ENERGINET

REPORT

SECURITY OF GAS SUPPLY 2021

Note: the editorial team for this publication closed on January 6 2022

GLOSSARY

Degree days:
Degree days are a measure of how cold it has been. The degree days in a 24-hour period are the difference between the average daily temperature and 17°C. For example, if the average temperature over the 24 hours is 4°C, there are 13 degree days in the given day. 24-hour periods with an average temperature above 17°C do not count. The degree days for the year are found by adding up the degree days of the individual 24-hour period.

Gas year:
A gas year is defined as the period from 1 October to 30 September.

Nm^3:
One Nm^3 (normal cubic metre) is the amount of gas which at 0°C and an absolute pressure of 1.01325 bar takes up 1 cubic metre. 1. mio. Nm^3 equals approx. 11 GWh in 2020.

Normal year:
A normal year is defined as and calculated at 3,113 degree days.

CONTENT

THE REPORT IN BRIEF

Energinet believes that the supply situation at the beginning of the year is robust

Security of supply remained high in Denmark during the past year. We have passed through our second winter without the Tyra complex in operation, and with no incidents threatening security of supply. Despite low temperatures up until May 2021 and high demand for gas throughout much of Europe.

Biomethane continues to contribute increasingly to security of supply. The number of biogas plants supplying gas to the gas system is constantly growing and the biomethane in the gas system now averages a 21 % share of volume over the year.

Right now, we are seeing a gas market with high gas prices, also in Denmark. One reason for this is that Danish gas prices are closely tied to gas prices in Germany, which supplies most of Denmark's gas. Overall, gas prices in Denmark are also determined by global supply and demand, which depends largely on how market participants choose to handle the availability of gas for their gas customers.

Global economies have opened up again following COVID-19 shutdowns, and in summer 2021, electricity production was based more on gas than it was the previous year, in part due to lower-than-normal electricity production from wind and hydroelectric power. These and other factors have driven up gas prices. High gas prices have made it less attractive for market participants to store gas, as they usually do in summer.

There has been no shortage of storage capacity, and in interaction with adjacent gas systems, Energinet ensured the necessary entry capacity for the gas system in Denmark.

Denmark is more vulnerable to gas supply disruptions or extraordinary demand for gas while redevelopment of the Tyra complex continues, which is expected to be until June 2023. It is

therefore vital that market participants respond appropriately and book sufficient storage and transport capacity to supply Danish gas consumers.

It has been a challenge to fill the gas storage facilities for winter 2021/2022 due to the high gas prices in summer and autumn 2021. The storage level for the coming winter was therefore lower at the beginning of the winter than in previous years. For example, 7,545 GWh was booked in the Danish gas storage facilities in 2021/2022. In comparison, the storage facilities were filled up to 10.1 GWh until the end of November in 2020/2021.

Energinet believes that the supply situation at the beginning of the winter is robust, but with the low storage level and high gas prices, security of supply during the coming winter and early spring will to a larger extent be in the hands of market participants. During the redevelopment period of the Tyra gas complex, Energinet has adjusted the market rules to create incentives for optimum utilisation of the capacity available in the system. Energinet also continuously briefs market participants on the supply situation and their obligation to ensure optimum utilisation of the system.

New emergency supply principles adapted to this future scenario are being prepared. Denmark will also increasingly become a transit country for gas.

In line with EU requirements, Energinet has purchased emergency storage from Gas Storage Danmark A/S and reserved filling requirements (the amount of gas that must be available in the various gas storage facilities at given times) from storage customers, to supply protected and non-protected customers if an emergency situation arises. The reserved storage volumes are sufficient to meet consumption for three consecutive days with extraordinarily high demand (20-year event) and supply protected customers for 30 days.

International supply and demand factors will continue to determine the gas price in Denmark in the future. However, Denmark will remain robust in relation to security of supply, as there are two Danish gas storage facilities and direct connections to Norway, Poland and Germany, and the Tyra platform will also be back in operation. New emergency supply principles adapted to this future scenario are being prepared. Denmark will also increasingly become a transit country for gas.

SECURITY OF SUPPLY IN DENMARK ALSO DEPENDS ON GLOBAL MARKET CONDITIONS

As winter 2021/2022 approached, gas prices throughout Europe and Asia rose dramatically. Gas prices in Denmark have risen in step.

In 2021, the gas market in Denmark – and worldwide – saw major fluctuations within a short period of time and large price increases. This has put pressure on security of supply in several European countries. Despite this, the supply situation in Denmark looks adequate at the beginning of the winter. However, gas supplies in Denmark are vulnerable due to a lower storage filling level in Denmark in 2021/2022, and dependence on Germany, where the levels of stored gas were historically low in autumn. Longer term, the gas market is expected to continue to see price fluctuations, due in part to the phasing out of coal-fired power stations in several countries.

During the Tyra platform redevelopment, Denmark has imported most of its gas from Germany. Germany is the largest gas market in Europe, with annual gas consumption of approx. 86 bcm[1]. In comparison Denmark's annual gas consumption constitutes 2.5 bcm. The European gas transmission systems are closely connected, and gas can be traded across borders in the EU. Gas pricing is reciprocally linked across the largest gas markets in Europe.

[1] Billion cubic metres of gas

[2] LNG: Liquefied Natural Gas. Natural gas that is pressurised and cooled to approx. -160° C. LNG is transported by ship around the world.

Much of the gas imported into the EU comes from LNG[2]. Most of the global LNG production is in Qatar, Australia and USA. Global LNG production has risen dramatically over the past five years. The price of LNG is therefore having an increasing impact on gas prices around the world. LNG producers ship the LNG to where the price is highest. Several countries in South East Asia and South America are very dependent on LNG imports, and therefore willing to offer a high price. The EU countries therefore compete internationally to attract LNG supplies.

Why are gas prices rising in Europe?
The prices reflect global gas supply and demand.

Demand for gas in Europe was high in 2021. The winter of 2020/2021 was generally cold throughout much of Europe and lasted into May, which is longer than normal. European gas storage facilities therefore ended last winter at low levels. A lot of gas therefore had to be put into storage during the summer and autumn. At the same time, economies have reopened after COVID-19 restrictions were eased. This has led to high demand from industries depending on gas for the production of goods. Reopening economies has also led to higher demand for electricity. Electricity generation from wind turbines and hydroelectric power reservoirs was

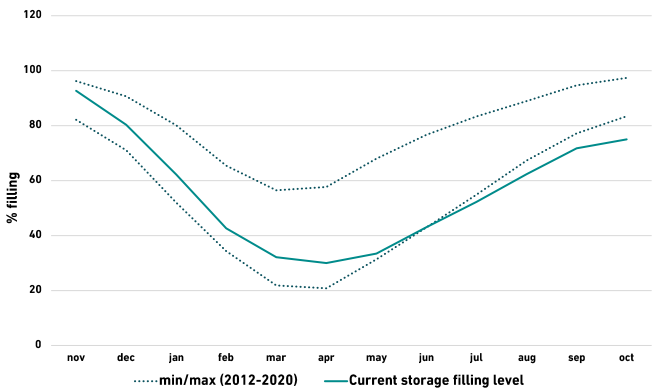
below average in Europe during summer 2021. The higher electricity generation required has therefore derived in part from gas-fired power stations in Europe, pushing demand for gas even higher.

Gas supplies in Europe were impacted by several factors in 2021 which made it difficult to increase the supply of gas in step with the higher demand.

EU gas production has been declining for several years, as many existing fields are being exhausted, or have been rebuilt (including the Tyra field in Denmark). The supply shortfall in recent years has been replaced by more gas imports from countries such as Russia and Norway and via LNG.

The rapidly growing LNG market has been unable to keep up with the sharp increase in gas demand in 2021. Several countries in East Asia, in particular, have had high demand for LNG. LNG prices have therefore been higher in Asia than in Europe. As a result, LNG supplies have primarily been shipped to Asia. Europe has therefore imported less LNG in 2021 than expected.

Gas imports from Russia and Norway were affected by several temporary interruptions in the first half of 2021. A gas treatment plant in Russia caught fire last summer, reducing the volume of gas Russia could export. The Norwegian offshore gas system underwent extensive maintenance over the summer, which also reduced the volume of gas imported from Norway.



As a result of the increase in demand and the failure to increase gas supply in 2021, the gas price has risen dramatically. In October, the price rose above EUR 100/MWh, which was a clear sign of a strained supply situation on the European gas market.

Prior to the winter, security of supply in Europe was under more pressure than normal, as the high gas prices clearly indicated.

The gas storage facilities in Europe are necessary to secure the gas supply during a cold winter. At the beginning of the winter (1 October), the average storage level in Europe was 75 %. This is the lowest level since 2012. The figure on the previous page shows changes in the storage level in Europe in 2021.

Impact on security of supply in Denmark

As long as the gas storage facilities are sufficiently full, Denmark is equipped to handle a cold winter. However, the Danish gas market is still highly dependent on imports from Germany, where gas storage levels were also relatively low at the start of winter. If a gas crisis occurs on the German gas market, and the fixed capacity being exported to Denmark cannot be maintained, this will have a major impact on supply in the Danish gas market. Depending on the seriousness of a given gas crisis on the German market, this will affect the volume of gas that can be imported from Germany. If the import capacity from Germany is hit hard, this will have a negative impact on security of supply in Denmark. However, the probability of this is deemed to be low, as northern Germany in particular is well supplied, in terms of pipelines and access to stored gas.

Gas market in Europe in the long term

The EU has adopted binding climate targets, whereby CO_2 emissions must be reduced by 55 % by 2030, and the EU must be climate neutral by 2050.

This naturally affects the role of gas in Europe's energy mix. The gas being used today can be partly replaced by biogas and hydrogen. But much of the current gas consumption must be replaced by electricity before 2050.

The transition is already underway. In the short term, this means that EU member states have decided to gradually phase out their coal-fired power stations. Several countries have also decided to phase out nuclear power plants.

This means that a large proportion of electricity production capacity will be decommissioned as 2030 approaches. This is to be primarily replaced by renewable energy, but it will be difficult to replace 100 % of the decommissioned coal and nuclear power plants with renewable energy. It is therefore expected that part of the capacity will be replaced by new gas-fired power stations in the short term, while renewable energy production is further expanded. Since gas emits approx. half as much CO_2 as coal, this will result in a rapid reduction of CO_2 emissions.

