L-Gas Market Conversion Review

Summer Report 2020

Task Force Monitoring L-Gas Market Conversion

Ministry of Economic Affairs and Climate Policy

Foreword

This is the second 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 (2019/2020) 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. A special focus is provided on the impact of the coronavirus (Covid-19) induced lockdowns measures on the conversion programmes in the respective markets.

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. The report is published semi-annually. The Netherlands will use these reports 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 May 22, 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.

Groningen gas has a notably lower calorific value compared to the average European gas, which means that it cannot simply be replaced by other domestic or imported sources. These need to be converted to L-gas referred in the current report as "pseudo L-gas".

Pseudo L-gas can be principally produced in two ways:

- nitrogen blending: 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;
- enrichment: adding H-gas to Groningen gas until the upper Wobbe-limit of the L-gas specifications.

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[2]) in GY 2018/19, the production of pseudo L-gas more than doubled during the same period of time. This trend continued through the 2019/20 heating season[3], with Groningen gas production decreasing by 44% (or 42.9 TWh) year-on-year. As a consequence, the utilization rate of the conversion facilities has increased steadily from GY 2014/15 to an average of 91% through the GY 2018/19 and averaged over 100% of firm capacity through the 2019/20 heating season, indicating the use of interruptible capacity

Pseudo L-gas will play an increasingly important role in reducing Groningen gas production, with its share expected to increase from 65% in GY 2019/19 to over 99.5% 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. Nitrogen blending alone will account for over 87% of L-gas produced in the Netherlands in GY 2022/23 and expected to provide almost 85% of the upward production flexibility necessary to meet demand in a cold GY.

L-gas is consumed in the Netherlands and is exported to neighboring markets in Belgium, France and Germany, where it serves dedicated networks for 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, this 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 L-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 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.

Consumption of L-gas from the Netherlands decreased by over 3% (or 9.6 TWh) year-on-year through the 2019/20 heating season in the L-gas region. L-gas consumption declined despite a higher number of degree days and was primarily due to the effect of the market conversion programs in the respective L-gas markets in GY 2018/19, which naturally reduced demand for L-gas during the consequent heating season.

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.[4]

[1] A gas year (GY) starts on 1 October and ends on 30 September.
[2] Volumetric data is expressed in Normal cubic meters (Nm^3), under reference conditions of temperature (0 °C) and pressure (101.325 kPa).
[3] The heating season (or gas winter) starts on 1 October and ends on 31 March.
[4] GTS (2017), Netwerk Ontwikkelingsplan 2017.

Consequently, L-gas imports are expected to fall from 49.1 TWh in GY 2019/20 to 0 in Belgium, from 42.7 TWh to 0 in France and from 166.7 TWh to 0.3 TWh in Germany by GY 2029/30.

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

- the reduced L-gas demand should be met with adequate L-gas supply, including transport capacity;
- H-gas deliverability should be guaranteed as it is used as feedstock to produce pseudo L-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, with conversion activities being stopped in March and April. In Germany, all conversion activities resumed in May and it is estimated that 99% of the planned 2020 conversions are to be completed in 2020. In France, the conversion of customers appliances resumed mid-May and the conversion of the Dunkerque sector is still scheduled for October 2020. In Belgium, the start of the works related to the adaptation of pressure regulators in households was postponed from 1st June to 1st of September, whilst the conversion target remains unchanged.

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 a more quickly decreasing Groningen output), the Netherlands will increase the production of pseudo L-gas, primarily by means of additional nitrogen blending.

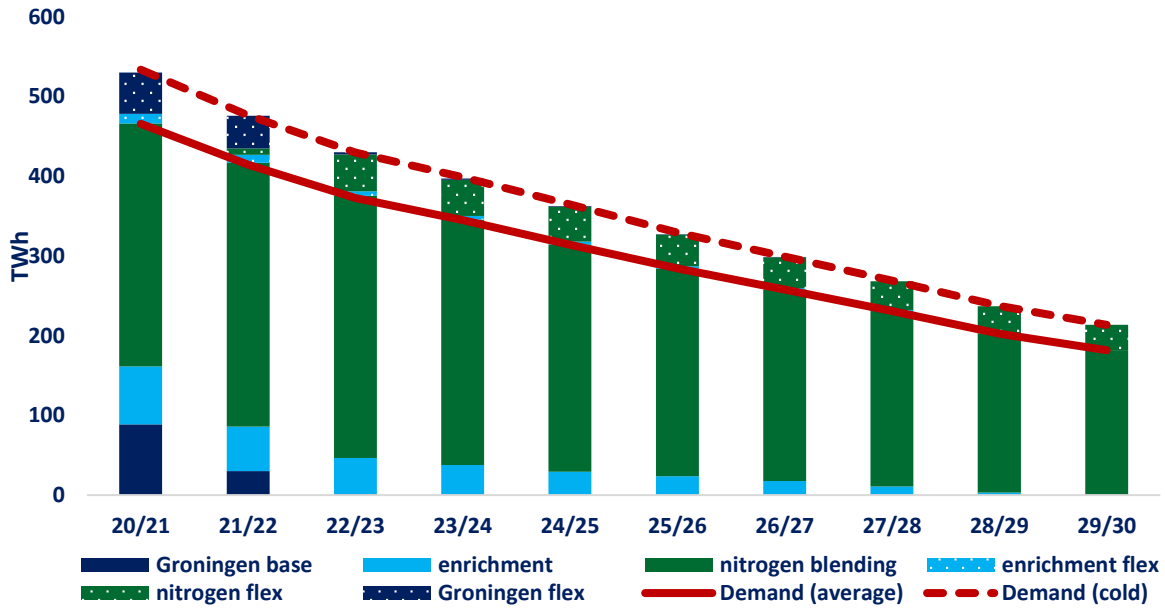
Additional purchase of nitrogen allowed to expand the nitrogen blending capacity by 80,000 m3/h N2 at the Wieringermeer conversion facility from 215,000 to 295,000 m3/h starting from 23 December 2019. This translated into an additional 48.9 TWh of pseudo L-gas production capability. Moreover, a new nitrogen plant at Zuidbroek, planned to start operations from 1st of April 2022 with a capacity of 180,000 m3/h N2, will be able to produce over 68 TWh of additional pseudo L-gas. The outbreak of covid-19 and consequent lockdowns did not have an impact on the construction schedule of the nitrogen plant as of September 2020.

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.

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 L-gas supply to consumers in all markets both in an average and in cold year.

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 enrichment and by the nitrogen blending facilities.

L-gas supply-demand balance projection in an average and cold year (GY 20/21-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 since 2014, from 259 TWh to 494.1 TWh in 2019. In fact, the Netherlands became a net importer of natural gas in 2018 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.

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 winter. Based on the assumptions of the TYNDP2020 the results show that there will be 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 of 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.[5]

The L-Gas Market Conversion Monitoring Task Force will continue to monitor and assess the deliverability of H-gas supply to the Netherlands and the Northwest European markets served by L-gas.

[5] For more details please contact Jacques REBEROL, Modelling Subject Manager, System Developpment at ENTSOG: Jacques.Reberol@entsog.eu

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. Despite a slightly higher number of heating degree days, consumption of L-gas from the Netherlands decreased by over 3% year-on-year through the 2019/20 heating season in the Belgium, France, Germany and the Netherlands. This was primarily due to the effect of the market conversion programs in the respective L-gas markets in GY 2018/19, which naturally reduced demand for L-gas during the consequent heating season. 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 44% year-on-year during the 2019/20 gas winter. This has been possible due to higher L-gas production via nitrogen blending, which increased by over 18% and drove up the utilization rate of nitrogen blending facilities from an average of 95% through the 2018/19 heating season to an average of above 100% of their firm capacity during the 2019/20 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 increasing by 32% year-on-year and meeting approximately one-fifth of the region's L-gas demand.

4. The Covid-19 induced lockdowns had only a minor impact on the overall schedule of the conversion programs, with conversion activities being stopped in March and April. In Germany, all conversion activities resumed in May and it is estimated that 99% of the planned 2020 conversions are to be completed in 2020. In France, the conversion of customers appliances resumed mid-May and the conversion of the Dunkerque sector is still scheduled for October 2020. In Belgium, the works related to the adaptation of pressure regulators in households started on 1st of September instead of 1st of June, whilst the conversion target volume remains unchanged. 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.

5. Belgium's conversion plan has been slightly revised, with the identification of an opportunity to optimize the conversion of the Brussels Region Distribution Network and complete it by 2022. In the previous conversion planning, the Brussels Region was converted in four years (2020 till 2023).

6. In 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 at an average rate of approximately 10% per year.

7. Together with the increase in nitrogen capacity, the allowed Groningen production and the structural decrease in L-gas demand in the region, it will be possible to meet the decreasing L-gas demand, when the precondition of sufficient H-gas is supplied towards the Netherlands is met.

8. 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 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 winter. The results show that there is sufficient transport capacity during disruptions in an average year. In 2021 ENTSOG will perform security of supply calculations in order to investigate the transport of gas in a cold winter.

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 networks for 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.

L-gas demand has a strong seasonal profile, with over two-third of consumption occurring through the heating season of the Gas Year[6]. As such, a special focus on the supply-demand dynamics during that period is necessary to evaluate the state of L-gas supply deliverability.

The Dutch Parliament adopted a resolution which requires the Min. EZK to report twice a year on concrete measures to reduce the demand for Groningen gas and their foreseen impact[7]. 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 the Parliament on 8 April and 19 June.

The report provides a special focus on the potential impact of the covid-19 induced lockdowns on the implementation of the conversion programs in each market.

[6] The heating season (or gas winter) starts on 1 October and ends on 31 March. The Gas Year starts on 1 October and ends on 30 September of a calendar year.

[7] 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.

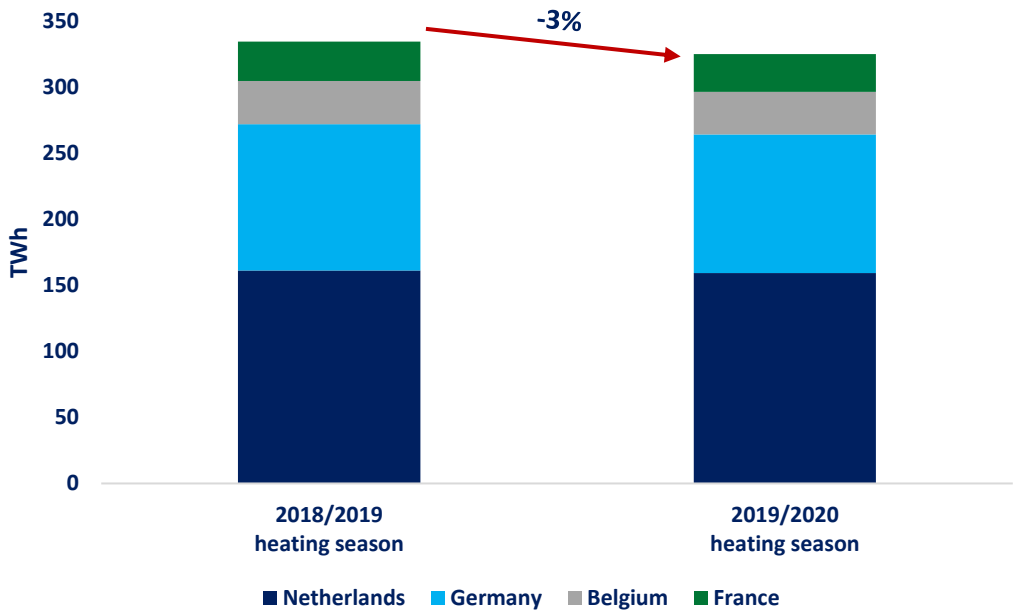
2. L-Gas demand

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).

