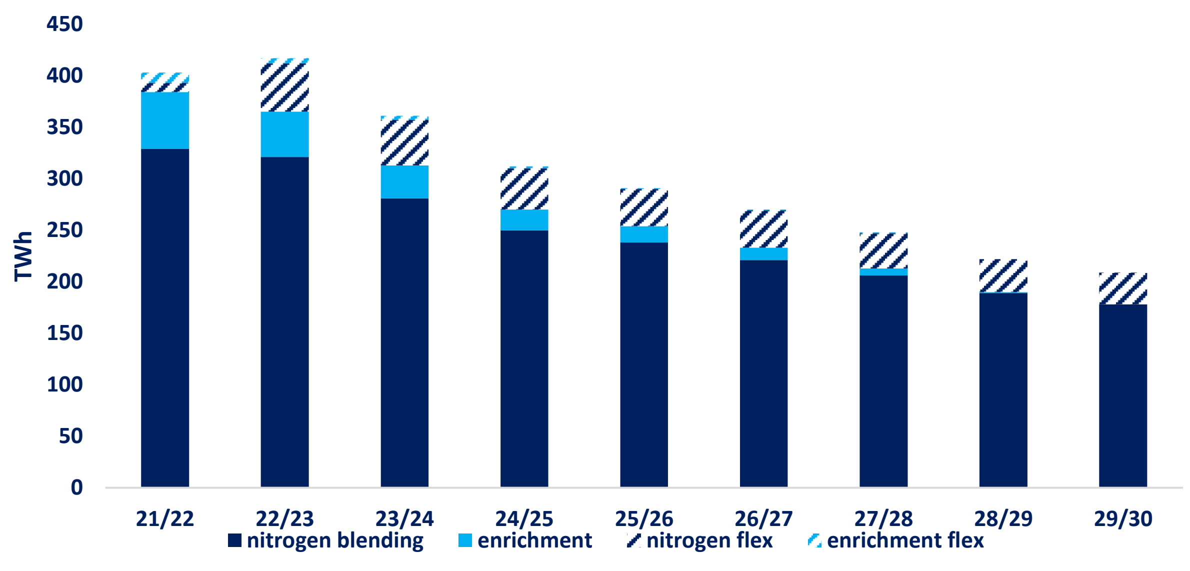
[19] The European Union, Turkey and the United Kingdom.
[20] The churn is the ratio between the traded volumes on a hub and the physical deliveries of the hub. A higher churn ratio suggests a more liquid and developed hub.

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 of January 2021 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 GY 22/23 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 2021, that for the base case the minimum production from the Groningen field is needed until GY 2025/2026. Based on the sensitivity analysis performed by GTS, a realistic timeframe for the closure of the Groningen field is between mid-2025 and mid-2028. 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. 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.

To substitute the declining production from the Groningen field, the production of pseudo L-gas will further increase, primarily by means of additional nitrogen blending with (imported) H-gas. In the GY 2022/23, pseudo L-gas will account close to over 95% (or 371 TWh) of L-gas produced in the Netherlands and is set to provide over 94% of the upward production flexibility necessary to meet Dutch L-gas demand in a cold GY in the L-gas region. Nitrogen blending alone will account to over 83% (or 321 TWh) of L-gas produced in the Netherlands and expected to provide over 87% of the upward production flexibility necessary to meet demand in a cold GY.

This will be supported by the new nitrogen plant at Zuidbroek, which is currently under construction and is planned to start operations from 1st of April 2022 with a capacity of 180,000 m3/h N2 and able to produce between 68 TWh and 97 TWh of additional pseudo L-gas. Despite being heavily impacted by the outbreak of Covid-19 and consequent lockdowns, the planned commissioning date of the nitrogen plant is still April 2022. However, the project slack has been exhausted. Uncertainty around the evolution of the Covid-19 pandemic and its implications for the conversion planning and construction of the Zuidbroek facility remains a key risk factor. Due to the current developments, there is a real risk of delay on the commissioning date of the Zuidbroek facility. The risk of having a delay of more than half a year, however, is low.