It therefore does not seem likely that gas demand will decrease in Europe towards 2030. As coal-fired and nuclear power plants are phased out, gas will probably account for a larger share of electricity production than in recent years. With varying electricity production from wind turbines and solar cells, the demand for gas may vary considerably in the future. The gas price in the market may therefore fluctuate more in the future.

International supply and demand factors will continue to determine the gas price in Denmark in the future. LNG transport capacity is continually being expanded globally. Poland and Germany are both currently planning to expand their LNG capacity. With Baltic Pipe, Denmark will also be closely connected with Norway and Poland. This will lead to a more tightly coupled world market price for gas.

However, Denmark will remain robust in relation to security of supply, as there will be Danish storage facilities and direct connections to Norway, Poland and Germany. The Tyra platform will also be back in operation. There will therefore be many sources of gas, and two gas storage facilities to smooth out seasonal fluctuations in the gas system.

1. THE PAST GAS YEAR (OCTOBER 2020 – OCTOBER 2021)

Security of supply remains high, despite another year without the Tyra complex, as there has been sufficient gas to supply gas consumers.

1.1 Security of supply incidents and drills

There have been no security of supply incidents in the past year.

1.1.1 IT incidents

There have been no IT incidents that impacted the gas supply in the gas system during the past year.

1.1.2 Contingency drills

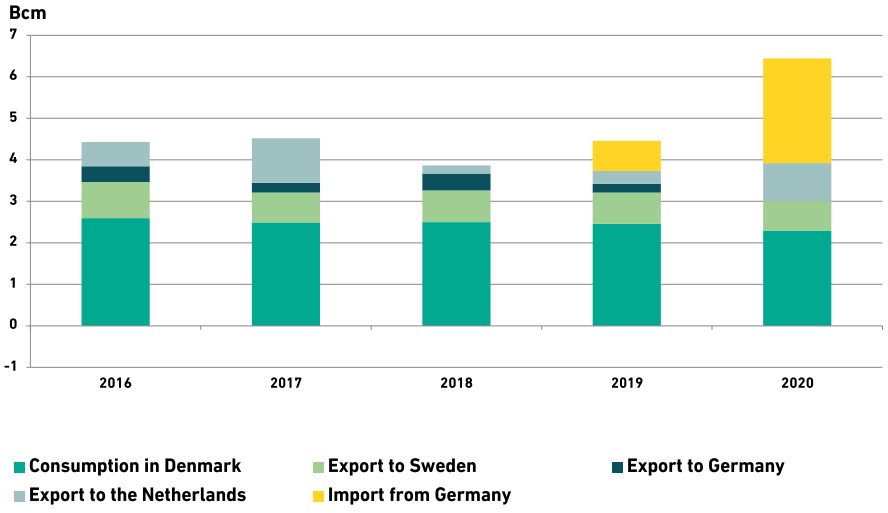
On Thursday 30 September 2021 at 17.00, Energinet held a contingency drill in cooperation with the police, TrekantBrand and Region Southern Denmark. The contingency drill took place at Energinet's compressor station in Egtved. The scenario for the drill was mass injury, whereby 23 injured extras were positioned at different locations at the substation. All extras were evacuated, and the control room – including the control room guards – was evacuated to the emergency control room in Erritsø, where Energinet has its head office.

The drill was completed at 20.30. All parties took away important learning points from the drill, and there was excellent dialogue and cooperation between Energinet, the police, Trekant-Brand and Region Southern Denmark throughout the preparation process and the subsequent evaluation.

1.2 Use of the gas transmission system event

None of the peak day volumes exceeded the maximum commercial capacity limit in the transmission system entry and exit points in 2020. The peak day volumes also did not

FIGURE 1: ANNUAL NET PRODUCTION FROM THE NORTH SEA DISTRIBUTED ON FLOW, 2016-2020



exceed the commercial capacity limits at the two Danish gas storage facilities – Stenlille and Lille Torup.

1.2.1 Gas supplies for the North Sea

North Sea supplies to Nybro fell dramatically in 2020 after the Tyra complex ceased operations in September 2019. A small amount of gas is still being supplied to Nybro from the Syd Arne field. In 2020, the Syd Arne field supplied approx. 73 million Nm^3 of gas to Denmark. This volume is expected to decline in 2021, but this will not have any impact on security of supply, as the primary sources of supply are Ellund/Germany and the two Danish gas storage facilities.

1.2.2 Ellund

In 2020 and 2021, the flow direction between Denmark and Germany was exclusively northbound. In 2020, the total northbound flow via Ellund was 2,525 million Nm^3. The peak day volume of 9.1 million Nm^3 occurred on 13 July 2021, when it met both the increased offtake in distribution and at the power stations as well as what was injected into storage facilities. The peak daily volume of 9.1 million Nm^3 was within the commercial Ellund entry capacity limit.

1.2.2.1 Capacity orders at Ellund

Auctions are held each year for the purchase of capacity at Denmark's only interconnection point in Ellund, which is the interconnection between Germany and Denmark. By purchasing capacity at Ellund, gas market players (shippers) can reserve the right to import or export gas between Germany and Denmark.

Shippers must book capacity in the gas system from Energinet when they want to transport gas in the transmission system. Capacity can be booked as annual, quarterly, monthly, daily, or within-day products.

On 5 July 2021, auctions were held on the PRISMA platform for annual products for capacity in Ellund for the next five years.

For the current gas year 2021/2022, which started on 1 October 2021, 0.1 GWh/h less annual capacity than last year was booked.

TABLE 1: CAPACITIES AND UTILISATION IN THE DANISH SYSTEM, MILLION NM^3/DAY

		Maximum daily flow			
		Capacity Mcm/d	2018 Mcm/d	2019 Mcm/d	2020 Mcm/d
Nybro	Entry	32,4 [2]	9,7	12,3	1,1
Lille Torup Gas Storage Facility	Injection/ Withdrawal	3,6 / 8,0 [3]	4,2/8,3	2,9/8,3	3,4/3,9
Stenlille Gas Storage Facility	Injection/ Withdrawal	4,8 / 8,2 [3]	4,1/8,2	4,3/5,4	4,6/4,8
The Danish Exit zone	Exit	25,5 [5]	16,6	14,0	11,4
Ellund	Entry/ Exit	10,8 [4] / 20,0	5,9/5,4	14,2/4,5	9,1/0
Dragør Border	Exit	8,6 [1]	5,7	4,0	3,4

Note 1: The Swedish system is not able to receive these volumes at the assumed minimum pressure in Dragør of 44 bar. The firm capacity is stated at 7.2 million Nm^3/day. The Danish and Swedish balance zone was merged on 1 April 2019.

Note 2: Total capacity of the receiving terminals in Nybro. The potential supplies are smaller today as the Tyra-Nybro pipeline is subject to a capacity constraint of approx. 26 million Nm^3/day, and large volumes cannot be supplied from the Syd Arne pipeline.

Note 3: Guaranteed capacity. The Danish gas storage company dimensions the commercial injection capacity conservatively in relation to pressure in the transmission system. When the pressure in the transmission system occasionally increases, it is possible to inject more gas into the storage facilities than the specified injection capacity.

Note 4: At a calorific value of 11.2 kWh/Nm^3.

Note 5: Supplies to the distribution system and power stations

There is still unused capacity for short-term contracts with German TSO Gasunie Deutschland, and unused capacity for short and long-term contracts with the other German TSO, Open Grid Europe. This means that approx. 75 % of the capacity (3.7 of 5 GWh/h) is still reserved for the third year with the Tyra complex out of operation.

No extra annual products were sold for the next gas year 2022/2023. Approx. 60 % of the capacity (2.9 of 5 GWh/h) has been reserved for this year – the final year with Tyra out of operation. The unused capacity for the 2022/2023 gas year will be offered for sale on PRISMA again in July next year.

1.2.3 Use of gas storage facilities

Following the Stenlille expansion in 2020, the two Danish gas storage facilities have offered volume capacity of 10.46 TWh, corresponding to approx. 902 million Nm^3. In 2021 (storage year 2021, starting on 1 May 2021), a volume capacity of 10.08 TWh was offered. The drop in storage capacity is partly due to the continuous reduction in volume in the Lille Torup gas storage facility resulting from natural underground processes, and partly because the gas in the Danish gas storage facilities is becoming less energy-efficient as it mixes with higher levels of German/Russian gas, which has a lower calorific value than Danish North Sea gas.

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Energinet estimates that demand for withdrawal capacity at peak loads varies between 12-16 million Nm^3/day during normal operation. Demand for withdrawal capacity from the storage facilities depends not only on demand, but also on market prices.