Total consumption of Dutch L-gas declined by 3% (9.6 TWh) from 334.9 TWh in the 2018/19 heating season to 325.3 TWh in 2019/20. This has been primarily driven by the start of the implementation of the market conversion programs in the respective L-gas markets in GY 2018/19, 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.

Figure 2.1 Consumption of L-gas from the Netherlands in the 2018/19 and 2019/20 heating seasons

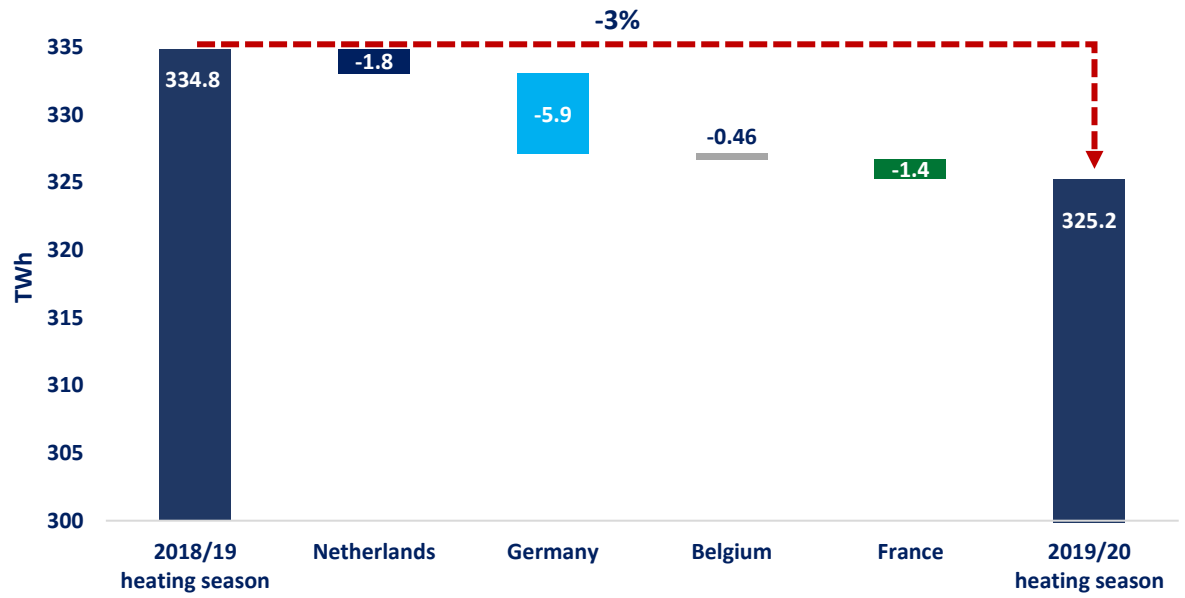


It is important to highlight that market conversion volumes do not necessarily translate into the same amount of L-gas consumption change as other demand side factors also have an influence on the overall L-gas demand. There is particularly a strong correlation between the number of heating degree days (HDD) and L-gas consumption, given its predominant use for space heating purposes. In the 2019/20 heating season, the number of wind-adjusted HDD was 0.9% higher compared to the previous heating season based on the measurements at the Royal Netherlands Meteorological Institute in De Bilt[8].

As shown in Figure 2.2 Germany accounted for over 60% of the decline in Dutch L-gas consumption through the 2019/20 heating season, followed by the Netherlands (18.8%), France (14.8%) and Belgium (4.8%). Regarding year-on-year comparisons, Germany recorded a reduction of 5.3%, France 4.7%, Belgium 1.4% and the Netherlands 1.1%.

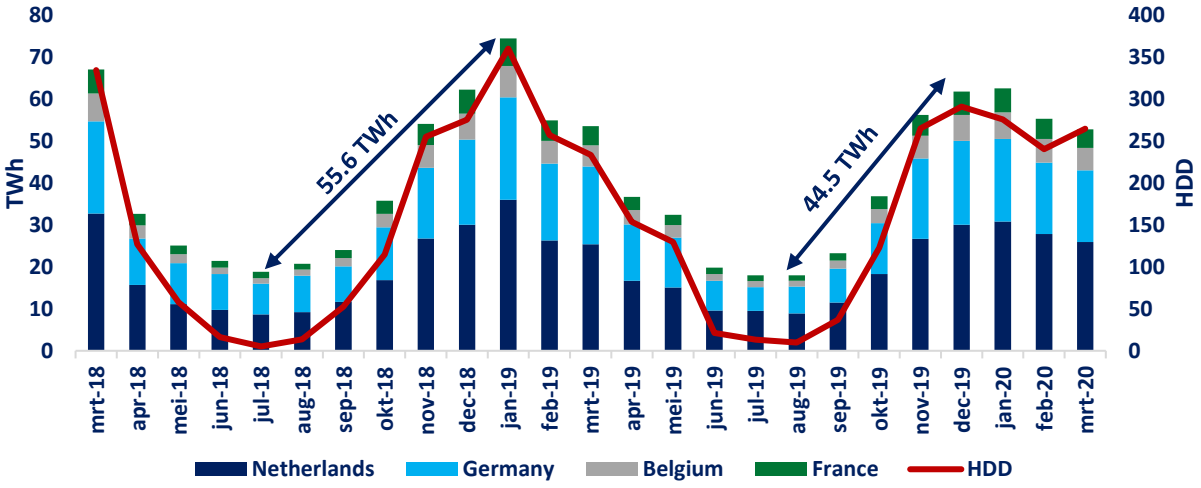
[8] For more detail regarding the climatological context, please refer to Annex VI of the current report.

Figure 2.2 Change in Dutch L-gas consumption in 2019/20 vs 2018/19 heating season



Peak monthly consumption decreased by 16% (11.9 TWh) in the 2019/20 heating season compared to the previous heating season and consequently the demand swing (represented by the arrows in Figure 2.3) contracted by 20% (11.1 TWh). This has been largely driven by the climatological context and the more even distribution of HDDs through the 2019/20 heating season.

Figure 2.3 Dutch L-gas monthly consumption March 2018 – March 2020



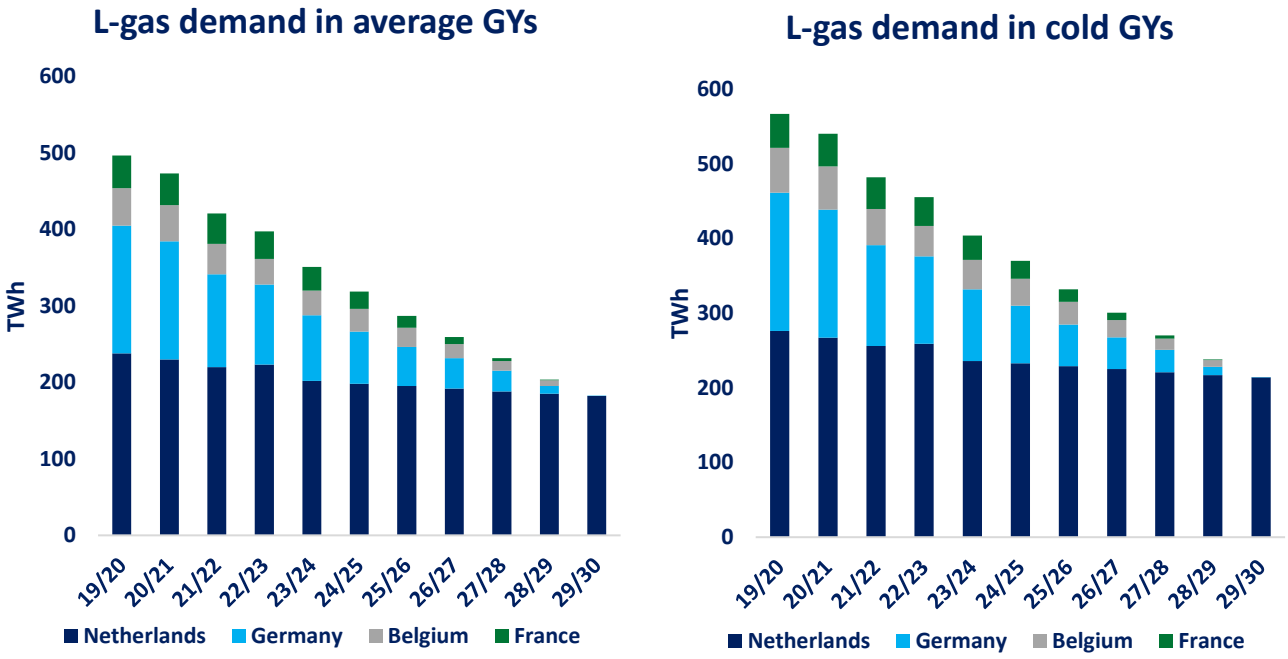
2.2 The expected annual demand for L-gas from the Netherlands until GY 2029/30

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.[9]

As a consequence, L-gas imports are expected to fall from 45.4 TWh in GY 2018/19 to 0 in Belgium, from 41.6 TWh to 0 in France and from 163.6 TWh to 0.3 TWh in Germany by GY 2029/30 both in an average and cold GY.

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

Figure 2.4 Projected 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, this 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 zero.

Both the realized number of gas installations or consumers that are converted and the corresponding volume 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 potential impact of the Covid-19 induced lockdowns.

3.1 Germany

Legislative changes, conversion costs and additional measures[10]

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). Furthermore, the law lays down rules on partial reimbursement if customers buy a new gas appliance.

In addition, 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 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.

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

Conversions from 2015 to 2019[11]

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. 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.