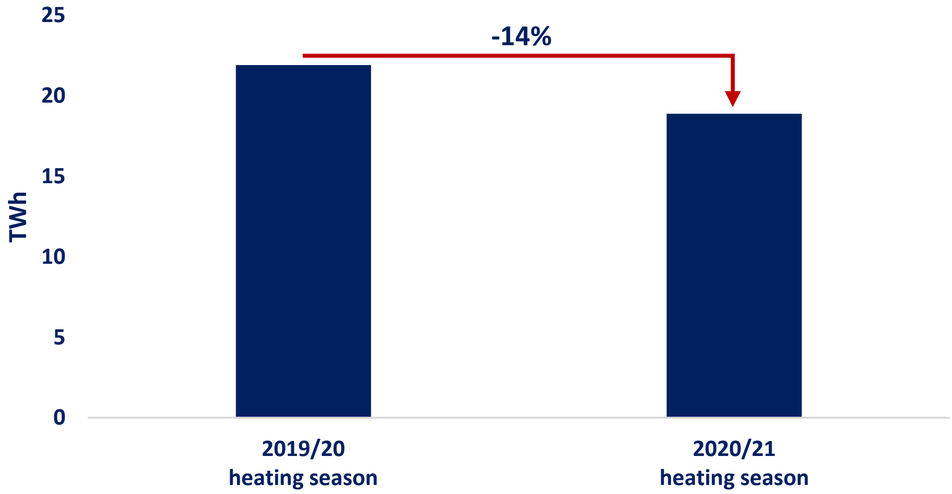
Figure 4.4 Indication of pseudo L-gas production during an average and cold gas year in the Netherlands (GY 2020/21-2029/30)



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 14% (or 3 TWh) from 21.9 TWh during the 2019/20 heating season to 18.9 TWh in 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 heating seasons

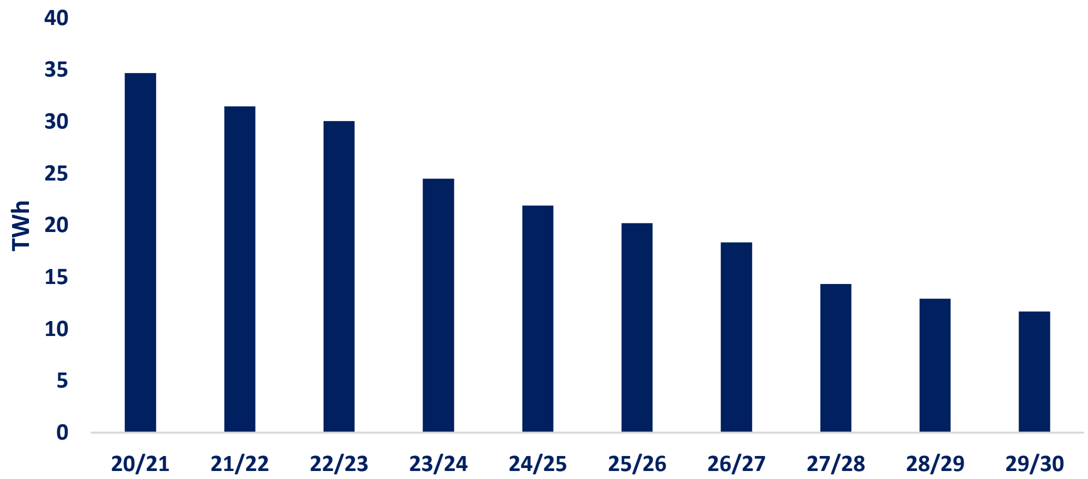


In Germany, L-gas production is expected to decrease at an annual average rate of ~12% from 41 TWh in GY 2019/20 to 11.7 TWh by GY 2029/30. There is one peak nitrogen/H-gas blending facility in Germany, in Rehden, supplying only limited volumes of converted L-gas.

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 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. 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 or France. There is one nitrogen/H-gas blending facility in France. It is located at Loon Plage (near Dunkerque) and it was designed for peak-load needs only. In 2021 this part of GRTgaz network will be converted to H-gas and this facility will be abandoned. 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 2020/21-2029/30) in TWh