Gas consumption varies over the year and over each 24-hour period. Market players can use the Danish gas storage facilities to store gas to exploit price differences, for example

FIGURE 2: STORAGE WITHDRAWAL AND INJECTION PER MONTH, 2020

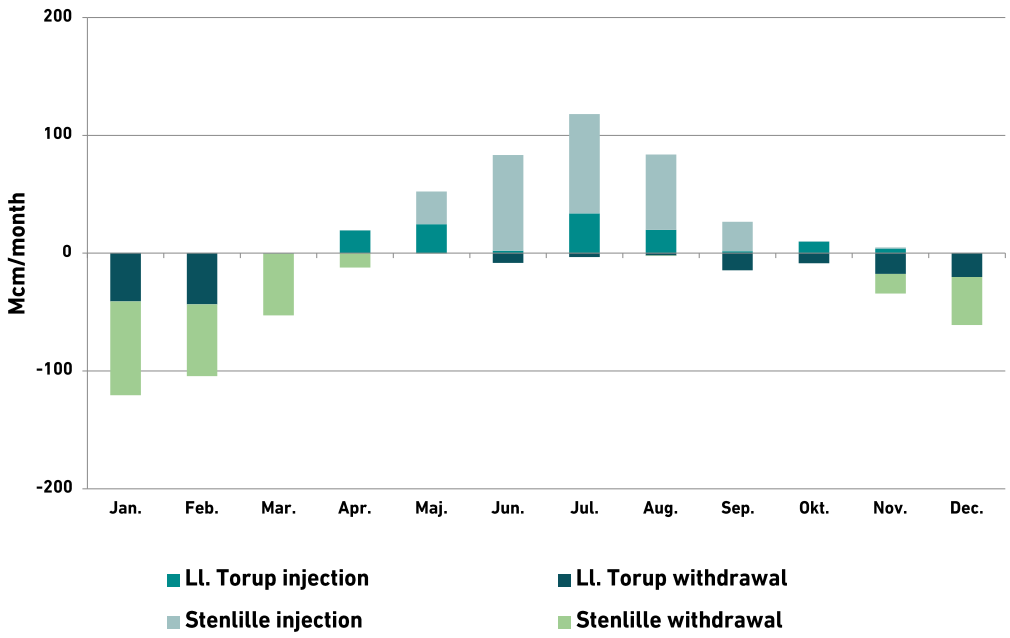
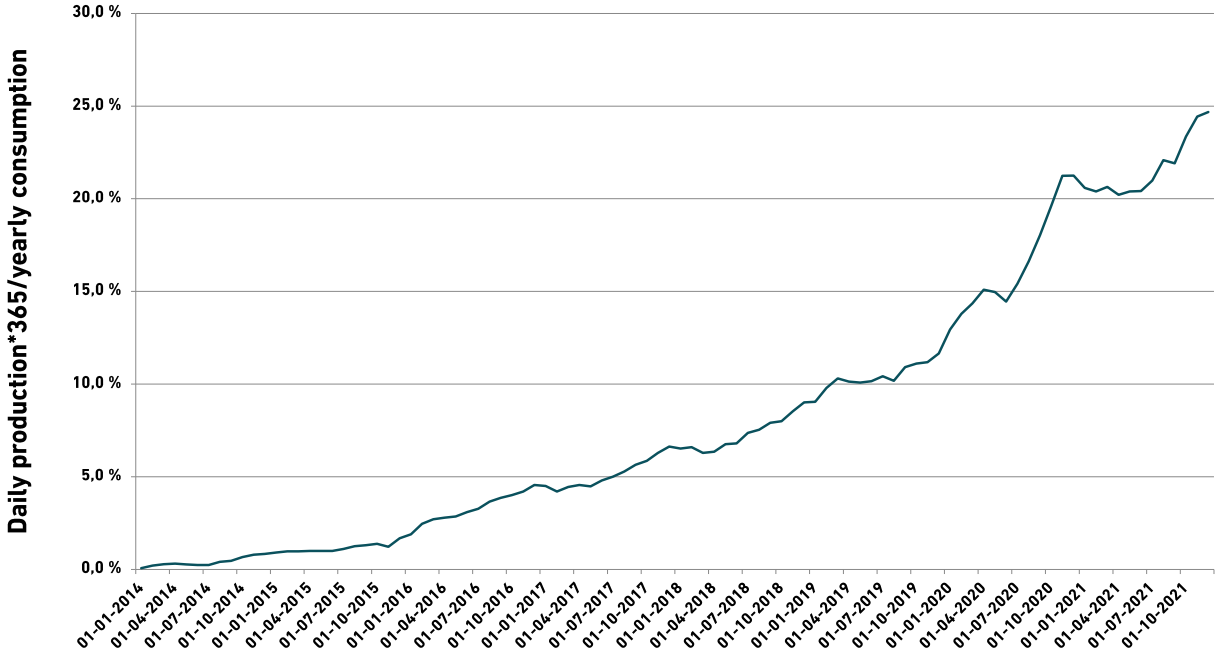


FIGURE 3: SHARE OF BIOGAS RELATIVE TO CONSUMPTION IN DENMARK, CALCULATED AS A 12-MONTH AVERAGE ENDING ON 1 OCTOBER 2021



across seasons and markets, and to supply the necessary daily capacity. During the summer, when gas consumption is low, gas is injected into the gas storage facilities. In winter, when the supplies can no longer cover Danish consumption or exports to Sweden, gas is withdrawn from the storage facilities again; see figure 2.

1.2.3.1 Gas storage capacity

Shippers are responsible for balancing their flows of gas in and out of the gas system, and thus safeguarding the supply of their connected Danish consumers (via gas suppliers). It is thus the shippers' responsibility to ensure sufficient gas in the system. Having gas in storage is an important element in maintaining the security of gas supply during the Tyra shutdown. It is the storage customers that ensure sufficient gas volumes are stored to safeguard the supply of their connected Danish and Swedish consumers – even during prolonged and unusual cold spells.

Energinet purchases gas for emergency storage so it can supplement supplies to protected customers in emergency situations. During the period of rebuilding the Tyra complex, the emergency storage volume will be determined by a situation in which no gas is supplied from either the Tyra-Nybro offshore pipeline or Germany. Energinet's emergency storage is 1,700 GWh (approx. 151 million Nm^3, with a calorific value of 11.2 kWh/Nm^3). This is supplemented by the purchase of 2,100 GWh (approx. 187 million Nm^3 with a calorific value of 11.2 kWh/Nm^3) in filling requirements – the volume of gas which must be available in the gas storage facilities at specific times – for the 2021/22 withdrawal season. Withdrawals from Danish storage facilities were historically low in 2020. All offered capacity was sold out, but customers ended up having withdrawn only approx. 35 % of the gas from the storage facilities at the end of the year. In April 2020, the storage level was 6.8 TWh out of 10.6 TWh of sold capacity. The picture was the same across Europe, where storage levels were very high due to historically low withdrawals. This meant that there was limited demand for gas for injection during the same period as COVID-19 broke out. This resulted in periods with negative oil prices in 2020, and a fear of negative gas prices.

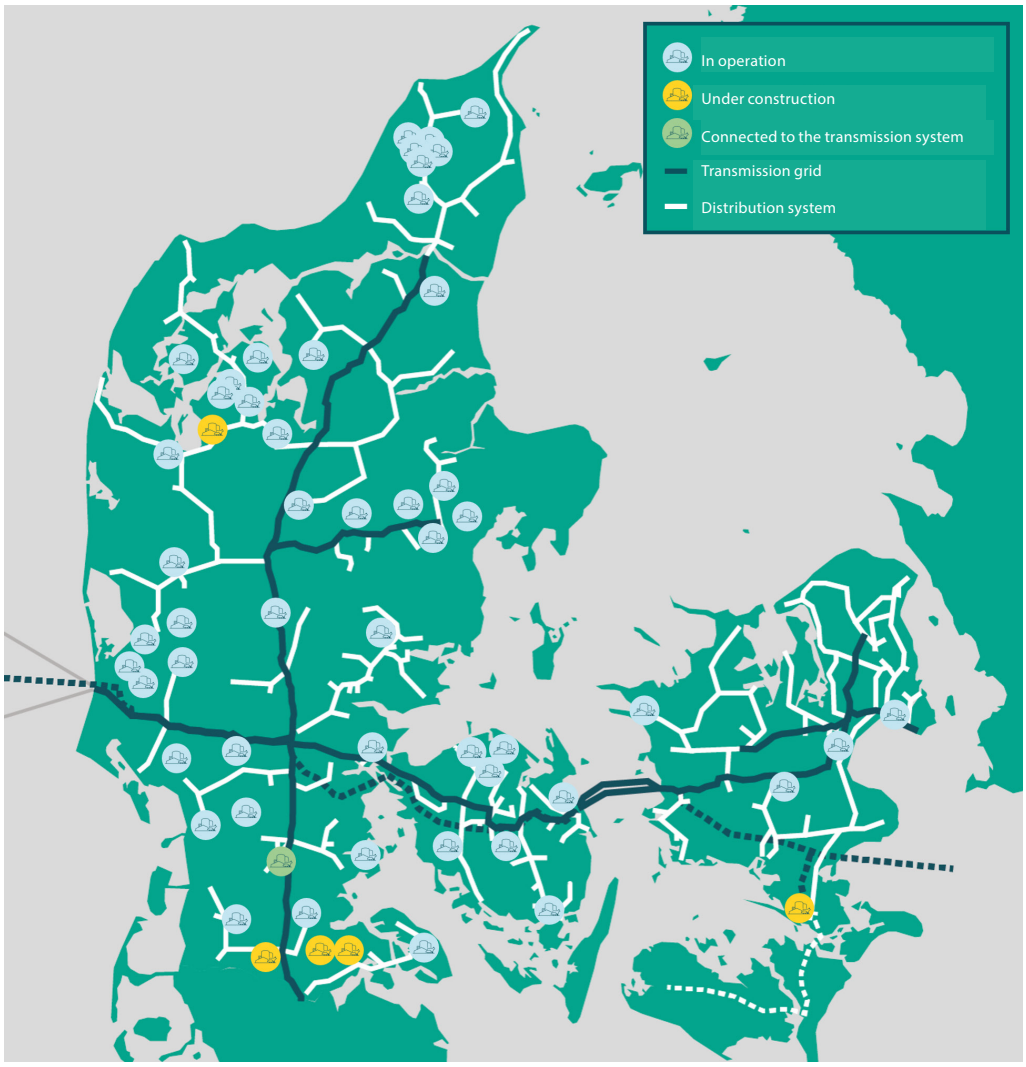
The very low summer prices combined with significantly higher winter prices made it attractive to expand the Stenlille gas storage facility. The expansion was approved back in 2007. During the expansion of the Stenlille gas storage facility in early August 2020, the market reversed, and prices were pushed up. This resulted in a stop clause being activated in the Stenlille expansion, which only reached about one third of the planned level.

The lack of withdrawals in winter 2019/2020 also meant that much of the gas in the storage facilities was still Danish North Sea gas, with a higher calorific value than imported gas from Germany. This meant that the offered capacity was only minorly adjusted in relation to 2019. Following the expansion in Stenlille, the capacity offered was 10.46 TWh, corresponding to approx. 902 million Nm^3. The Stenlille expansion added approx. 3 % to the total storage capacity in Denmark.