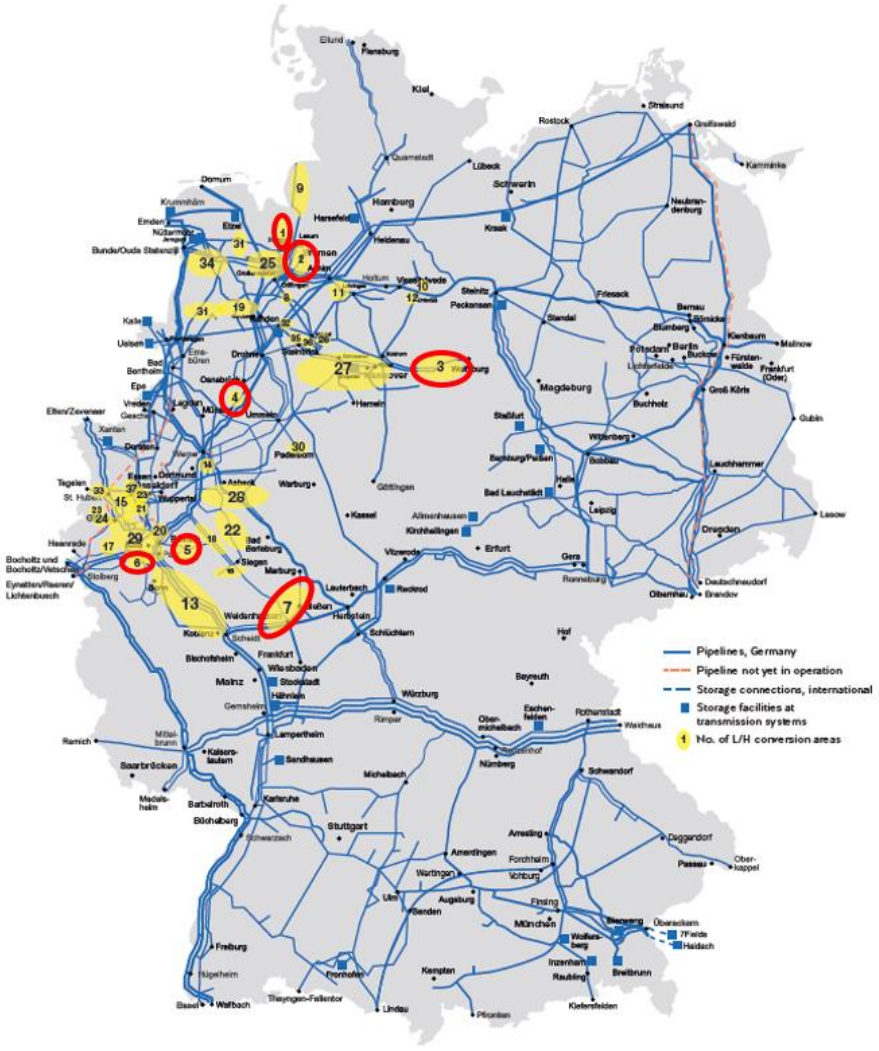
As these advanced changes had been made years before the due date, they continue to be a relief for the Groningen production in the years to come.

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.

Conversions in 2020 and the impact of Covid-19

In 2020, 7 areas with 394,000 appliances are planned to be converted. Conversion relates to a capacity of 5.2 GWh/h and a volume of 18.1 TWh (average year). The respective conversion areas are displayed in the illustration below.

Map 3.1 Planned market conversions in Germany in 2020



The rapid spread of Covid-19 in Germany has resulted in minor changes to the original conversion plans presented in the Gas Network Development Plan 2020–2030 for 2020.

The Covid-19 pandemic means that all parties involved are facing challenges that were previously unknown in some cases. In particular, these include the reduction or temporary suspension of survey and adjustment work

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

(causes including those refusing entry), guaranteeing the full availability of conversion service providers, the implementation of special hygiene protocols and providing the customers concerned with comprehensive information.

As of 1 July 2020, 218.000 appliances have been converted from L- to H-gas. This corresponds to 55 % of the overall conversion plan for the year 2020.

According to the original plans, an additional 31.000 appliances should have been converted to H-Gas by 1 July but are delayed by 1 to 3 months due to the Covid-19 situation. The major part of the delayed appliances is still planned to be converted within the year 2020 provided that the Covid-19 situation in Germany remains stable. Only an amount of 6,000 appliances (0.05 GW) to be converted are rescheduled to 2021. This however will 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. Table 3.1 provides a detailed status of the conversion areas in Germany and the respective delays caused by Covid-19.

Table 3.1 Market conversion in Germany in 2020

Area (number in map)	TSO	Target number of appliances (in NPD 2020)	Revised target number of appliances (as 1 June 2020)	Planned technical conversion months (in NPD)	Planned technical conversion month (as 1 June 2020)
EWE Zone part I (1)	GTG	50,000	38,000	February-June	February-June
EWE Zone part I (1)	GTG	17,000	23,000	September-October	Sept-November
Bremen/Delmen-horst (2)	GUD	30,000	30,000	July	July
Bremen/Delmen-horst (2)	GUD	23,000	23,000	September	September
East Hanover/Wolfsburg (3)	GUD	5,000	5,000	March	March
East Hanover/Wolfsburg (3)	GUD	34,000	34,000	April	May
East Hanover/Wolfsburg (3)	GUD	27,000	27,000	June	June
East Hanover/Wolfsburg (3)	GUD	8,000	8,000	September	September
East Hanover/Wolfsburg* (3)	GUD	0	0	October	October
Teutoburger Wald 5 (4)	OGE (Nowega)	39,000	39,000	October	October
Aggertal pipeline (5)	OGE	4,000	4,000	April	August
Aggertal pipeline (5)	OGE	3,000	0	August	-
Aggertal pipeline (5)	OGE	-	3,000	-	September
Aggertal pipeline (5)	TG	0	0	April	April
Aggertal pipeline (5)	TG	5,000	5,000	April	August
Aggertal pipeline (5)	TG	10,000	15,000	June	September
Aggertal pipeline (5)	TG	9,000	20,000	August	November
Aggertal pipeline (5)	TG	16,000	0	October	-
Bonn (6)	OGE	21,000	21,000	March	March
Bonn (6)	OGE	4,000	4,000	June	July
Middle Hesse (7)	OGE	22,000	22,000	March	March
Middle Hesse (7)	OGE	20,000	20,000	April	April
Middle Hesse (7)	OGE	17, 000	17,000	June	June
Middle Hesse (7)	OGE	16,000	16,000	July	July
Middle Hesse (7)	OGE	16,000	16,000	September	September
Total		**395,000**	**389,000**		

**no distribution networks*

In order to monitor ongoing developments, each working day, the industry associations BDEW and DVGW are recording figures for refused entry and illness directly from market conversion service providers.

Transmission and distribution system operators have jointly established a system to cautiously proceed with the conversion while reassessing the circumstances and being able to adapt planning if needed. There have also been good experiences in terms of communication specific to Covid-19. Hardly any problems due to COVID-19 have been reported for the switchovers currently being implemented.

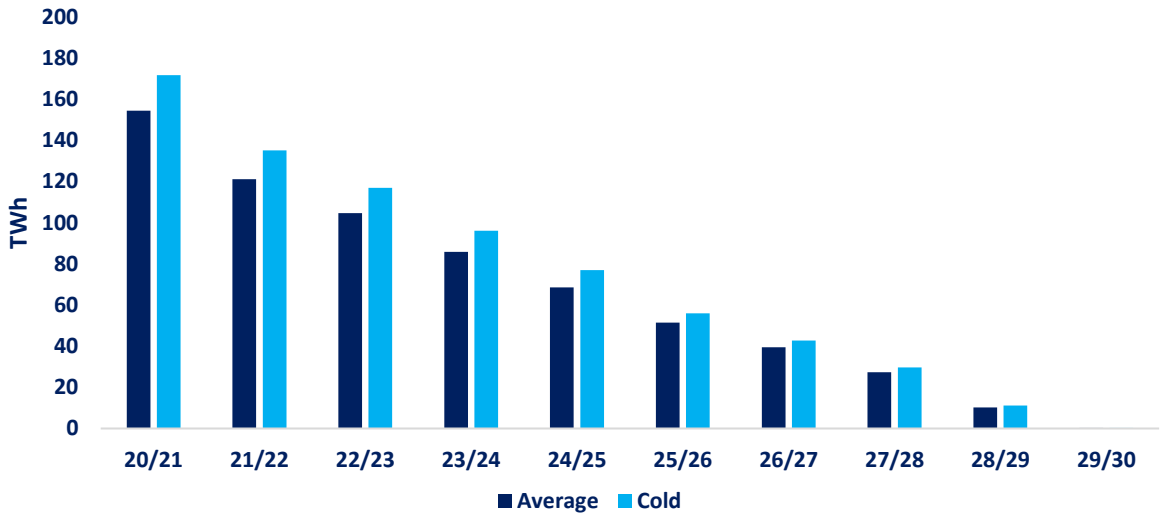
Despite the difficult Covid-19 situation in spring 2020, the gas demand from the Netherlands will not deviate against the assumptions already published in the Winter Report 2020. However, the challenge ahead will be to manage the high numbers of conversions scheduled for the next years.

Conversions until GY 2029/30

In Germany, approximately 4 million of gas appliances will need to be converted between GY 2020/21 and GY 2029/30, translating into a total volume of 178.2 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 2020/21-GY 2029/30) for average and cold GYs



3.2 France

Legislative changes and conversion costs[12]

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 gas infrastructures tariffs and are estimated to amount to approximately EUR 800 million.

Conversions achieved in GY 2018/19 and GY 2019/20

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).

During the GY 2019/20 the conversion program continued in the Grande Synthe area with 19,000 consumers converted on November 28, 2019.