5. Storage of L-gas

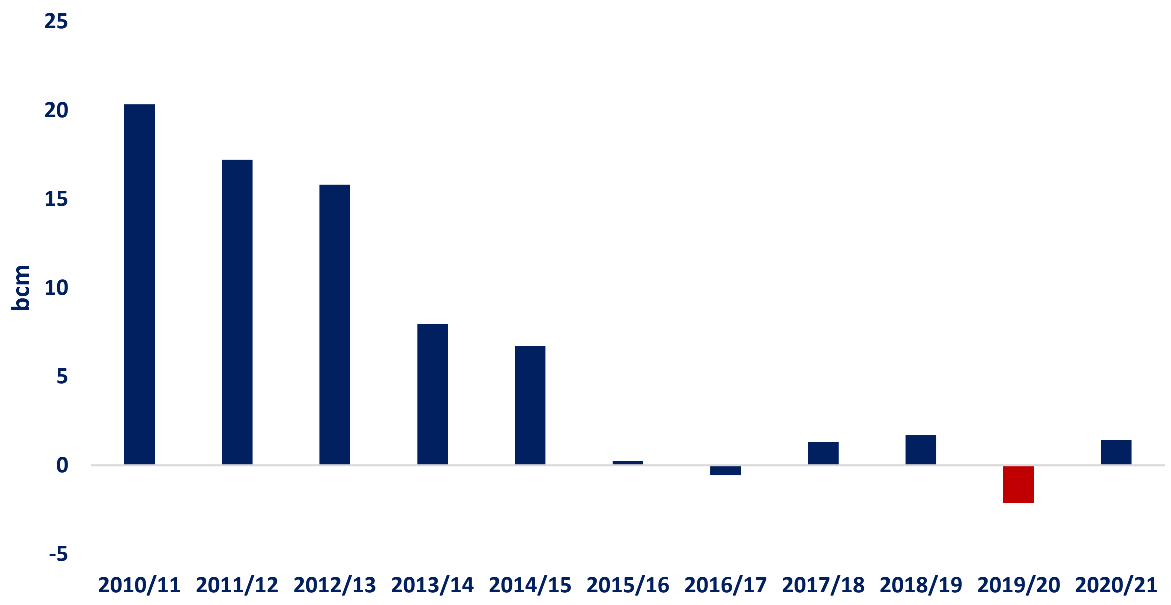
Natural gas storage plays a key role in meeting both seasonal and more short-term demand requirements, providing additional flexibility to the gas system.

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 on 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 96.1 TWh, with a total withdrawal capacity of 2,934 GWh/d.

Most of L-gas storage is located in the Netherlands[21] (65 TWh or 68%) and Germany (18 TWh or 19%). 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.

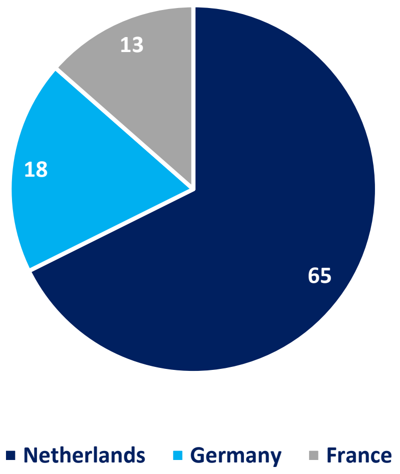
Almost two-thirds of withdrawal capacity is concentrated in the Netherlands, followed by Germany (23%). France's Gournay storage facility accounts for 8% of L-gas withdrawal capacity in northwest Europe. For more details on L-gas storage please refer to Annex 4 of the Report.

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. It has been investigated if the Grijpskerk storage (27.7 TWh working capacity) could be switched to store L-gas gas.

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 m³ is converted to store H-gas at the Huntorf storage site in Germany.

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

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

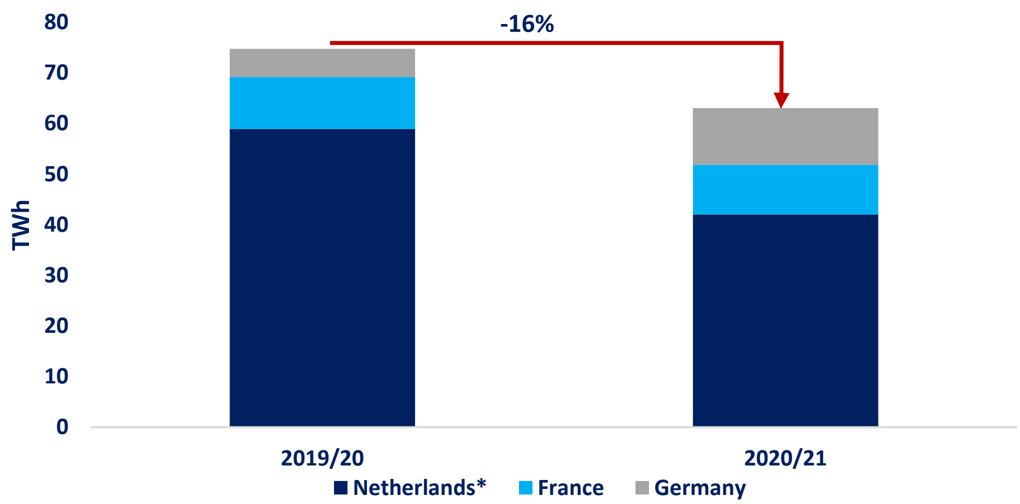


5.2 The role of L-gas storage during the 2020/21 heating season

Storage played a key role in meeting L-gas demand through the 2020/2021 heating season, with gas supply from storage sites accounted for over 18% of total L-gas consumption[22] during this period.