1.2.4 Biogas in the gas system

The volume of biogas added to the gas system continues to

FIGURE 4: MAP OF DENMARK SHOWING THE DANISH GAS SYSTEM AND BIOGAS PLANTS



increase. In 2020, it accounted for approx. 17 % of Danish gas consumption.

This share has since increased to almost 22 % in 2021. However, it could have been higher if the entire industry had not been impacted by a general shortage of biomass[3], as lower volumes of waste and residual products were generated by the food industry as a result of COVID-19. If biogas production had been at the same level for all of 2021 as at was at the end of 2021, the biogas share would have reached almost 25 %.

Since 2013, 51 biogas facilities have been connected to the gas system. A couple of plants are connected directly to the transmission system one at Bevtoft and one at the Herning-Skjoldelev grid[4], while the other plants are connected to the distribution system. The combined maximum connection capacity of the plants is more than 90,000 Nm^3/year.

It is necessary to transfer the added biogas from the distribution system to the transmission system in five locations in Denmark. This is via a 'reverse flow' of surplus biogas. Another reverse-flow plant is under construction. Over the last 12 months (1 October 2020 – 30 September 2021), more than 31 million Nm^3 of biogas have been added to the transmission system from these plants, including production at the biogas plant in Bevtoft.

1.3 Gas consumption

Gas consumption has been stable at around 2,500 million Nm^3/year (after adjusting for weather[5]) since 2015, with only the central power stations seeing a drop in consumption.

[3] Important resource for biogas production.
[4] This transmission pipeline is being operated by Evida and the biogasplant has an connection agreement with Evida.
[5] It is not possible to directly compare one year's energy consumption with another year's consumption. This will not be correct, because one year may have been very cold and the other year very mild. In order to make a comparison, each year's consumption needs to be adjusted by converting it to a normal year in terms of temperature.

Gas consumption depends on whether it has been a warm year or a cold year. 2021 was very close to normal, with 1 % fewer degree days than in a normal year. 2020 had 13 % fewer degree days than in a normal year, making it a mild year.

1.3.1 Peak day consumption

The temperature has a major impact on peak day consumption and hence on the load on the gas system. During 2021, the peak day consumption in Denmark was 18.1 million Nm^3, of which 1.3 million Nm^3 (approx. 7 %) was supplied by biogas production, while the rest of the gas came from Germany and the gas storage facilities. This was on 21 February 2021, when the daily mean temperature was -6° C. In comparison, the peak day consumption in 2020 was 12.6 million Nm^3 (with 1.3 million Nm^3 supplied by biogas production).

1.4 The gas market

The gas market has undergone a historic change that has not been seen before. Gas prices started the winter at around EUR 18/MWh, and rose for most of the year, peaking at EUR 128/MWh on 7 October 2021.

The significant development in gas prices is due to many different factors which have driven the price upwards. Overall, the high gas prices reflect the global supply and demand for gas, with supply falling short of demand.

In both Europe and Asia, the winter of 2020/2021 was cold and long, resulting in record-low storage levels afterwards. Economies also reopened following the COVID-19 shutdowns, which meant that industry also demanded more gas to produce goods. The gas supply was impacted by maintenance of gas infrastructure and high demand for LNG[6] in Asia, which drew LNG supplies away from Europe. Prices were therefore driven up in the lead-up to winter, as the limited amount of gas on offer was needed both to fill the gas storage facilities and supply industry.

[4] Liquefied gas (natural gas cooled to -160° C) which can be transported by ship.

1.4.1 Trades on the Danish gas exchange

The volume of gas traded on the Danish Exchange Transfer Facility (ETF) increased during 2021.

In 2021, 50 % more volume was traded on the ETF than in 2020. This is a change from the trend seen from 2019-2020, where liquidity declined. The large increase in liquidity is primarily due to a cold first quarter, where it was necessary for the gas market to trade large volumes of gas because demand was also high.

However, the first quarter of 2020 was mild, leading to lower demand for gas, as in the previous year. It is also possible that several shippers have chosen to move away from fixed supply contracts, as the ETF price has generally been very close to the prices on the German gas exchanges.

GAS QUALITY DURING THE COMING WINTER

Energinet is responsible for ensuring at all times that the quality of the gas supplied from the gas transmission system complies with the Conditions for Gas Transport and the Executive Order on Gas Quality (Executive Order no. 230 of 21 March 2018)

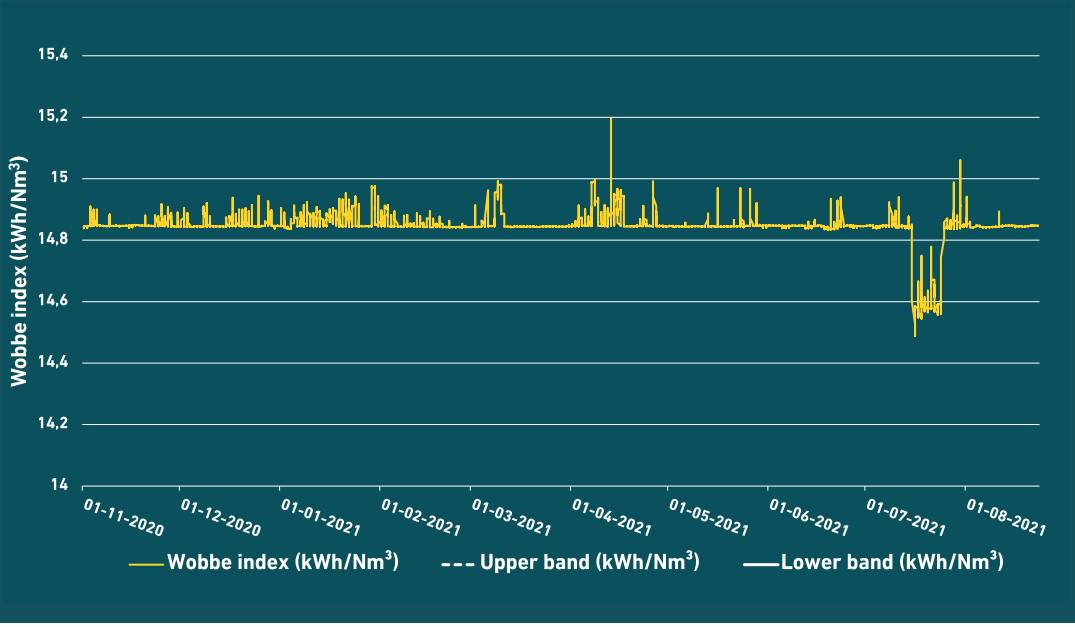
The gas in the Danish gas system is supplied from different sources (the North Sea, Germany, the Danish gas storage facilities and biogas), with varying gas quality. Biogas injected to the gas system is similar to the existing gas in the system and consists primarily of methane with small quantities of carbon dioxide, nitrogen and oxygen.

Under normal supply conditions, it is a requirement that the upper Wobbe index for gas is in the range of 14.1-15.5 kWh/Nm^3 (50.76 til 55.8 MJ/Nm^3). The relative density of gas must be between 0.555 and 0.7.

The transported gas complied with the quality requirements in 2020/2021.

Gas quality can impact on the plants using the gas, and thus on gas consumers. In recent years, gas has primarily been supplied via Germany, as the Tyra complex is still undergoing reconstruction. The gas quality for Danish consumers has been very stable during this period. This is expected to continue until Baltic Pipe is commissioned in 2022 and the Tyra field recommences operations in 2023. Gas quality has generally not given rise to any challenges for consumers.

FIGURE 5: WOBBE INDEX IN THE DANISH GAS SYSTEM FOR 2021, MEASURED AT EGTVED EAST



2. WINTER 2021/2022

The gas system is robust, with sufficient entry capacity and storage volume to bring the system through an extremely cold winter. However, Denmark remains vulnerable as long as the Tyra complex is under redevelopment

The unusual European and global situation in the energy markets is creating a changed picture in relation to booking storage capacity, which is vital to security of supply. Gas market players therefore have a special responsibility to utilise the system optimally, to maintain a high supply situation throughout the winter.

2.1 Capacity bookings

Shippers must book capacity in the gas system from Energinet when they want to transport gas in the transmission system.

Annual bookings for the 2021/2022 gas year:

- Ellund exit, exports of gas to Germany: No annual capacity booking have been made for the 2021/2022 gas year. This is completely expected during the current period with Tyra undergoing redevelopment, resulting in a constant need to import gas.
- Ellund entry, imports of gas from Germany: Like last year, virtually no additional capacity was sold for the coming gas year. Approx. 4 million kWh/h were sold earlier via the Open Season process[7] and the capacity sale the previous year. The total capacity at Ellund entry on the Danish side is 7.7 million kWh/h. Capacity bookings at Ellund entry are described in more detail in section 2.2.2.1.
- Joint Exit Zone[8] supply of gas to end customers in Denmark and Sweden: This annual capacity can be booked all year round, which means that bookings are not necessarily placed near the start of the gas year on 1 October.
- Nybro entry, gas from the North Sea: Only a minor booking has been placed, to supply gas from the Syd Arne field, which continues to supply gas during the period the Tyra complex is out of operation. The booking has more than halved since last year (from approx. 0.1 million to 0.04 million kWh/h), in line with the downward trend in the flow we are seeing from Syd Arne.
- RES Entry, biogas injected into the gas system: In the same way as with the Joint Exit Zone, annual capacity at RES entry can be purchased throughout the year. However, there has been a clear general increase in the level of

[7] Energinet has expanded the transport connection from Ellund in the northbound direction. Prior to the expansion, Energinet invited tenders for capacity in a bidding process (Open Season) to determine the interest in the project. In the Open Season process, the companies must submit financially binding bids and may thereby acquire connection capacity.

[8] In connection with implementation of the Joint Balancing Zone with Sweden in 2019, the exit points towards Danish end users and Sweden have been gathered in one point, called the Joint Exit Zone.

ENERGINET WINTER OUTLOOK 2021-2022 AND 2022-2023

To assess the supply situation, a reliability evaluation of the gas system is carried out. This evaluation looks at whether the system capacities are able to ensure supplies to consumers during each 24-hour period, ie an assessment of entry capacities, including storage volumes, in relation to consumption. The Winter Outlook assessment examines whether the system is able to provide the necessary capacity to meet an unusually high consumption based on a winter day with a mean temperature of minus 13°C.