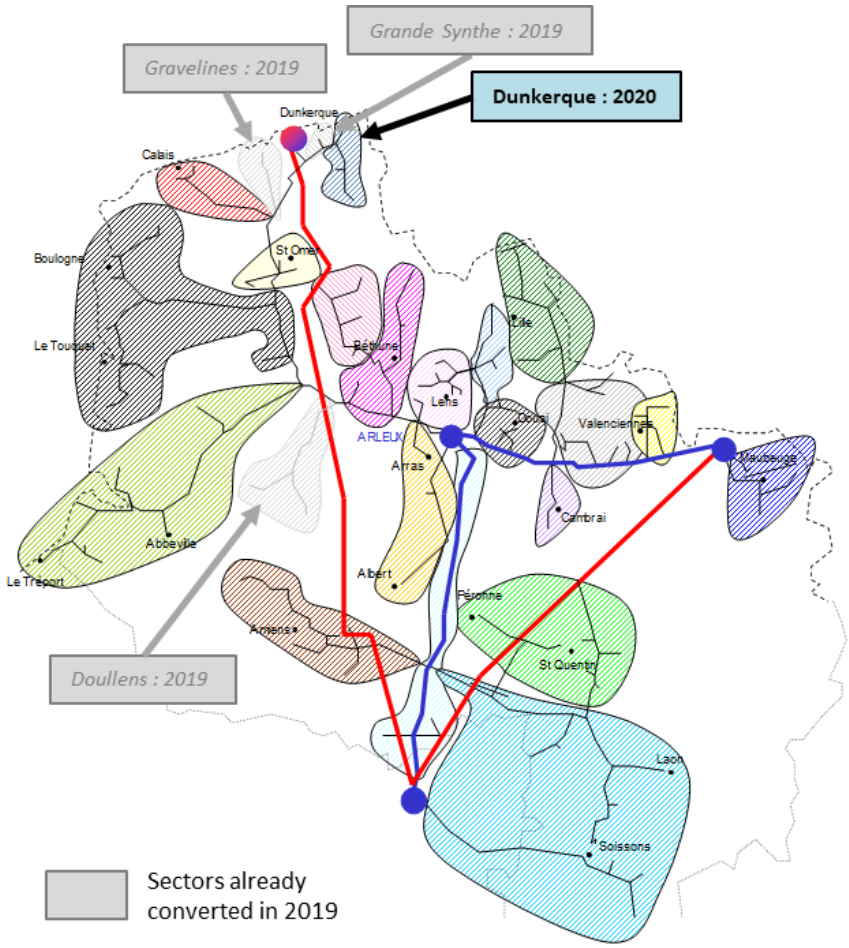
Conversions in 2020 and the impact of covid-19

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 1.2TWh under average weather conditions.

Operations at consumers' houses to check and adapt gas appliances started on 2nd March 2020, with an expected rhythm of 20% of appliances per month from April until June. 2000 of them were checked and adapted as of mid-March (16/03) when the operations have been suspended due to Covid-19 outbreak.

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

Map 3.2 Market conversions in France in 2019 and 2020



The lockdown in France stopped the conversion activities by DSO in the sector of Dunkerque on March 16. It is important to note that the area concerned by the conversion program in France was classified as a red area with respect to Covid-19, which means that it was a highly contaminated area.

From March 16, conditions for resuming settings of gas appliances have been put in place by the DSO and its implementation has been initiated with customers: a letter and a "health instructions" brochure were sent to customers informing them of the resumption of the settings under specific conditions to guarantee their safety and the safety of the workers. The letter invited them to contact the DSO to confirm their agreement. Local officials and local press relayed these messages.

Settings of customers appliances resumed on 18 May starting with around 30 volunteer heating technicians. A ramp-up took place in the following weeks and significant efforts were made to catch up with the accumulated delay. Dunkerque sector conversion is now scheduled for October 27, 2020.

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 has no consequence on that part of the program.

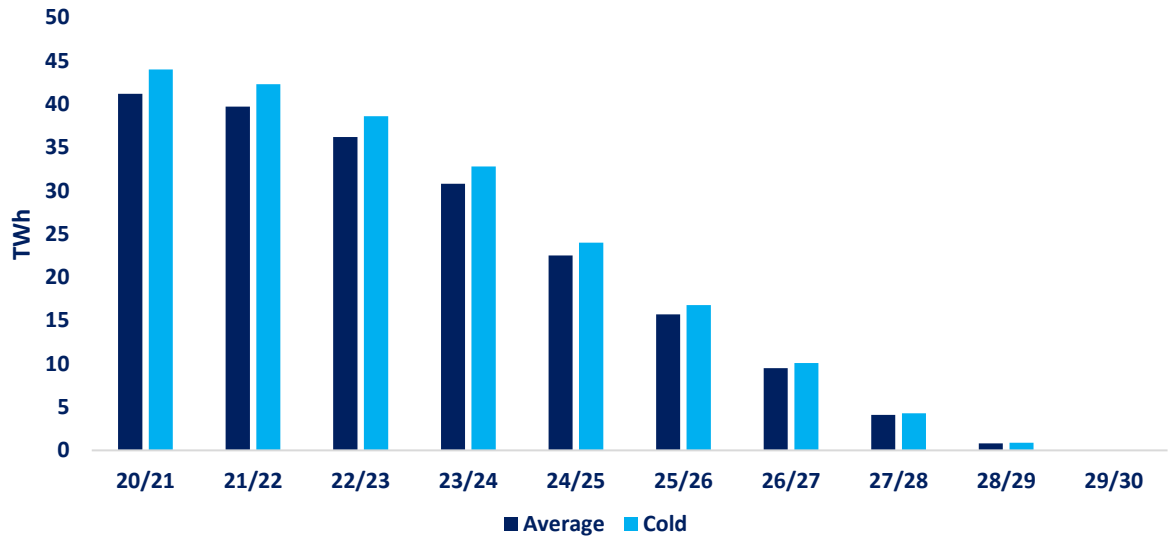
GRTgaz conversion activities now concern mainly the preparation of the conversions planned in 2021 and further. In particular, there are two GRTgaz projects to be achieved in 2021. Even if there is delay with respect to the original planning, the current commissioning dates of these two projects remain compatible with the conversions planned in 2021.

Conversions until GY 2029/30

In France, over 1.2 million of gas consumers will need to be converted between GY 2020/21 and GY 2029/30, translating into a total volume of 41.2 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 2020/21-GY 2029/30) for average and cold GYs



3.3 Belgium

Conversions up to 2020[13]

In Belgium, the L- to H-gas conversion project continued in GY 2018/19, with the conversion of 15,000 connections on June 1, 2019, in Wallonia (municipalities of Gembloux, Hélécine, Incourt, Jodoigne, Lincent, Orp-Jauche, Perwez, Sombreffe). Another 20,000 connections were converted on Oct 1, 2019, in Flanders (Brasschaat, Essen, Kalmthout, Wuustwezel). These conversions took place at junction points between the H- and the L-grids. No particular issue is to be reported for this phase.

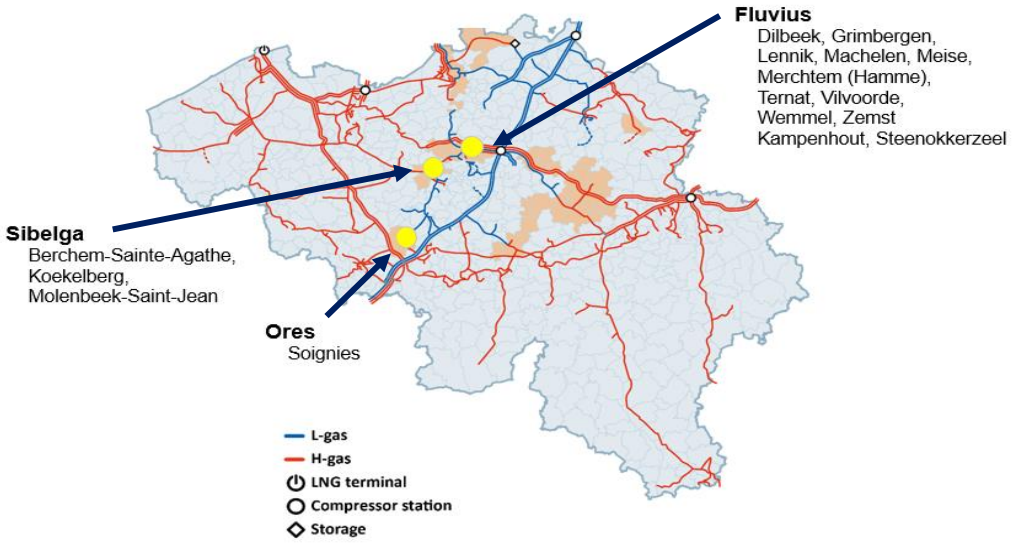
Conversions in 2020 and the impact of Covid-19

In 2020, some 129,761 connections are planned to be converted, translating into an annual consumption of 1.92 TWh under average weather conditions. This is partially enabled by an upgrade of the Winksele compression station whereby H-gas from the natural gas transport backbone (West-East VTN) will start to be injected into the L-gas grid. In total, more than 50,000 connections will be converted in the western part of the Brussels-Capital Region (Berchem-Sainte-Agathe, Koekelberg, Molenbeek-Saint-Jean), more than 70,000 connections in Flanders (Dilbeek, Grimbergen, Kampenhout, Lennik, Machelen, Meise, Merchtem (Hamme), Steenokkerzeel, Ternat, Vilvoorde, Wemmel, Zemst) and 6,000 connections in Wallonia (Soignies). Due to the outbreak of the Covid-19 pandemic, the works related to the adaptation of the pressure regulator in households started on 1st of September instead of the 1st of June as previously planned.

However, the conversion target (129,761 connections with an annual consumption of 1.92 TWh) remains unchanged.

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

Map 3.3 Market conversion in Belgium in 2020



Conversions until GY 2029/30

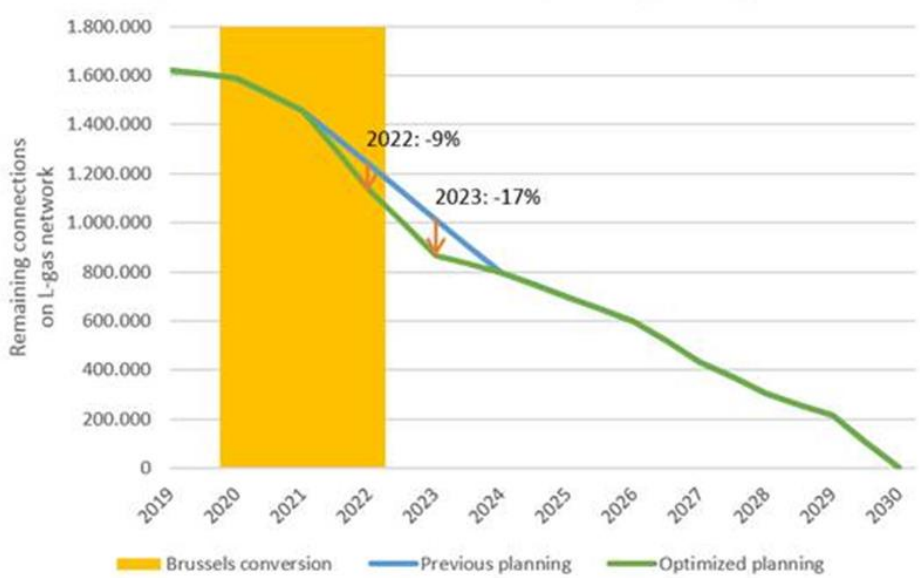
In Belgium, almost 1.5 million of gas connections have to be converted between GY 2020/21 and GY 2029/30, translating into a total volume of 47.22 TWh.