As total L-gas demand declined more sharply (-10.6 TWh) compared to L-gas production (-4.4 TWh), the reliance. on storage declined compared to last year through the 2020/21 heating season. Consequently, net storage withdrawals decreased by almost 16% (or 11 TWh) year-on-year from 74.7 TWh during the 2019/20 heating season to 63 TWh. The Norg storage facility in the Netherlands alone accounted for close to 55% of total net storage withdrawals during the 2020/21 gas winter.

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



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.

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, Epe L-gas (UES) and Epe L-gas (RWE Gas Storage West) storage sites are expected to undergo a

[22] Including L-gas produced and consumed in Germany.

partial conversion starting by 2024, and a final conversion to H-gas by 2030 and 2029 respectively. As such, by 2030 L-gas working storage capacity in Germany will fall close to 0.

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

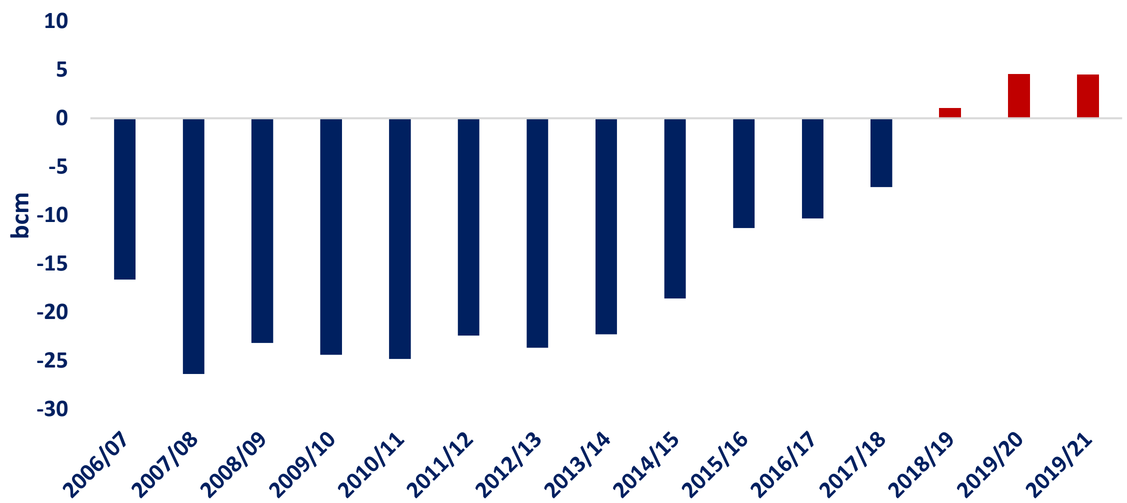
In the Netherlands, the Grijpskerk H-gas storage facility is expected to be converted to L-gas. Once completely converted (through multiple leaning cycles) Grijpskerk could provide 27.7 TWh of additional working L-gas storage working capacity, with a withdrawal rate of 586 GWh/d. However, the license for the conversion has not yet been granted. This is planned for the start of 2022.

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.

The Netherlands' position as a net importer of natural gas is particularly visible during the heating season. Net imports of natural gas rose by more than four-fold in the 2019/2020 heating season compared with the same period of the previous GY and remained at a similar level through the 2020/21 heating season.

Figure 6.1 Net natural gas imports of the Netherlands per heating season (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.

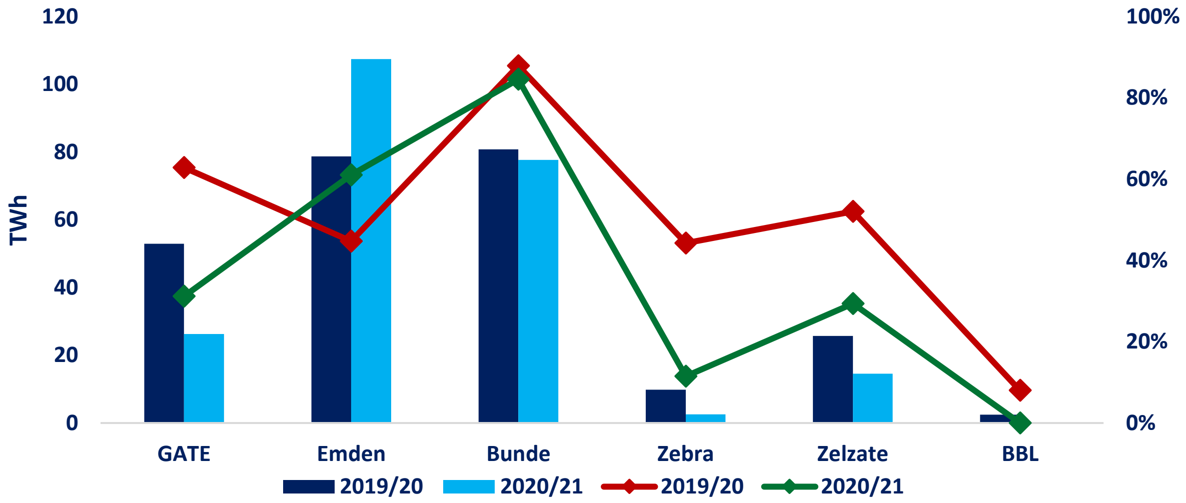
There are also two import interconnectors with Belgium: Zelzate and Zebra, with a combined entry capacity of over 143 TWh/y. Zebra has recently been acquired by GTS and will be integrated into the GTS network.