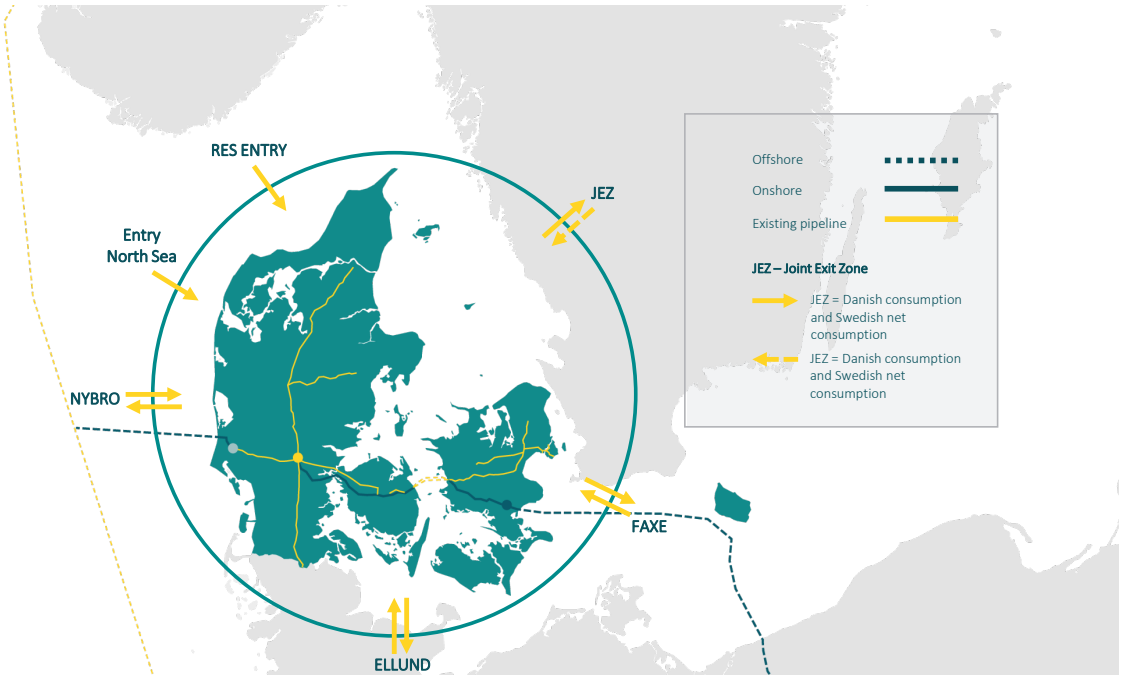
Assessment for the coming winter 2021/22
The assessment indicates that there is sufficient capacity in the gas system to meet demand on a very cold day, while the Tyra complex is under redevelopment.

Exit zone: Consumption in Denmark is 19.8 million Nm^3/day. For the exit zone, the offtake corresponds to Energinet's expectations at a daily mean temperature of -13°C.
Ellund: Ellund has net imports of up to 10.3 million Nm^3/day.
Dragør: Dragør has exports of 5.6 million Nm^3/day.
Storage facilities: Total withdrawal of gas from the storage facilities is estimated at 16.2 million Nm^3/day, with 8.2 million Nm^3/day coming from Stenlille and 8.0 million Nm^3/day from Lille Torup. In special operating situations, 18.5 million Nm^3/day can be supplied, with 8.2 million Nm^3/day coming from Stenlille and 10.3 million Nm^3/day from Lille Torup.
Nybro: Supplies in Nybro, which only come from the Syd Arne field, are estimated at 0.4 million Nm^3/day.
RES: 1.0 million Nm^3 biogas/day is supplied to the gas system.

Assessment for winter 2022/23
The assessment indicates that there is sufficient capacity in the gas system to meet demand on a very cold day. The Europipe (EP) II tie-in has been completed, allowing imports from Norway via EP II. Baltic Pipe has also been completed in the Baltic Sea. However, the new pipeline from Egtved to Nyborg will not be complete until 1 January 2023. The Tyra complex is expected to be completed on 1 June 2023.

Exit zone: Consumption in Denmark is 19.8 million Nm^3/day. For the exit zone, the offtake corresponds to Energinet's expectations at a daily mean temperature of -13°C.
Ellund: Ellund has net imports of up to 10.3 million Nm^3/day.
Dragør: Dragør has exports of 5.6 million Nm^3/day.
BP: Up to 7.5 million Nm^3/day will be exported at Faxe (from 1 October 2022 to 31 December 2022). Up to 27.4 million Nm^3/day will be exported at Faxe (from 1 January 2023).
Storage facilities: Total withdrawal of gas from the storage facilities is estimated at 16.2 million Nm^3/day, with 8.2 million Nm^3/day coming from Stenlille and 8.0 million Nm^3/day from Lille Torup. In special operating situations, 18.5 million Nm^3/day can be supplied, with 8.2 million Nm^3/day coming from Stenlille and 10.3 million Nm^3/day from Lille Torup. A distribution of withdrawals is used which supports the highest possible system pressure.
Nybro: Supplies in Nybro, which only come from the Syd Arne field, are estimated at 0.4 million Nm^3/day.
RES: 1.6 million Nm^3 biogas/day is supplied to the gas system.
EP II: Up to 27.4 million Nm^3/day is imported at Nybro.

FIGURE 6: FUTURE GAS TRANSMISSION SYSTEM AND MARKET MODEL WITH BALTIC PIPE.



annual bookings for the 2020/2021 gas year compared to the last gas year 2019/2020, from approx. 0.45 million kWh/h to approx. 0.6 million kWh/h.

2.2 Cubic metre limit (Danish Energy Agency)

A cubic metre limit is set and published each year by the Danish Energy Agency prior to the gas year and is used to decide which customers are protected. For the 2021/22 gas year, the limit for protected customers is 2.6 million Nm^3/year, compared to 2.4 million Nm^3/year last gas year. As the limit increases, the number of non-protected customers will be reduced. In practice, the cubic metre limit means that industrial enterprises and gas-fired CHP plants will be protected if they have an annual gas consumption of less than 2.6 million Nm^3/year.

2.3 Capacity assessment for the meter and regulator stations and distribution system

Gas supplies to individual consumers must be maintainable at very low daily mean temperatures in crisis situations, where demand is expected to be unusually high. The gas system must therefore be dimensioned so that it has the necessary capacity to supply the distribution areas at all times. This is ensured by assessing the gas offtake from each meter and regulator station. The assessments are performed by Energinet on the basis of reporting from the Evida distribution company.

Energinet assesses that the meter and regulator stations and the distribution system throughout Denmark have sufficient capacity to cover the supply requirement for winter 2021/22.

RISK ASSESSMENT OF THE EUROPEAN GAS MARKET

Risk assessment of the European gas market
The European Network of TSOs (ENTSOG) prepares a forecast each year for the supply situation in Europe in the coming winter (Winter Supply Outlook) and summer (Summer Supply Outlook). Every four years, they also prepare an analysis of security of supply in Europe, to identify where and when problems with supplying gas consumers may arise in the various countries. The SOS2021 security of supply analysis was published in late November 2021.

ENTSOG's outlook for the coming winter of 2021/2022
- European domestic production remains in a downward trend
- The storage level at 1 October is the lowest seen in the last nine years due to high consumption last winter. This resulted in a low storage level at the start of the injection period, combined with low injection over the summer due to high gas prices
- The European gas system is deemed to have sufficient flexibility to be able to supply all customers throughout the season, assuming that it is possible to import gas volumes corresponding to historical imports
- LNG continues to play an important role in meeting demand as a flexible supplier
- The risk of consumers outages in Southern Eastern Europe has been reduced due to the installation of new infrastructure.

ENTSOG's analysis of security of gas supply in Europe (SOS2021)
Under EU regulation 2017/1938, ENTSOG must conduct an analysis of security of supply in Europe every four years. The analysis must be used to prepare the regional risk assessments (which precede the national risk assessments). The coming regional risk assessments describe the period from winter 2023/24 and four years ahead. This means that they must describe the Danish supply situation with both the Baltic Pipe supply corridor and the Tyra platform in operation.

ENTSOG's analysis involves simulations of failure of the largest single supply sources in specific regions (risk groups) defined in the regulation to supply the EU gas market. Supply scenarios are also defined in the regulation, such as the 20-year event for gas consumption.

In the simulations relevant to Denmark, no constraints were identified in the European gas infrastructure that led to insufficient gas supplies to the Danish and Swedish gas markets (ie no infrastructure bottlenecks were identified). ENTSOG has also conducted a sensitivity analysis of supply failures from Ukraine without Nord Stream 2 in operation, on a day with extremely high gas offtake (20-year event). In this case, there is a risk that this could affect supplies to the Danish and Swedish gas markets.

3. DEVELOPMENT IN THE DANISH GAS TRANSMISSION SYSTEM

The future development of the gas system is analysed to assess the need for long term initiatives.