Belgium's conversion plan has been slightly revised, with the identification of an opportunity to optimize the conversion of the Brussels Region Distribution Network. In the previous conversion planning, the Brussels Region was converted in four years (2020 till 2023). The optimized conversion planning foresees a phased conversion following the three commercial/physical zones of the Region (Aggregated Receiving Stations), whereby Brussels is converted in three years (2020 till 2022).

The new planning requires a shift of some of the conversion activities from 2022 to 2021, and from 2023 to 2022. It was the result of coordinated effort between the TSO Fluxys and the DSOs involved (Sibelga in Brussels, as well as Fluvius in Flanders for the parts of its network which is supplied by the same TSO station as Sibelga). Adaptions are required on the TSO network to facilitate this shift (notably enabling the simultaneous supply of two types of gases – H and L – to Sibelga from one of the stations on the TSO network), and the DSOs had to anticipate conversion activities and allocate resources accordingly.

The optimization of the conversion planning results in a small reduction of L-gas import needs between 2021 and 2023. The graph below shows the change in the planning in terms of number of connections. From 2024 to the end, the conversion planning remains unchanged.

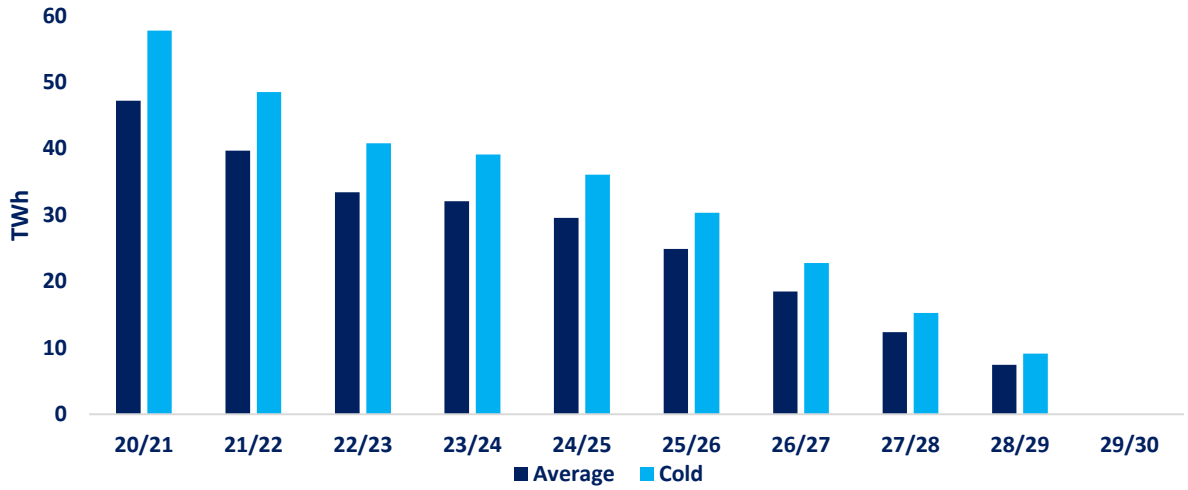
Optimization of the conversion planning in Belgium



As a consequence to the market conversion, Belgium's L-gas imports from the Netherlands are expected to fall to 0 by GY 2029/30. However, the rising numbers of connections to be converted each year makes the L- to H-gas conversion a challenging program.

In the longer term, the Belgian market conversion has to take account of the remaining L-gas volumes required for France.

Figure 3.3 Belgium's L-gas imports from the Netherlands (GY 2020/21-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) by October 2022[14], equating to the consumption of the nine largest users. To compensate for a part of the conversion costs of the relevant industrial customers, the Dutch government will establish a compensation scheme.

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 170.9

[14] In the current planning there are four sites where the conversion is expected to be delayed by several months. This should have a limited impact on the gas production from the Groningen gas field as long as other measures remain on schedule.

TWh (or 17.5 bcm) in GY 2018/19. This trend continued through the 2019/20 heating season, with Groningen gas production falling by 44% (or 42.9 TWh) year-on-year, from 96.5 TWh to 53.6 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.[15]

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.

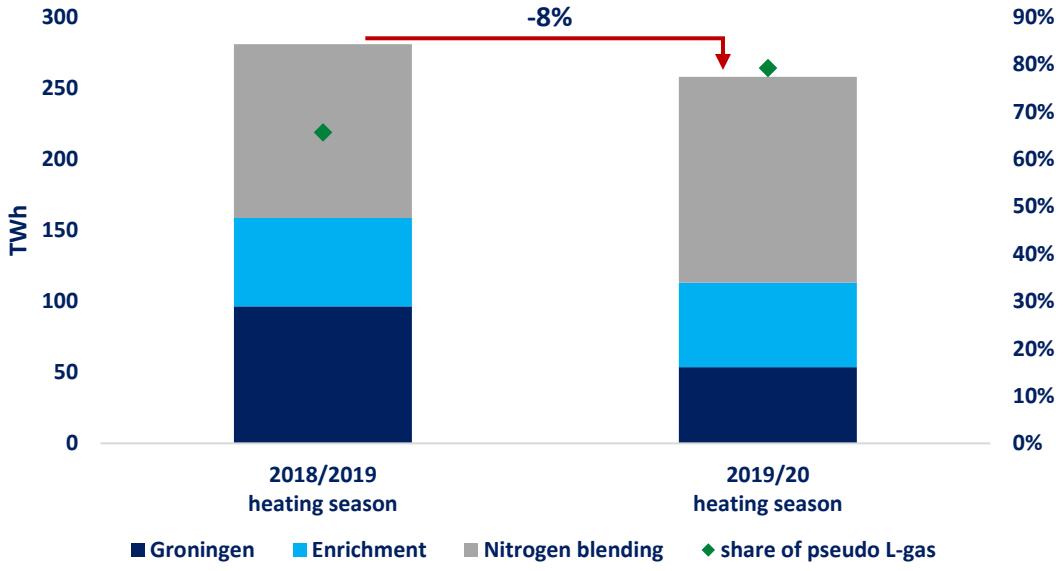
During the 2019/20 heating season, total pseudo L-gas production increased by 10.8% (or 19.9 TWh) year-on-year, from 184.5 TWh in 2018/19 to 204.4 TWh. Consequently, the share of pseudo L-gas in total Dutch L-gas production grew from 66% to 79% in the last two heating seasons.

It is important to highlight that this has been entirely driven by a higher L-gas production via nitrogen blending increasing by 18.3% (or 22.4 TWh) while pseudo L-gas obtained via enrichment decreased by 4% (or 2.5 TWh) following lower gas extraction from the Groningen field. As a consequence, the utilization rate of nitrogen blending facilities has increased from an average of 95% through the 2018/19 heating season to an average of above 100% of firm capacity during the 2019/20 heating season, indicating the use of interruptible capacity.

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 operations on 23rd December 2019, slightly before the planned start date. This has translated into an additional 48.9 TWh/year of pseudo L-gas production capability.

Total nitrogen usage for pseudo L-gas production increased by 18.2% year-on-year, from 1.46 bcm during the 2018/19 heating season to 1.72 bcm in 2019/20.

Figure 4.1 L-gas supply in the Netherlands in 2018/19 and 2019/20 heating seasons



Altogether, L-gas production in the Netherlands has fallen by 8.2% (or 23 TWh) year-on-year, from 281 TWh during the 2018/19 heating season to 258 TWh in 2019/20. As such, the decline in L-gas production has been greater than the year-on-year reduction in L-gas consumption (-9.6 TWh) with the difference being compensated by 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).

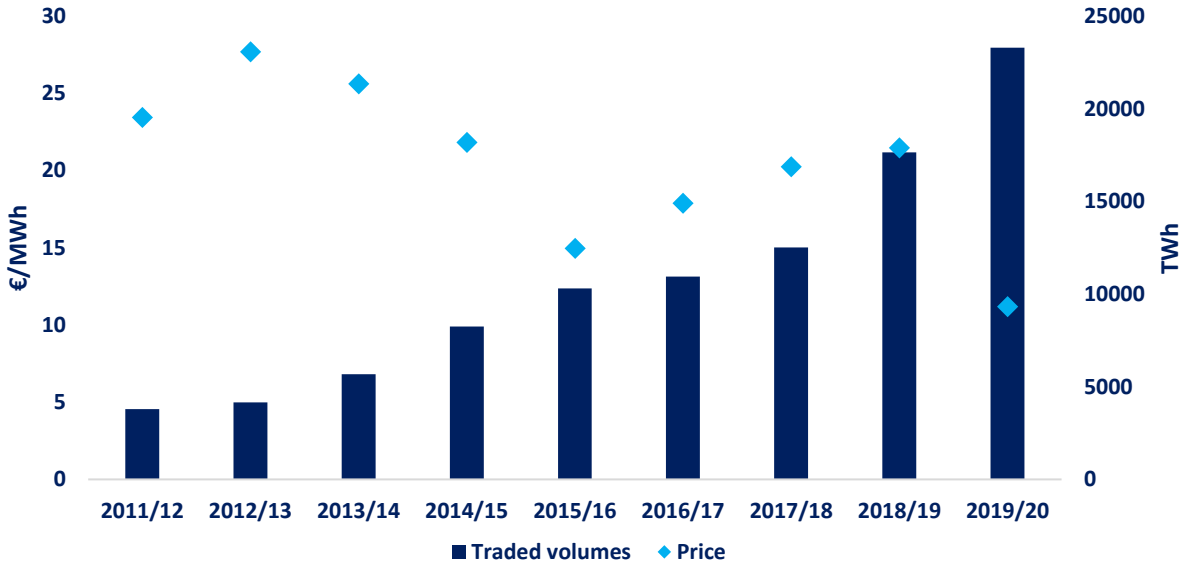
[15] In the process of nitrogen blending nitrogen is added to H-gas in order to bring down the Wobbe-value until it meets the upper Wobbe-limits of the L-gas specifications. Enrichment refers to the process adding H-gas to Groningen-gas until the upper Wobbe-limit of the L-gas specifications.

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.

Natural gas prices on TTF averaged at €11.2/MWh through the 2019/20 heating season, their lowest price level for this part of the Gas Year since TTF has been launched in 2003. This has been partly driven by the particularly mild winter weather conditions both in Asia and Europe, the substantial increase in liquefied natural gas (LNG) production capacity (mainly in the United States) and the slowdown of natural gas demand growth in Asia following the Covid-19 pandemic outbreak and consequent lockdowns.

Under these market conditions, Europe –with its ample regasification and storage capacity- played a key role in absorbing surplus LNG from the global gas market, with overall LNG imports into Europe[16] rising by almost one-third(or 189 TWh) year-on-year during the 2019/20 heating season. This in turn provided downward pressure to natural gas prices across European gas hub, including TTF.

Figure 4.2 TTF gas prices and traded volumes per heating seasons (2011/12-2019/20)



During the same period of time, traded volumes on TTF expanded by an impressive 32% year-on-year to over 23,000 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[17], increasing from 49 in 2018/19 heating season to 75 in 2019/20.