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 9% (or 22 TWh) year-on-year through the 2020/21 heating season. This has been primarily due to the lower entry flows from the Gate terminal, which more than halved (-26.7 TWh) as LNG imports to the Netherlands declined sharply. Consequently, the utilization rate of the Gate terminal fell from 63% through the 2019/20 heating season to 31% during the 2020/21 gas winter.

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 heating seasons



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

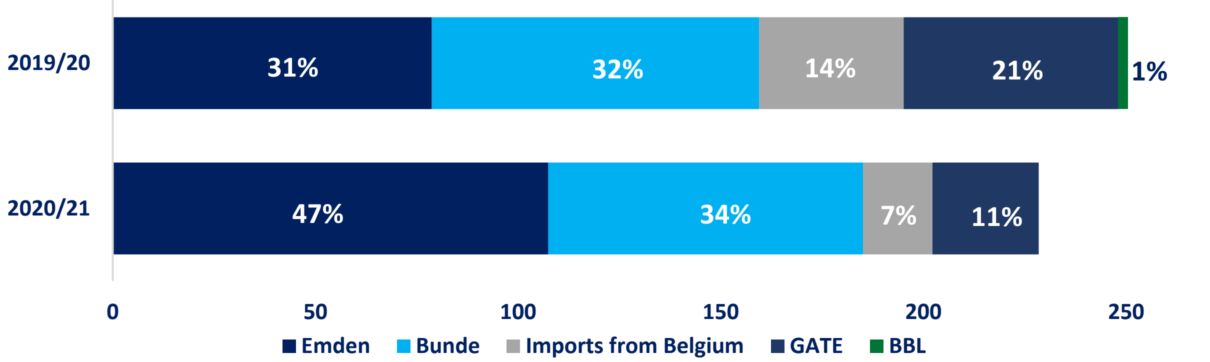
Lower LNG imports were compensated by a strong increase in Norwegian deliveries via Emden, rising by 36% (or 28.7 TWh) year-on-year in the 2020/21 heating season. As a consequence, the utilization rate of Emden rose to 61% during the 2020/21 heating season, up from 45% a year earlier. Imports via the Bunde/Oude Statenzijl interconnection point with Germany decreased only slightly, by 3.8% (or 3 TWh), indicating a continued strong utilization rate of 85% through the 2020/21 heating season, down from 88% a year earlier.

Import flows from Belgium through Zebra and Zelzate more than halved, declining by 18.5 TWh compared to 2019/20 heating season, significantly increasing the utilization rate of Zelzate from 52% to 29% and the utilization rate of Zebra from 44% to 11%. It should be noted that LNG imports via the Zeebrugge terminal in Belgium and the Dunkerque terminal in France decreased by almost 60% (or 44.4 TWh) year-on-year through the 2020/21 heating season, potentially weighing on export flows towards the Netherlands.

Import flows via the BBL pipeline fell from last year's 2 TWh to close to 0 during the 2020/21 heating season, as the National Balancing Point (NBP, the gas hub of the United Kingdom) was trading on average at a premium of USD 0.36/mmbtu compared to TTF through the heating season.

Figure 6.3 shows H-gas imports to the Netherlands by main entry points through the last two heating seasons. The share of Emden in H-gas imports rose from 31% during the 2019/20 heating season to 47%, the share of Bunde/Oude Statenzijl rose from 32% to 34%, whilst the share of Gate plummeted from 21% to 11% and the share of imports from Belgium dropped from 14% to 7%. The share of BBL declined from 1% to close to 0.