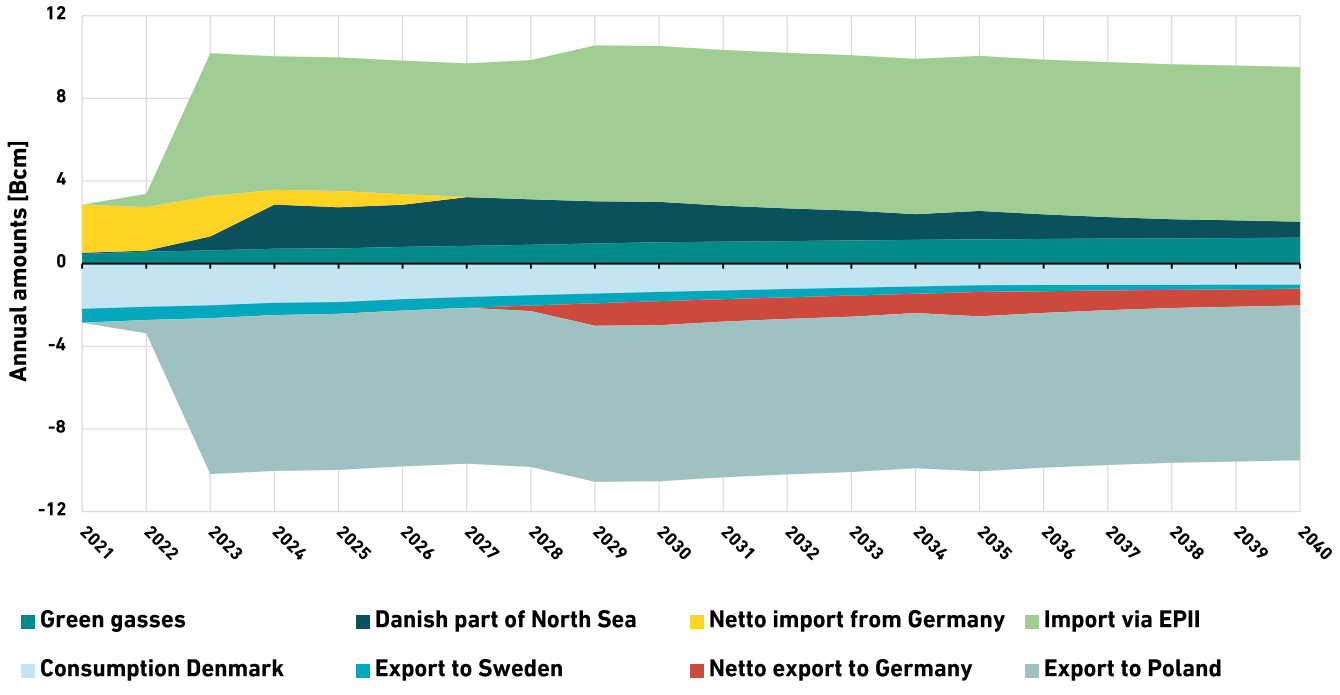
3.1 Expected use of the gas system

3.1.1 Supply situation, 2021-2040

The supply situation outlook is Energinet's best estimate of how the supply situation may develop. The supply situation is continually updated based on the analysis assumptions from the Danish Energy Agency and the North Sea forecast. The latest update for the supply situation is based on Analysis Assumptions 2021 and North Sea forecast 2021.

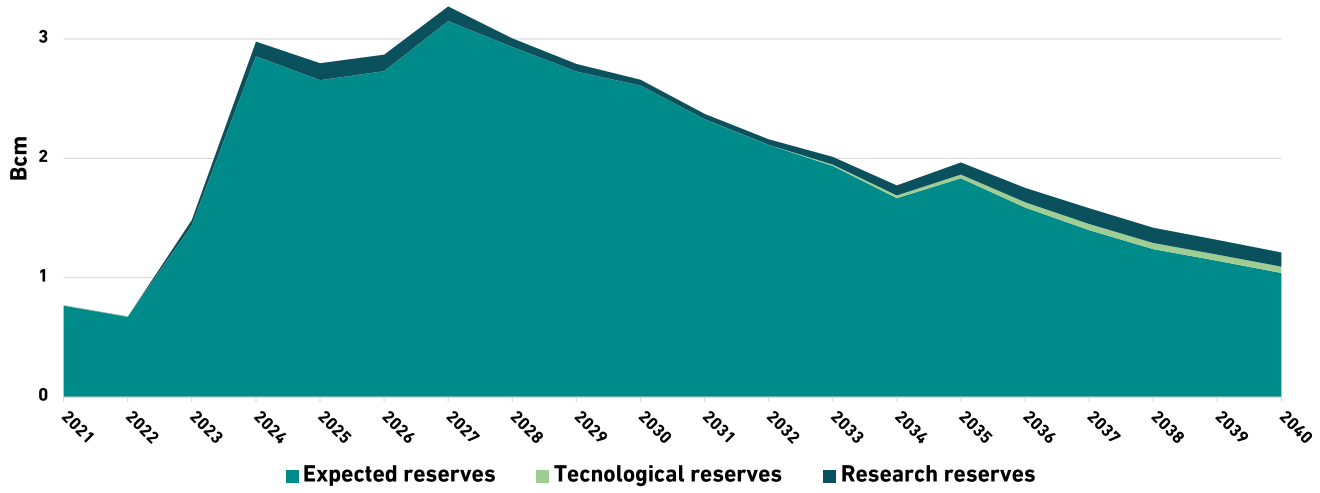
During the Tyra complex redevelopment, the Danish gas system is more vulnerable than before. However, the capacity between Germany and Denmark has been sufficiently expanded. Together with the gas storage facilities, this provides enough flexibility in the system to supply Danish and Swedish gas consumers. With supplies from Norway and supplies to Poland via Baltic Pipe, security of supply is expected to be at least as high as before redevelopment of the Tyra complex began.

FIGURE 7: COMPOSITION OF PIPE GAS IN DANISH CONSUMPTION, 2021-2040



Note: The supply situation 2021-2040 based on the Analysis Assumptions 2021.
The quantities are converted from energy unit kWh to Nm^3 using a fixed upper calorific value of 12.1 kWh/Nm^3 for all points.
Positive figures indicate import, while negative figures indicate export and consumption.
For each year, the total import equals to the sum of exports and consumption.

FIGURE 8: DANISH ENERGY AGENCY'S FORECAST FOR NORTH SEA SALES GAS, 2021-2040



Note: The figure is based on data from the Danish Energy Agency, published in September 2021. The expected reserves are a forecast of extraction from existing fields as well as discoveries using existing technology, and are included in Analysis Assumptions 2021 with a distribution of 75 % to Denmark after Tyra reopens in June 2023.

However, the technological reserves are estimates of the extraction potential when using new technology, and the exploration reserves are future new discoveries resulting from exploration activities currently underway and future new tender rounds.

3.1.2 North Sea supplies in the longer term

Major changes lies ahead for the Danish North Sea supplies, with the reopening of the Tyra complex and commissioning of the connection to the Norwegian Europipe II gas pipeline, which is part of the Baltic Pipe project.

The connection to Europipe II is expected to be commissioned in October 2022 as part of Baltic Pipe, while the Tyra complex is expected to reopen in June 2023. In the period leading up to commissioning of the connection to Europipe II, only relatively small North Sea supplies to Denmark via the Syd Arne pipeline are expected, while gas from the southern fields in the Danish North Sea will be delivered to the Netherlands.

In the period prior to the commissioning of the Tyra complex, imports from Germany will be the primary source of supply for the Danish and Swedish gas markets. In the winter months, gas from the Danish gas storage facilities will supplement this. Following reopening of the Tyra complex and commissioning of the connection to Europipe II, the connection to Europipe II will be the largest source of supply to Denmark.

Gas supplies to Denmark from the Danish part of the North Sea via Nybro are determined by North Sea production and export distribution to the Netherlands (via the North Sea), Germany (via Denmark) and Poland (via Denmark). The market players decide the distribution, but the distribution in the Analysis Assumptions is forecast to be 75 % to Denmark for the period following the expected reopening of the Tyra complex; based in part on Ørsted's agreement to supply of gas to Poland from the Danish part of the North Sea.

3.1.3 Biogas production

The volume of biogas added to the gas system is expected to increase from 500 million Nm^3 in 2021 to 1,000 million Nm^3 in 2030, corresponding to an annual share[9] of 22 % of Danish gas consumption in 2021 and 75 % in 2030 (see Analysis Assumptions for Energinet 2021). Biogas production is expected to be able to meet Danish gas consumption on an annual basis from 2034, but since biogas consumption is based on the purchase of guarantees of origin, for gas from renewable energy injected into the gas system, it is not certain that all the biogas will be consumed in Denmark.

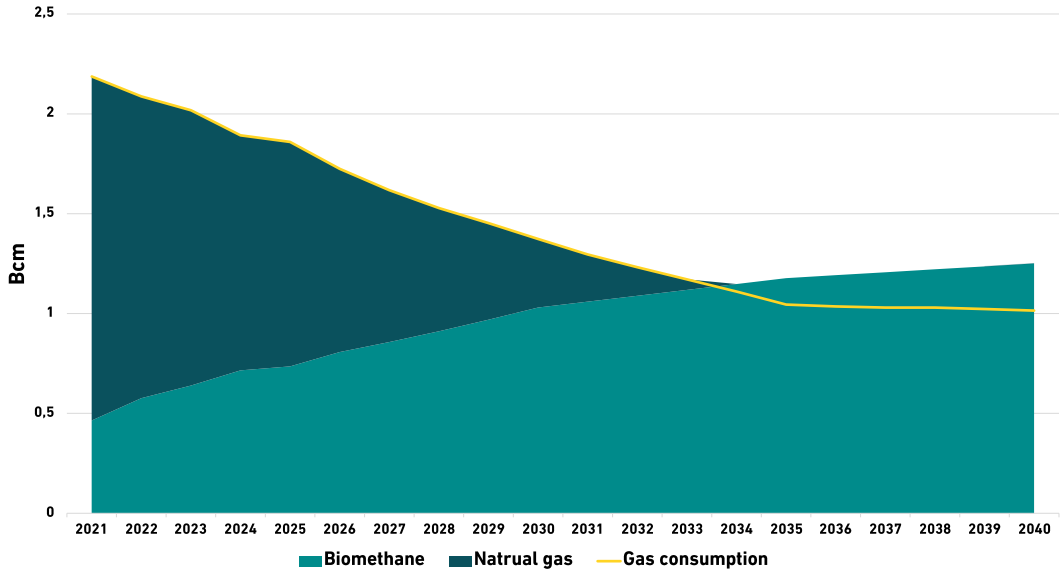
Biogas production is a significant contribution to the security of supply, both in relation to meeting an increasing share of gas demand and in relation to the locations of the biogas production facilities. Biogas provides Danish gas consumers with a larger decentralised and wide-spread gas supply. Decentralising supply will, to a certain extent, help protect consumers in the event of supply failure, as the system will not be dependent on a primary source of supply in the North Sea, but will have several small sources of supply to draw on.