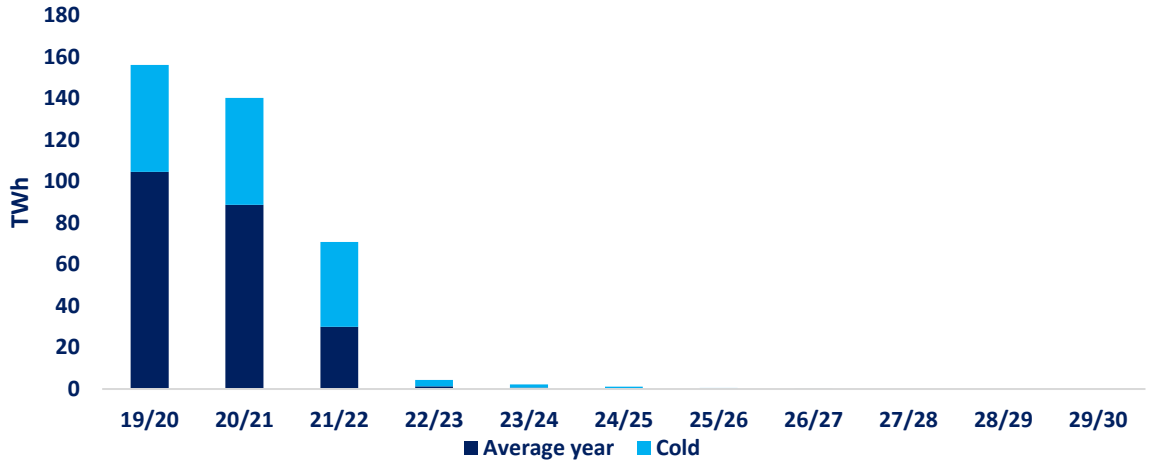
4.3 Indication of the L-gas production in the Netherlands for the period GY 2019/20 – GY 2029/30

The Groningen production cap for the GY 2019/20 has been set at 11.8 bcm (or 114 TWh) for an average GY and 17 bcm (167 TWh) in a cold year. The initial target has been revised down in March 2020 by the Ministry of Economic Affairs and Climate, to 104.5 TWh for an average GY and to 156 TWh for a cold GY. This was possible due to the high nitrogen utilization between October and December and the expansion of the working gas volume of UGS Norg.

Gas production from Groningen is expected to decline further in the coming years to reach 0 by mid-2022 for an average GY.

[16] The European Union, Turkey and the United Kingdom.
[17] 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.

Figure 4.3 Indication of the L-gas production from Groningen in an average and cold gas year (GY 2019/20-2029/30)

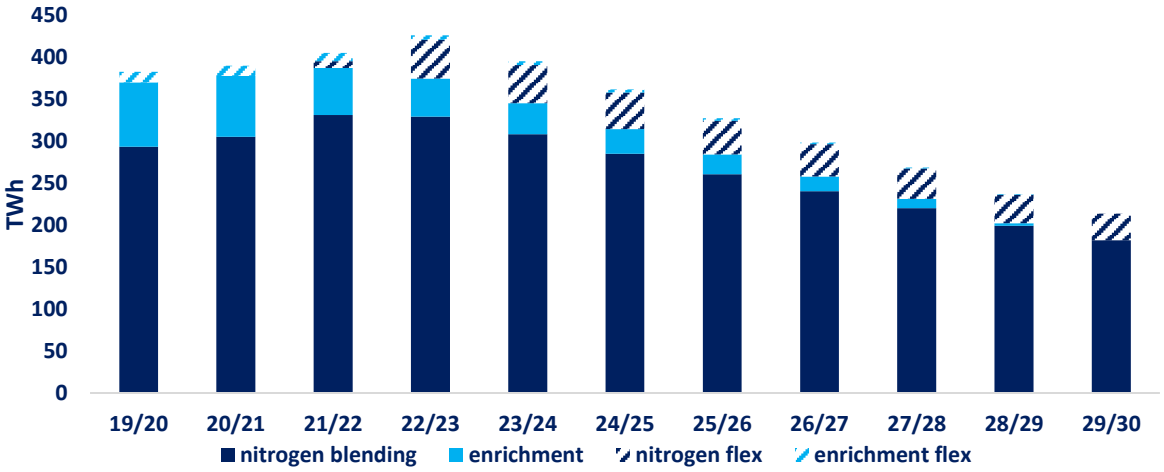


It is currently being investigated what this means for the date by which the gas production from Groningen can come to a full stop. In this investigation two factors play a role: volume and capacity/flexibility. For the analysis of this report a scenario elaborated by GTS has been used with an eventual minimal flexible production until the GY 2024/25, 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 capacity factor will be discussed in the February 2021 report.

To substitute the declining production from the Groningen field, the production of pseudo L-gas will further increase, primarily by means of nitrogen blending with (imported) H-gas. In the GY 2022/23, pseudo L-gas will account for over 99.5% (or 374 TWh) of L-gas produced in the Netherlands and is set to provide almost 95% of the upward production flexibility necessary to meet demand in a cold GY. Nitrogen blending alone will account for over 87% (or 329 TWh) of L-gas produced in the Netherlands and expected to provide almost 85% 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 over 68 TWh of additional pseudo L-gas. The outbreak of covid-19 and consequent lockdowns did not have an impact on the construction schedule of the nitrogen plant as of September 2020.

Figure 4.4 Indication of pseudo L-gas production during an average and cold gas year in the Netherlands (GY 2019/20-2029/30)

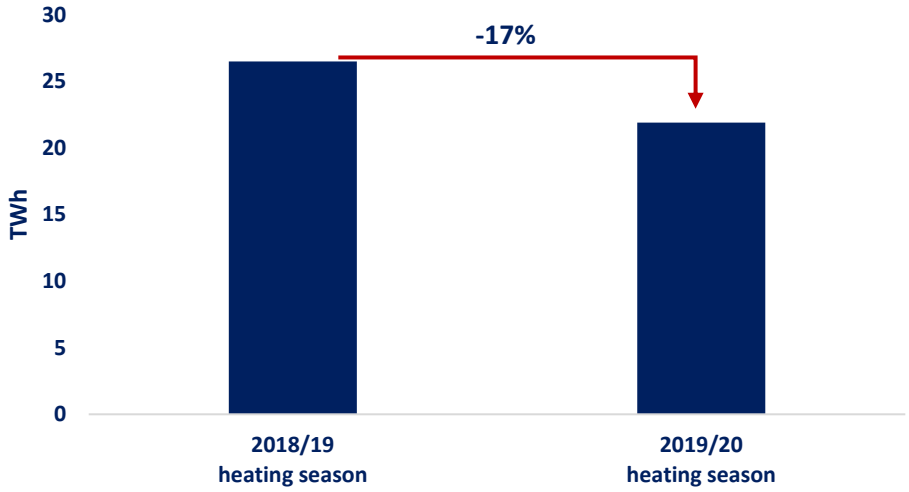


Pseudo L-gas production in the Netherlands is expected to reach its peak in the GY 2021/22, following which is set to decrease in line with the reduction in L-gas demand primarily from the importing markets (Belgium, France and Germany).

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

In Germany, L-gas production decreased by 17.3% (or 4.6 TWh) from 26.5 TWh in 2018/19 to 21.9 TWh during the 2019/20 heating season. This has been driven by lower total L-gas consumption (mainly as a result of the conversions already undertaken) which 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 2018/19 and 2019/20 heating seasons



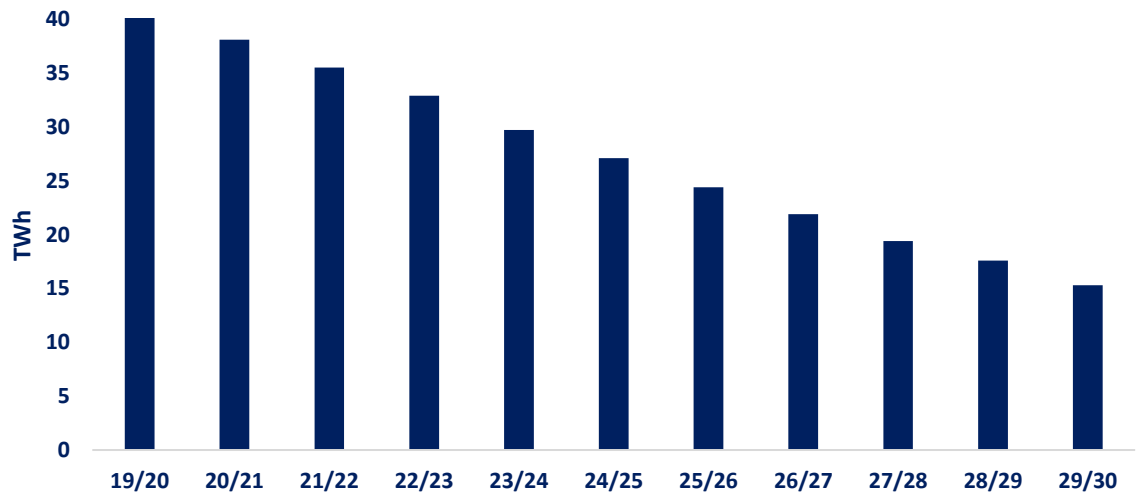
In Germany, L-gas production is expected to decrease at an annual average rate of ~9% from 48.7 TWh in GY 2018/19 to 15.3 TWh by GY 2029/30. There is one peak nitrogen/H-gas blending facility in Germany, in Rehden, supplying only limited volumes of converted L-gas.