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



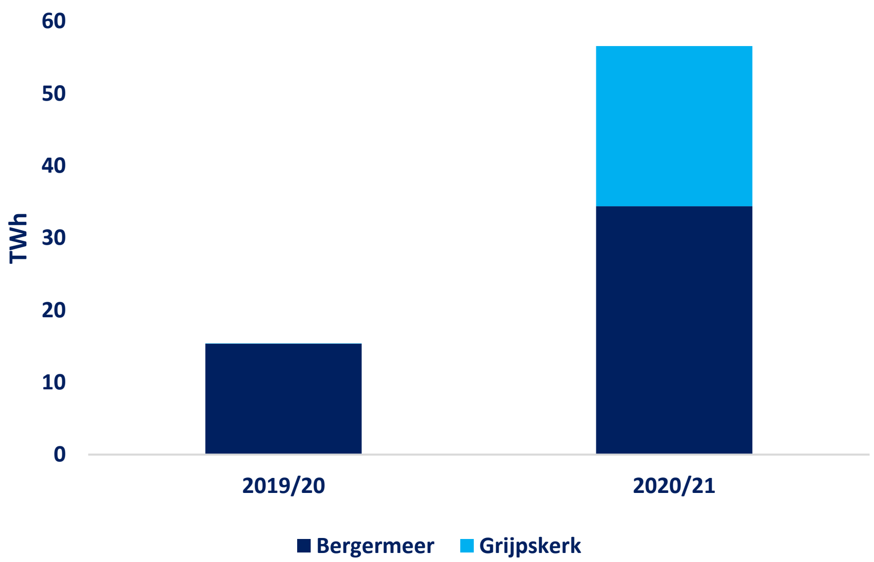
[23] Actual import flows divided by firm capacity of the entry point (Lesser Of Rule applied).

When considering these entry points, the annual spare import capacity of the Netherlands rose by 11% year-on-year to 226 TWh through the 2020/21 heating season, comparing to ~246 TWh of gas consumption during that period of the year.

Data from ENTSOG's Transparency Platform indicates that H-gas exit flows from the Netherlands rose by 16% (or 7.5 TWh) year-on-year during the 2020/21 heating season. This has been largely driven by higher exit flows towards the United Kingdom, with flows via the BBL pipeline rising by almost 14 times (or over 28 TWh), driven by a wider NBP-TTF price premium. Exit flows towards Belgium rose by 24% (or 2 TWh), mainly due to higher volumes via Zelzate. Exit flows to Germany via the Bocholtz interconnection point fell by 64% (or 23 TWh) compared to the 2019/20 heating season.

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 close to 22 TWh, exit H-gas flows rose by 7.5 TWh and the domestic demand (including for pseudo L-gas production) of H-gas increased by 13.5 TWh year-on-year during the 2020/21 heating season. The resulting 43 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 withdrawals from the Bergermeer and Grijpskerk H-gas storage facilities more than tripled (increasing by 41 TWh) year-on-year through the 2020/21 heating season, whilst H-gas from storage sites in Germany connected to the Dutch grid provided additional H-gas volumes.

Figure 6.4 Net withdrawals from H-gas storage sites in the Netherlands during the 2019/20 and 2020/21 heating seasons



Based on TYNDP2020 dataset, ENTSOG performed several additional disruption case calculations to investigate if sufficient H-gas supply can be delivered to the NW European markets in an average winter. The results show that there is sufficient transport capacity during disruptions in an average year and in high demand situations. Compared to TYNDP2018 (disruptions) calculations the configuration at European level has improved thanks to increased potential from suppliers (specifically extra LNG volume delivered to existing LNG terminals), new import routes in Europe (see TYNDP2020), and the reduced gas demand in France and the UK. The planned increase in capacity on the German/Dutch border raises the flexibility towards the Netherlands. In 2021, ENTSOG will perform security of supply calculations in order to investigate the transport of gas in a cold winter.[24]

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). For this 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. 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 assesments, preventive action and emergency plans are made.