3.1.3.1 Local imbalances

Local imbalances arise when the production of biogas exceeds the gas offtake in part of the distribution system, creating a local biogas surplus. Local biogas surpluses are already being handled in several parts of the gas system. As more biogas plants are established and connected, and consumption decreases, imbalances will arise in more locations. Imbalances

[9] Årsandelen opgør samlet biogasproduktion og samlet forbrug over et kalenderår. Årsandelen vil være lavere end den nævnte løbende andel som er nævnt i afsnit 2.2.4.

FIGURE 9: AF21 ON THE BIOGAS TREND



are most common during summer, when gas consumption is generally low, but this picture will change as production increases and consumption falls, with imbalances expected to occur all year round in several locations.

A biogas surplus in a local distribution system cannot be transported directly to other distribution areas or the transmission system without adaptations being made. For example, surplus biogas can be compressed and transported to the transmission system via a reverse-flow plant, or distribution systems can be connected using new pipelines.

Handling imbalances in the gas system contributes to security of gas supply in several ways. Biogas returned to the transmission system can be viewed as a source of supply to the gas transmission system. Connecting distribution grids will similarly secure supply from multiple meter and regulator stations as well as from several biogas plants in a larger interconnected distribution system area.

3.2 Consumption trend

Total Danish gas consumption is expected to decline to approx. 1,400 million Nm^3 in 2030, with biogas accounting for approx. 1,000 million Nm^3, and other gas for approx. 400 million Nm^3. The decline in gas consumption is being driven by the political goal of a 70 % reduction in CO_2 emissions in 2030 and climate neutrality in 2050. The trend in gas consumption over the next 20 years is based on the Danish Energy Agency's Analysis Assumptions for Energinet 2021 report, which reflects the current political goals.

3.2.1 Trend in consumer segments

The business sector uses gas for heating and for process purposes. Overall, gas consumption is expected to decline towards 2030. The reduction is primarily expected to be in the gas consumption for room heating. A decline in gas consumption in the business sector will occur despite expectations that parts of industry will see an increase in consumption due to the conversion from coal to gas. Nordic Sugar's connection to the gas system in 2024 is an example of this.

Aalborg Portland will be connected to the gas system in 2022. The projection for commercial gas consumption does not include large new gas consumption

for cement production. However, Aalborg Portland has the potential for gas offtake, which will increase commercial consumption towards 2030 if they replace a significant proportion of their existing coal and coke consumption.

In 2030, consumption of gas for heating in households is expected to have dropped by half compared to today. This is due to the expected effects of subsidy pools for electric heat pumps, reduced taxes on electric heating and funding for rolling out district heating, to support the political aim of phasing out oil and gas-fired boilers.
Gas consumption for combined heat and power and district heating is expected to fall to one third of current consumption in 2030. The reason for the decline in consumption is primarily that local CHP plants no longer receive subsidies, and that taxes on heat from electricity have been reduced. This means that the economics of gas operation at CHP plants have, relatively speaking, deteriorated. In future, gas is expected to primarily be used for combined heat and power and district heating in peak-load situations, for example when it is very cold, or if electricity prices are high due to low RE-based electricity generation from wind and solar power. In a normal year, this does not amount to much energy, but very high gas consumption may be seen on occasions, primarily for peak-load heat generation. Considerable fluctuations can be expected from year to year.

Unlike other segments, the transport sector's use of gas is expected to increase in step with greater interest in the use of biogas for road transport. According to the Danish Energy Agency's projection, the future consumption of gas for transport is highly uncertain.

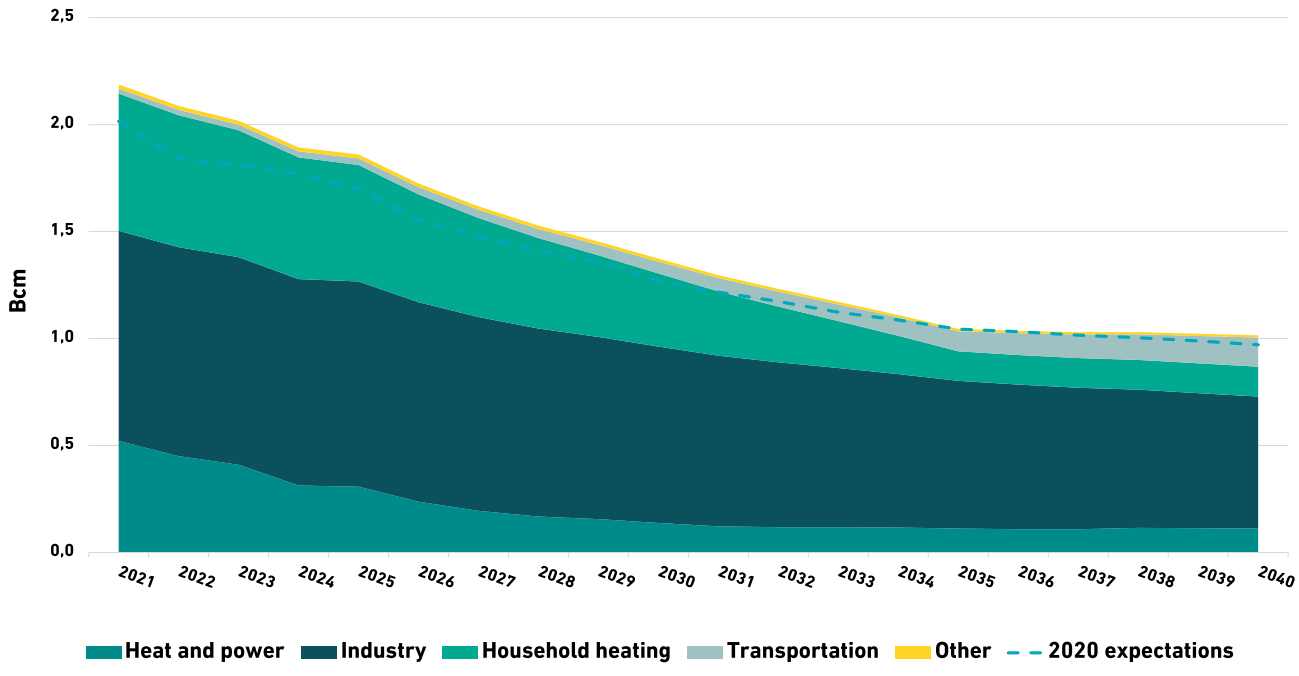
The consumption trend does not reflect the expressions of interest in switching from coal to gas in the industry. This means that gas consumption is expected to be higher than indicated in the assumptions. This particularly applies to Aalborg Portland's plan to convert to gas, which is expected to significantly increase total gas consumption. The total gas consumption by industry as a result of conversion from coal is therefore highly uncertain.

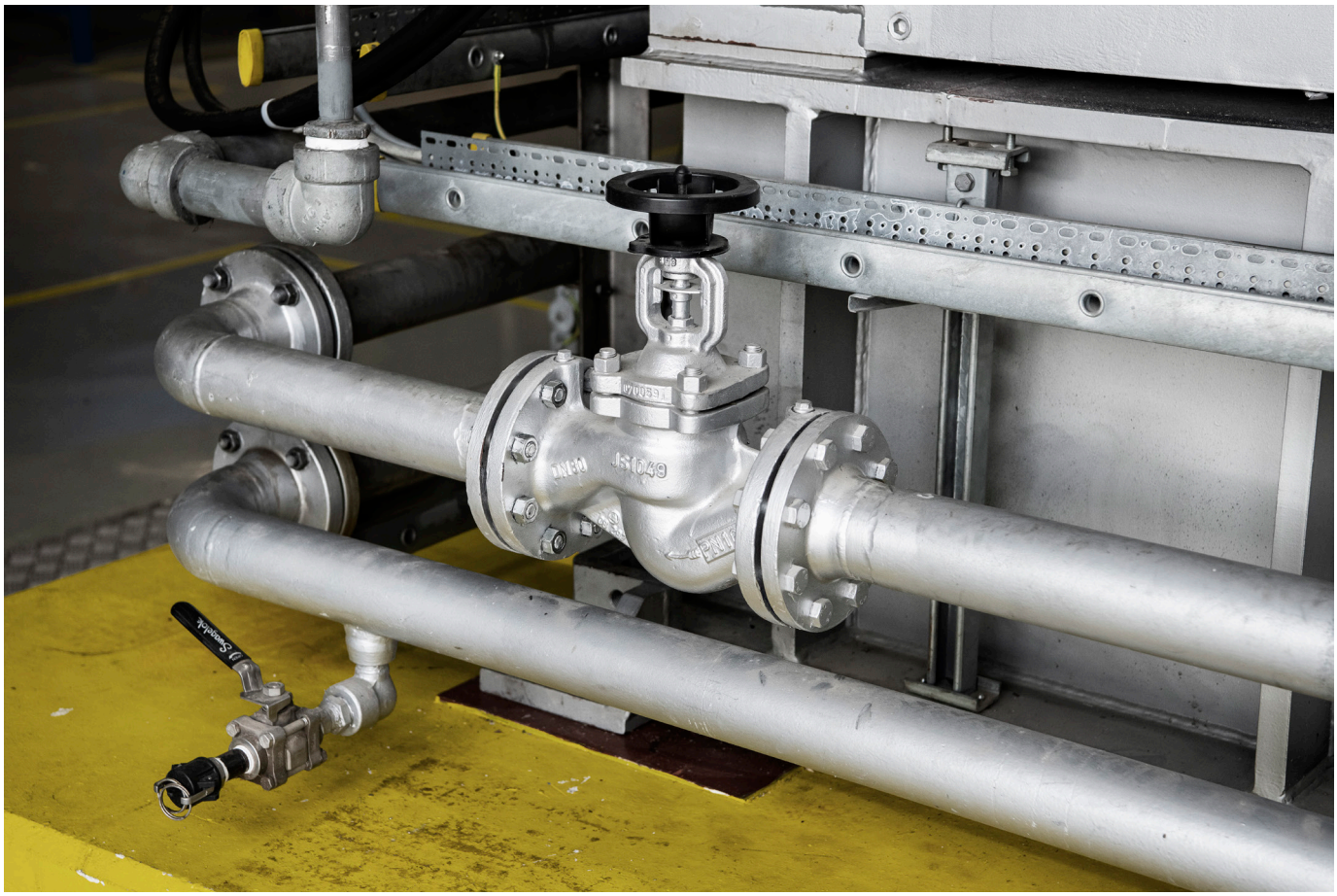
3.2.2 Consumption trend in Sweden

Sweden receives its gas from Denmark only. Gas consumption in Sweden must therefore be met by supplies from the Danish gas system. Expectations for Swedish gas consumption are based on dialogue between the Danish Energy Agency and the Swedish energy authorities[10]. In general, Swedish gas consumption via Danish infrastructure is expected to decline as domestic production of biogas increases and gas consumption is reduced. This will be offset by greater consumption of LNG in

[10] Summary note for the Danish Energy Agency's Analysis Assumptions for Energinet, 2021.