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. GTS has finished their construction of the H-gas connection, however, GTG is not yet connected to H-gas. GTG is still waiting for the necessary material as specified by the Dutch expert, which, according to other Dutch partners, is required to have an unusual specification. As a consequence, commissioning in Q3 may be further delayed. Once in operation, the blending facility allows 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. 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 2019/20-2029/30)



5. Storage of L-gas

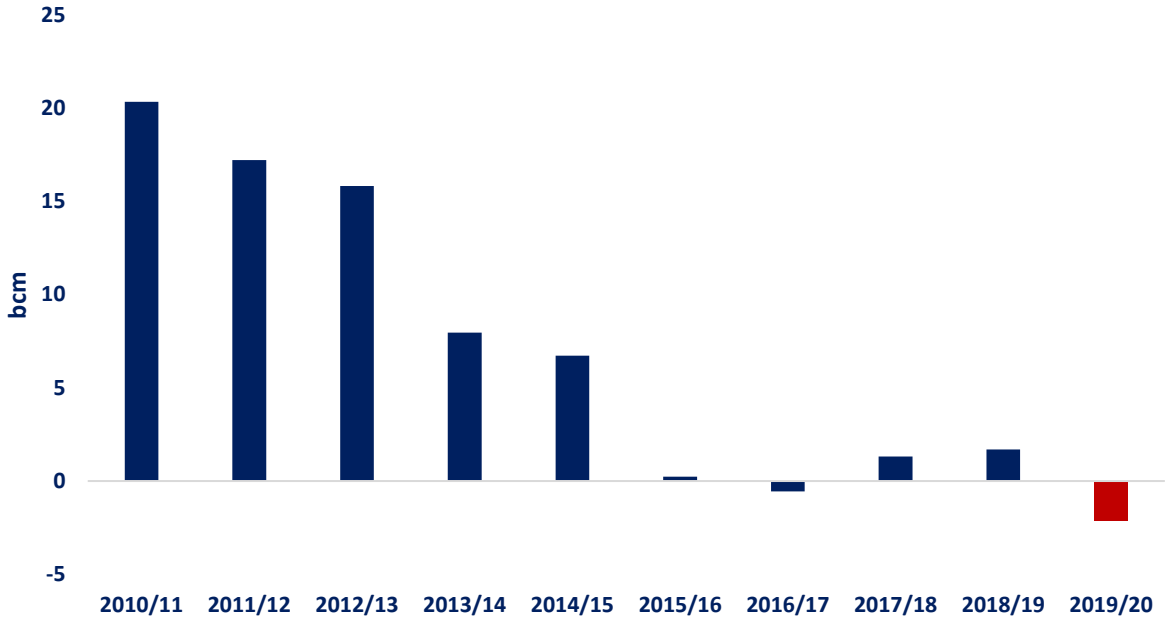
Natural gas storage plays a key role in meeting both seasonal and more short-term demand requirements, providing additional flexibility to the gas system.

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 (2010/11-2019/20)



It is important to highlight that in 2019/20, the seasonal swing turned into negative (-2 bcm). This has been partly enabled by the higher pseudo L-gas output from nitrogen blending facilities on one hand and the greater withdrawal rates from L-gas storages (primarily Norg).

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

Total L-gas storage capacity in Northwest Europe amounts to 98.4 TWh, with a total withdrawal capacity of 3,033 GWh/d.

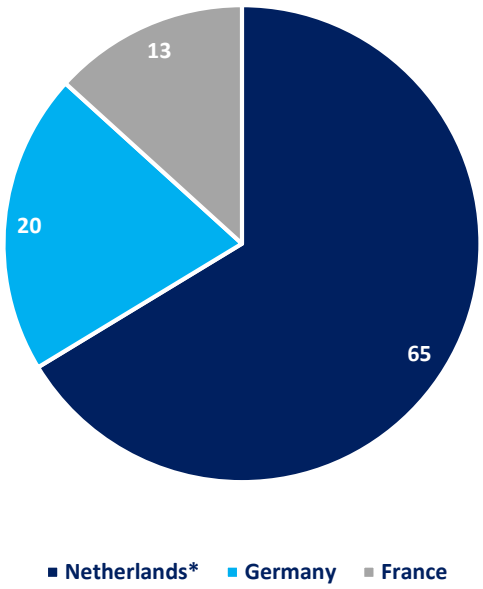
Most of L-gas storage is located in the Netherlands[18] (65 TWh or 66%) and Germany (20 TWh or 20%). There is one L-gas storage facility in France with a capacity of 13.4 TWh. There is no L-gas storage in Belgium, which relies on L-gas storages located in the Netherlands.

Almost two-thirds of withdrawal capacity is concentrated in the Netherlands, followed by Germany (26%). 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, -located in the Netherlands- has been used to store pseudo L-gas 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.

[18] 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)



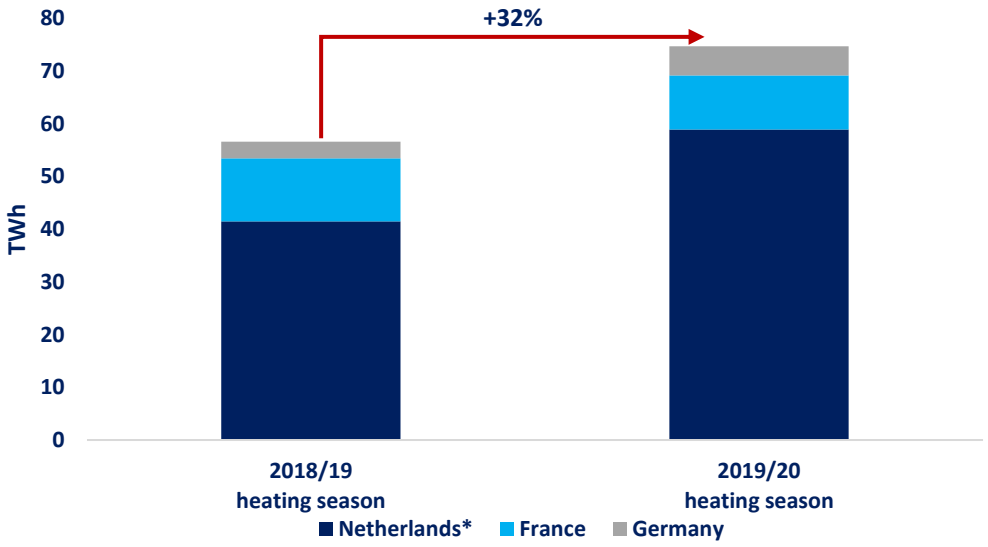
**including Norg*

5.2 The role of L-gas storage during the 2019/20 heating season

Storage played a key role in meeting L-gas demand through the 2019/2020 heating season, compensating for L-gas production falling more rapidly (-8% or 23 TWh) than Dutch L-gas consumption (-3% or 9.6 TWh).

Net storage withdrawals increased by 32% (or 18 TWh) year-on-year from 56.6 in 2018/19 to 74.7 TWh during the 2019/20 heating season. The Norg storage facility[19] in the Netherlands alone accounted for 70% of total net storage withdrawals and for closed to two-thirds of incremental storage supply during 2019/20 gas winter.

Figure 5.3 L-gas storage net withdrawals during the 2018/19 and 2019/20 heating seasons



**including Epe Eneco storage site located in Germany*

[19] Since the Norg storage is owned and operated by the same entity who owns and operates the Groningen field and has a direct connection with the Groningen field, the Norg capacity and working volume are taken into account in the Groningen production decisions (Dutch Mining Act, article 52c).

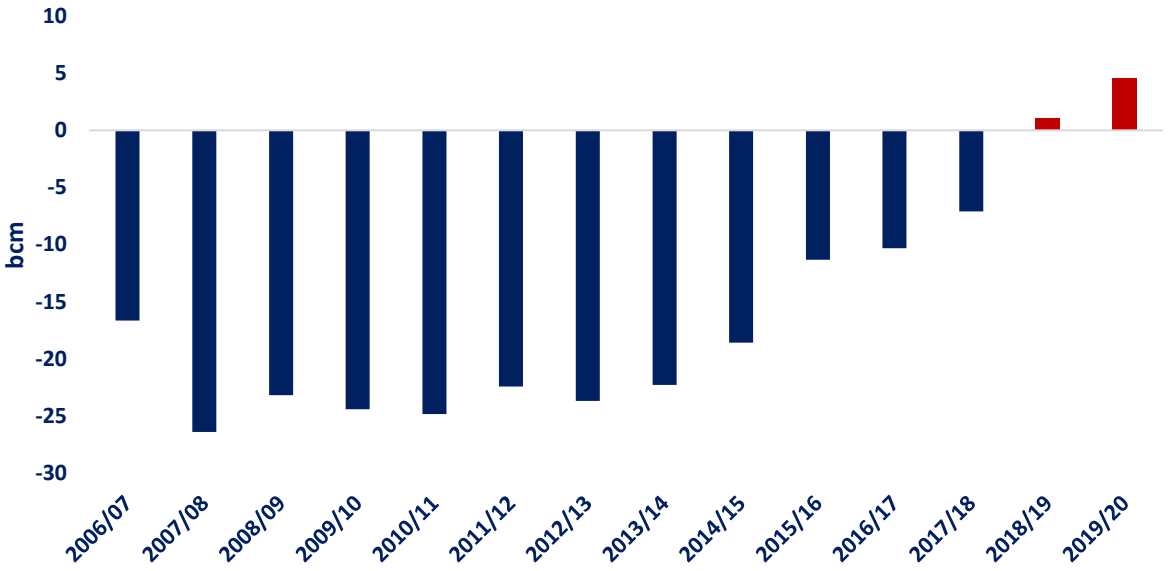
Gas supply from storage sites accounted for over 20% of total L-gas consumption[20] through the 2019/20 heating season, up from 15% during the same period in 2018/19.

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.

Figure 6.1 Net natural gas imports of the Netherlands per heating season (2006/07-2019/20)



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.

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.

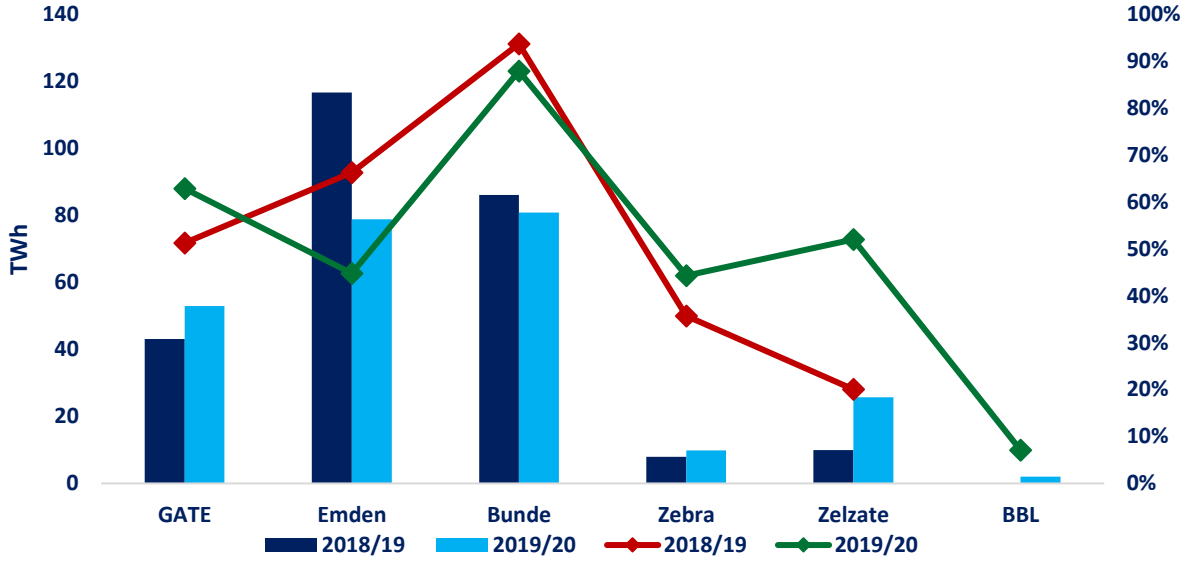
Data provided by ENTSOG indicates that total H-gas entry flows to the Netherlands decreased by 5.2% (or 13.6 TWh) year-on-year through the 2019/20 heating season. This has been primarily due to the lower exit flows primarily towards the United Kingdom, with flows on the BBL pipeline falling by almost tenfold from above 20 TWh during the 2018/19 gas winter to just above 2 TWh through the 2019/20 heating season.