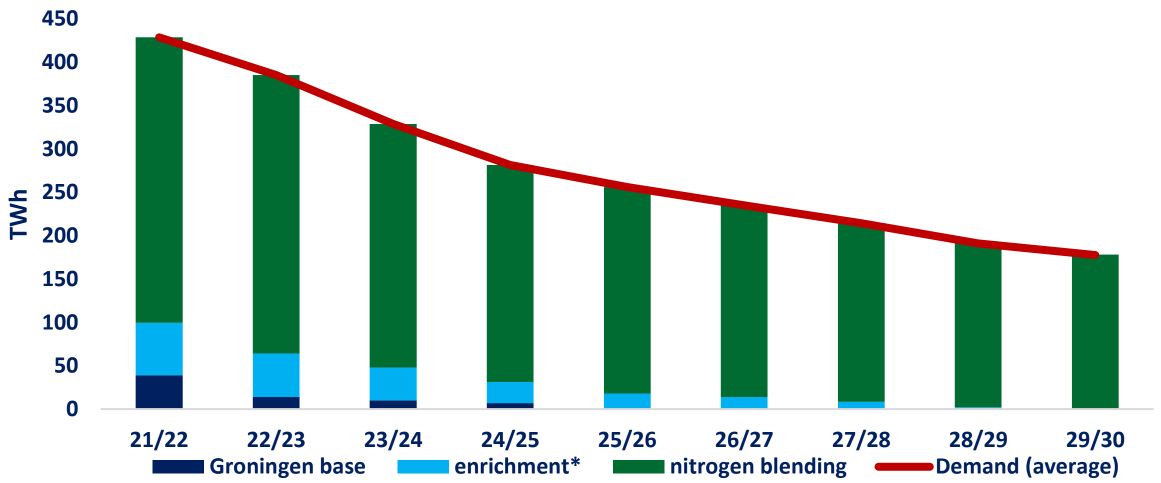
[24] For additional details, please refer to the Winter Report 2021 of the Task Force Monitoring L-Gas Market Conversion, Annex VII.

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 in cold year.

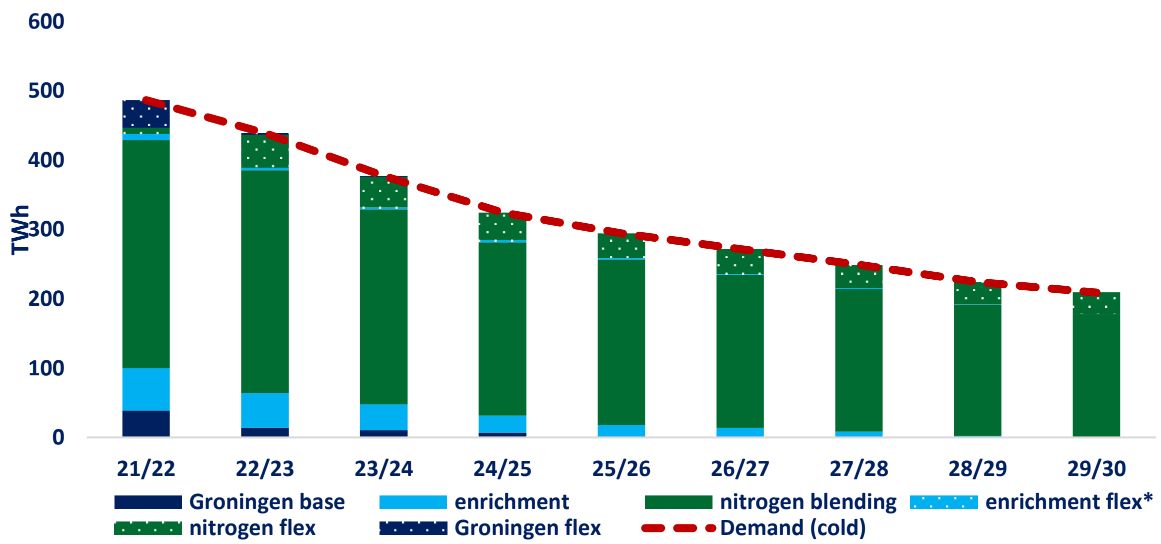
Through the market conversion period, the role of enrichment will decline in line with the decreasing Groningen production. Hence, nitrogen blending facilities will have an increasing role in meeting L-gas demand through the next ten GYs.

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 the GY 2024/25, to meet L-gas demand in the case of extreme cold days. This is currently being investigated. In the consecutive five GYs L-gas supply flexibility will be entirely provided by L-gas storages, L-gas enrichment and by the nitrogen blending facilities. The required capacity will be discussed in the February 2022 report.

Figure 7.2 L-gas supply-demand balance in a cold year[25] (GY 2021/22-GY 2029/30)



[25] 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 2019/20 heating seasons

1.1 Consumers demand for L-gas from the Netherlands[26] in the 2018/2019 heating season in TWh

Heating season 18/19	Germany	France	Belgium	Netherlands
Oct-18	12.6	3.1	3.2	16.8
Nov-18	16.9	5.1	5.4	26.7
Dec-18	20.3	5.7	6.2	30.1
Jan-19	24.4	6.6	7.5	36.0
Feb-19	18.3	4.9	5.4	26.3
Mar-19	18.5	4.6	5.1	25.4
Total	111.0	29.9	32.7	161.2