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

Figure 6.2 provides a comparison of the imported volumes and the utilization rates[21] of the importing facilities through the last two heating seasons.

LNG imports into the Netherlands edged up by almost 23% (or 9.8 TWh) year-on-year, driving up the utilization rate of the Gate LNG terminal to 63% from 51% through the 2018/19 heating season.

Figure 6.2 Natural gas imports to the Netherlands by main entry points and utilization rates in the 2018/19 and 2019/20 heating seasons*



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

Higher LNG imports and lower transit flows towards the United Kingdom weighed on the entry flows via Emden, with imports plummeting by almost one-third (close to 38 TWh), driving down the utilization rate of Emden to 45% from 66% during the 2018/19 heating season.

Imports via the Bunde/Oude Statenzijl interconnection point with Germany decreased only slightly, by 6% (or 5.3 TWh), indicating a continued strong utilization rate of 88% through the 2019/20 heating season, down from 94% a year earlier.

Import flows from Belgium through Zebra and Zelzate almost doubled, significantly increasing the utilization rate of Zelzate from 20% to 52%. It should be noted that LNG imports via the Zeebrugge terminal in Belgium and the Dunkerque terminal in France increased by almost 40% (or 21 TWh) year-on-year through the 2019/20 heating season, potentially incentivizing higher export flows towards the Netherlands.

Import flows via the BBL pipeline amounted to just above 2 TWh or 7% of the reverse capacity.

When considering these entry points, the annual spare import capacity of the Netherlands amounted to 202 TWh through the 2019/20 heating season, comparing to ~250 TWh of gas consumption during that period of the year.

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 winter. Based on the assumptions of the TYNDP2020 the results show that there will be 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 of 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.[22]

The L-Gas Market Conversion Monitoring Task Force will continue to monitor and assess the deliverability of H-gas supply to the Netherlands and the Northwest European markets served by L-gas.

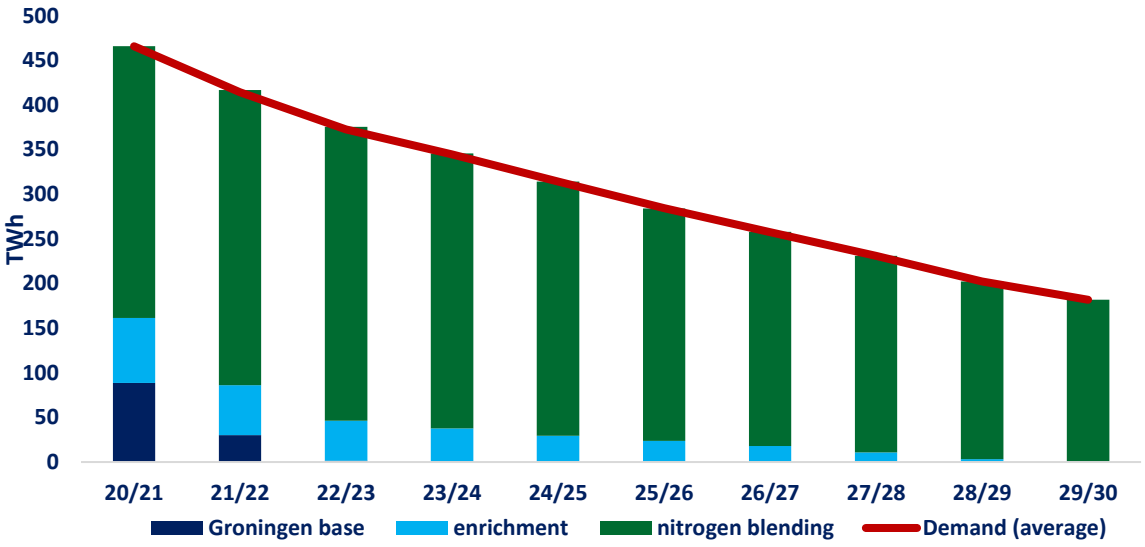
[21] Actual import flows divided by firm capacity of the entry point (Lesser Of Rule applied).
[22] For more details please contact Jacques REBEROL, Modelling Subject Manager, System Developpment at ENTSOG: Jacques.Reberol@entsog.eu

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

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.

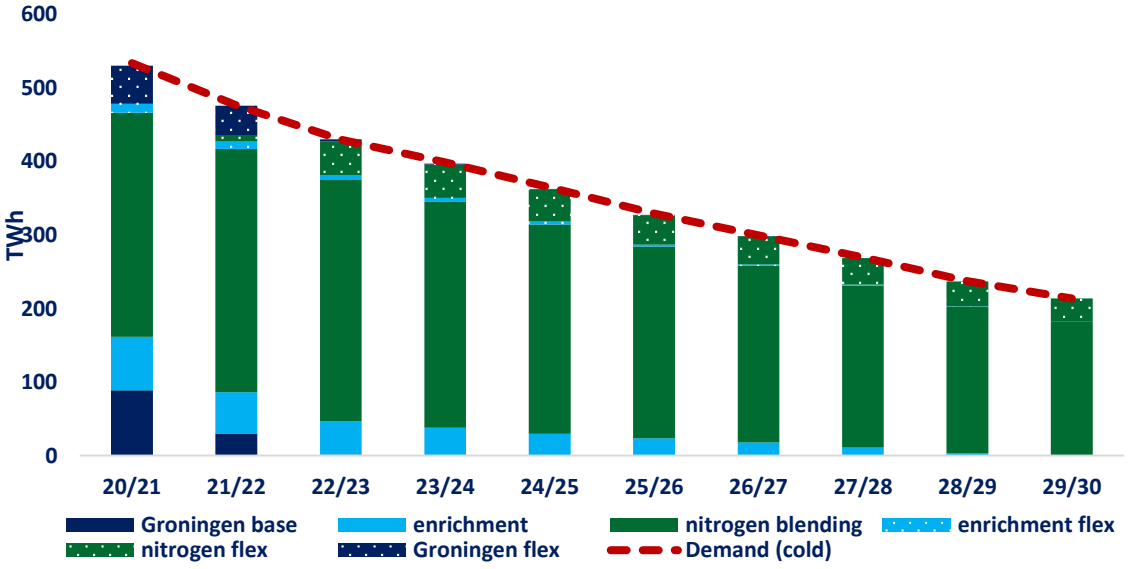
Through the market conversion period, the role of enrichment will decline in line with the decreasing Groningen production. Hence, nitrogen blending facilities will have an increasing role in meeting L-gas demand through the next ten GYs.

Figure 7.1 L-gas supply-demand balance in an average year (GY 20/21-GY 29/30)



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 enrichment and by the nitrogen blending facilities. The required capacity will be discussed in the February 2021 report.

Figure 7.2 L-gas supply-demand balance in a cold year (GY 20/21-GY 29/30)



The Covid-19 induced lockdowns had only a minor impact on the overall schedule of the conversion programs. However, 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.

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[23] 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	12.1	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

[23] 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
19/20	185.4	1145	166.7
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[24]	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
19/20	60.1	451.7	49.1
20/21	57.7	426.0	47.2
21/22	48.5	347.0	39.7
22/23	40.8	264.8	33.4
23/24	39.1	248.1	32.1
24/25	36.1	220.2	29.6
25/26	30.4	179.5	24.9
26/27	22.8	124.5	18.5
27/28	15.2	80.2	12.4
28/29	9.1	45.8	7.4
29/30	0.0	0.0	0.0

[24] 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 consumers demand for L-gas from the Netherlands in France[25] until GY 2029/30 (TWh)

	Cold		Average
	TWh	GWh/d	TWh
19/20	45.2	382.7	42.4
20/21	44	373.9	41.2
21/22	42.3	361.6	39.7
22/23	38.6	324.8	36.2
23/24	32.8	269.8	30.8
24/25	24	190.7	22.5
25/26	16.8	132.4	15.7
26/27	10.1	64.7	9.5
27/28	4.3	15.3	4.1
28/29	0.9	0	0.8
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
19/20	275.8	3045	237.8
20/21	267.1	2991	229.9
21/22	256.2	2930	219.8
22/23	239.1	2835	204.1
23/24	236.4	2804	201.7
24/25	232.5	2768	198.3
25/26	228.7	2730	195
26/27	225	2692	191.7
27/28	221.2	2654	188.4
28/29	217.4	2616	185.1
29/30	213.6	2578	181.8

[25] 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 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 (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]
19/20	18.1	389
20/21	31.8	574
21/22	19.3	495
22/23	25.4	552
23/24	20.2	505
24/25	23.7	514
25/26	17.2	499
26/27	17	458
27/28	15.1	232
28/29	8.5	191
29/30	0	0

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

Gas year	Volume converted [TWh]	Number of installations [Thousands]
19/20	1.92	129.76
20/21	7.53	323.02
21/22	6.25	335.75
22/23	1.36	71.1
23/24	2.52	101.63
24/25	4.66	96.25
25/26	6.42	166.14
26/27	6.1	129.57
27/28	4.96	91.04
28/29	7.42	212.31
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]
19/20	1.2	19
20/21	1.5	42
21/22	3.5	60
22/23	5.4	120
23/24	8.3	180
24/25	6.8	180
25/26	6.2	240
26/27	5.4	200
27/28	4.3	180
28/29	0.8	40
29/30	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*
19/20	156	104.5
20/21	140	89
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*
19/20	42	42
20/21	38	38
21/22	36	36
22/23	33	33
23/24	30	30
24/25	27	27
25/26	24	24
26/27	22	22
27/28	19	19
28/29	18	18
29/30	15	15

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	1.44	52
Nüttermoor L-Gas	0.43	24
Speicherzone L-Gas (EWE)	9.67	247
Empelde	3.55	73
Epe L-Gas (innogy)	1.77	98
Epe L-Gas (UES)	4.48	285
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 2018/19 and 2019/20 heating seasons

	2018/19	**2019/20**
The Netherlands	41.5	58.9
France	11.9	10.3
Germany	3.14	5.5

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 2019/20 heating season there were 1716 degree days (including leap day), slightly higher than the 1699 degree days recorded during the 2018/19 heating season.

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