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

Heating season 19/20	Germany	France	Belgium	Netherlands
Oct-19	12.2	3.0	3.4	18.3
Nov-19	19.1	5.0	5.5	26.7
Dec-19	20.0	5.6	6.2	30.0
Jan-20	19.7	5.7	6.3	30.8
Feb-20	17.0	4.8	5.6	27.8
Mar-20	17.1	4.5	5.3	25.9
Total	105.1	28.5	32.2	159.4

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

Heating season 20/21	Germany	France	Belgium	Netherlands
Oct-20	12.3	3.2	3.5	18.7
Nov-20	14.1	4.1	4.3	21.9
Dec-20	15.9	5.2	5.9	30.0
Jan-21	16.4	6.0	7.0	35.1
Feb-21	16.9	4.9	5.7	30.3
Mar-21	16.8	4.4	5.2	27.1
Total	92.4	27.8	31.5	163.1

[26] 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.

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
20/21	171.7	1032	154.4
21/22	135.1	917	121.1
22/23	116.9	802	104.7
23/24	96.1	686	85.8
24/25	76.9	574	68.5
25/26	55.9	458	51.4
26/27	42.8	343	39.4
27/28	29.7	228	27.3
28/29	11.1	115	10.2
29/30	0.3[27]	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
20/21	58	426	47
21/22	49	347	40
22/23	41	265	33
23/24	24	150	20
24/25	0	0	0
25/26	0	0	0
26/27	0	0	0
27/28	0	0	0
28/29	0	0	0
29/30	0	0	0

[27] 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).

2.3 Indication of the demand for L-gas from the Netherlands in France[28] until GY 2029/30 (TWh)

	Cold		Average
	TWh	GWh/d	TWh
20/21	42	362	40
21/22	41	350	38
22/23	37	314	35
23/24	30	237	28
24/25	22	185	21
25/26	17	128	15
26/27	10	61	9
27/28	4	14	4
28/29	1	0	1
29/30	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
20/21	274	2999	236
21/22	267	2960	230
22/23	248	2889	212
23/24	230	2777	196
24/25	226	2745	192
25/26	222	2719	189
26/27	219	2692	186
27/28	215	2666	183
28/29	212	2639	180
29/30	209	2613	177

[28] For France, all data are provided on the basis of the 2016 conversion plan that has been authorized for an experimental phase. The initial schedule is subject to change following the analysis of the results of this experimental phase.
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). A technical blending volume of 0,4 TWh in 2020 is estimated. Moreover, commercial blending may occur due to the oversize of the L-gas supply contract between Engie and GasTerra. Due to the unability to forecast the L-gas excess volumes sold by Engie on the Dutch and Belgian markets and the unability to forecast the efficiency of inter-TSO swaps, commercial blending of L-gas in the H-gas network could be anywhere between 0 and 20 TWh in 2020.
The above forecasts for peak daily and hourly demands (in GWh/d and kWh/h) correspond to final L-gas consumers in France and they can be supplied both by Taisnières B (Belgium/France interconnection point) and Gournay storage (and if necessary with nitrogen/H-gas blending facility at Loon Plage, only for 19/20 and 20/21 winters).
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.

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]
20/21	31.5	571
21/22	19.3	495
22/23	25.4	552
23/24	20.2	505
24/25	23.7	514
25/26	17.2	484
26/27	17	458
27/28	20.5	326
28/29	14.7	298
29/30	5.8	110

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

Gas year	Volume converted [TWh]	Number of installations [Thousands]
20/21	7.53	323
21/22	6.24	336
22/23	13.73	374
23/24	19.7	494
24/25	0	0
25/26	0	0
26/27	0	0
27/28	0	0
28/29	0	0
29/30	0	0

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

Gas year	Volume converted [TWh]	Number of connections [Thousands]
20/21	1	42
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

Annex IV: Expected 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	79	39
22/23	17	14
23/24	11	10
24/25	7	7
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*
20/21	34.7	34.7
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		
Lesum *(converted to H-gas)*	1.553	52
Nüttermoor L-Gas	0.43	24
Speicherzone L-Gas (EWE)	9.1	259
Empelde	2.29	73
Epe L-Gas (innogy)	1.77	98
Epe L-Gas (UES)	4.48	238
France		
Gournay	13	248
the Netherlands		
EnergyStock	3	252
Norg (Langelo)	49	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 2019/20 and 2020/21 heating seasons

	2019/20	**2020/21**
The Netherlands	59	42
France	10.3	9.8
Germany	5.5	11.2

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 the 2020/21 heating season there were 1773 degree days, higher than the 1716 degree days recorded during the 2019/20 heating season and the 1699 degree days during the 2018/19 heating season.

Contributors

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