FIGURE 10: EXPECTED TREND FOR GAS CONSUMPTION BY USE FOR THE PERIOD 2021-2040 AND ASSUMPTIONS FOR GAS CONSUMPTION FROM 2020





Swedish industry. However, this is not supplied via the Danish gas infrastructure. Approx. 670 million Nm^3 of gas is expected to be supplied to Sweden in 2021. This is expected to drop to approx. 450 million Nm^3 in 2030. Sweden has a small share of domestic biogas production, but is expected to continue to have Denmark as its primary source of supply.

3.3 Gas market trend

3.3.1 The Danish gas market

The Danish gas market remains dependent on one primary source of supply until Baltic Pipe is commissioned: The Ellund connection to Northern Germany. The Danish gas market therefore continues to be affected by prices on the North West European gas market. Later – presumably in 2023 – the Tyra platform will also be back in operation. This will lead to a robust situation for the Danish gas market, as it will have access to more sources of supply.

This may allow more active shippers into the Danish gas market, as Denmark will be a gateway for access to the Eastern European gas market.

3.3.2 The European gas market

In the European gas market, the trend of decreasing domestic production within the EU is expected to continue. The EU's domestic gas production has decreased significantly in recent years. There is also an expectation that large gas markets in Central and Eastern Europe will increase their demand for gas. They plan to phase out coal-fired power stations and expand their gas infrastructure. Coal is expected to be replaced by gas in the short term. Gas supplies must therefore be increased by importing from other sources.

The commissioning of Nord Stream 2 from Russia is expected to significantly boost the future gas supply. Nord Stream 2 is a connection between Russia and Germany which is expected to provide 55 bcm/year. However, Nord Stream 2 has been impacted by many sanctions. It is therefore still uncertain when it will be commissioned. Several countries are also focusing on expanding their LNG terminals, so they can receive gas from all over the world. Germany, Poland and Croatia all have specific plans for expansions. This will result in greater diversification in Europe's sources of supply, boosting security of supply.

3.4 Development of Danish gas infrastructure

Energinet is working to develop the transmission system, so it is technically optimised and cost-effective, based on holistic grid planning. This means that solutions must be found which can handle the short-term needs while also supporting the long-term development of the gas system.

Work on developing the infrastructure is being investigated in connection with

Energinet's analysis of the long-term development needs for the gas system[11]. The development needs encompass maintenance of the existing gas system, reinvestment and conversion, the use of new technologies, and the need for capacity adjustments and adaptations that reflect the green transition. A special angle in this context is sector coupling, with a focus on integrating electricity, gas, biogas, hydrogen etc. For example, the possibility of moving RE electricity production to the gas system via the methanisation of biogas is being investigated, and whether there is free capacity in the gas transmission system which can be used for hydrogen etc.

Digitalisation will play a key role in addressing greater unpredictability. This will be combined with demands for productivity improvements and a greater ability to make decisions based on facts for the chosen solutions, with economic optimisation in mind.

3.4.1 Further development of the gas system

Regarding the overall transmission system, it appears that no further changes are needed to ensure a continued high level of security of supply, even though the system will be running at almost full capacity when Baltic Pipe is commissioned, at the same time as Aalborg Portland and Lolland Falster need to be supplied.

As gas consumption decreases and a larger share is covered locally by biogas added to the gas system, an overall trend emerges in which the need for transport from the transmission system to the distribution systems through Energinet's meter and regulator stations is reduced. On a cold day, for most meter and regulator stations this means a reduction in utilisation corresponding to 30-50 % of its maximum capacity. In areas with a lot of biogas or a large share of gas used for heating, a greater reduction is seen. If biogas production drops or there is extraordinarily high consumption, the meter and regulator stations will continue to serve as backup for the distribution system and ensure a high level of security of supply.

There are various trends which affect the future utilisation of the meter and regulator stations:

1. As more gas distribution systems are connected, security of supply will increase as more meter and regulator stations supply the same areas;
2. New gas consumption will result in higher gas offtake in the peak-load situation at some meter and regulator stations. This is the case on Funen, where Fyn Power Station is being converted from coal to gas.

It may therefore be necessary to adapt the meter and regulator stations to the future system utilisation to ensure a high level of security of supply.

Growth in biogas production and declining consumption also mean that the transmission system must be adapted to better handle biogas production. This is being done in close cooperation between Evida and Energinet. For Energinet, this means that reverse-flow plants will be established to ensure that the biogas can be transported via the transmission system, stored in the large gas storage facilities, and used anywhere in the gas grid.

3.4.2 Maintenance of the gas transmission system

Denmark currently has a gas system with a high level of security of supply for the Danish gas market. Most of the Danish gas system was established in the 1980s, and has been continually monitored and maintained to ensure efficient operations and that it is available to commercial players with sufficient capacity. The basic life span of most of the physical assets is 30-50 years.

To meet a continued high level of security of supply, it is therefore natural that large parts of the gas system will require major reinvestments in the years ahead. This need has been calculated based on the condition assessments continually performed for the various plant types. Teknik & Anlæg (T&A) manages the physical assets for the owner of the gas transmission system, in line with principles from the ISO 55001 Asset Management system. The goal of introducing asset management in accordance with ISO 55001 is to ensure a uniform, high standard for management of the physical assets – from design and establishment to operation and maintenance and final asset disposal. The imminent certification means that Energinet will undergo annual audits by external certified auditors. Asset Management must also be the common reference for asset management across the organisation and in relation to our business partners. T&A expects to be certified at the end of 2022.

A maintenance strategy provides the framework for achieving efficient operation, including the asset management goals at any time. The maintenance strategy thus also provides a common framework for the Asset Management Plans (AMP) related to each type of plant, and ensures cohesion between these and the Strategic Asset Management Plan (SAMP) and hence the fulfilment of the owner's goals.

The general framework for the construction and maintenance of the owner's physical assets is provided by Executive Order no. 414 on Natural Gas. Actions are also guided by the GPTC guide, with the Danish Working Environment Authority's F.0.1 supplementary provisions. The aim of introducing asset management in line with ISO 55001 is to work more systematically with condition-based maintenance. This

[11] https://en.energinet.dk/About-our-reports/Reports/Long-term-development-plan-gas-2021

FIGURE 11: THE MAP SHOWS WHICH SECTIONS WORK CAN CONTINUE TO BE DONE ON (GREEN LINES) AND THE SECTIONS WHICH ARE STILL AFFECTED BY THE DANISH ENVIRONMENTAL AND FOOD APPEALS BOARD'S REVOCATION OF THE DANISH ENVIRONMENTAL PROTECTION AGENCY'S ENVIRONMENTAL PERMIT FOR THE BALTIC PIPE PROJECT IN DENMARK.

involves an effort to explore the potential for increasingly transitioning from schematised maintenance at fixed intervals, to condition-based maintenance with dynamic intervals. The ongoing operation and maintenance of the gas system is managed by prioritising and highlighting critical assets, justifying the activities and identifying and addressing the risks that require attention.

3.4.3 International infrastructure projects

In relation to gas, Energinet is currently working on one international infrastructure project – Baltic Pipe.

3.4.3.1 Baltic Pipe

Energinet, together with Polish gas TSO GAZ-SYSTEM, is currently implementing the Baltic Pipe project – a new gas transport route which will allow up to 10 billion Nm^3 of gas per year to be transported from Norway to Poland via Denmark.

The general status of the project is that the aim is still to have capacity available on 1 October 2022, but it will not be possible to have the full capacity available before 1 January 2023. This is because on 31 May the Danish Environmental and Food Appeals Board revoked the environmental permit for the Baltic Pipe project issued by the Danish Environmental Protection Agency in July 2019.

According to the appeals board, the Danish Environmental Protection Agency issued the environmental permit before an adequate explanation had been given of how annex-IV species (such as dormice, birch mice and bats) and their breeding and resting areas would be protected during work on the approx. 210 km long gas pipeline.

Energinet has subsequently been given permission to resume work on the sections where Annex-IV species are not impacted. An overview of the parts of the project affected is given in figure 11.

Once Baltic Pipe is fully established, it will have an impact on the flexibility and extra capacity of the overall system. Baltic Pipe is being built as an integral part of the overall transmission system, and not as a separate pipeline. This is because parts of the existing infrastructure can be used to transport gas from Norway to Poland via Denmark.
This has the advantage that Energinet will be able to more efficiently utilise the gas system, while also making Baltic Pipe cheaper to establish than if a separate pipeline had to be built with the full capacity. It also means that the system will have to be operated with a higher utilisation rate than it is today, as some of the available capacity in the existing system can be utilised.

In practice, this means that there will be less flexibility and less extra capacity in the system than today, at times when there is high utilisation – especially when a lot of gas is being transported from Norway to Poland via Denmark. It also means that operation of the system will change, as there will be less flexibility. This will also have an impact on the market, in the form of limitations on the size of imbalances players are permitted to have during a gas day.

You can read more about the Baltic Pipe project on Energinet's website

TARIFFS FOR USE IN THE TRANSMISSION SYSTEM, TRANSPORT TARIFF & EMERGENCY SUPPLY TARIFF

At the end of 2021, Energinet will announce an extension of the current uniform tariff principle, with a few adjustments. Energinet wants to expand the uniform tariff principle to include the upstream part of the Baltic Pipe project (the EP II connection). The volume tariff will also be removed, and the settlement period will be changed from the gas year to the calendar year.

The adjustments are being made to achieve a higher degree of harmonisation with adjacent systems.
Removing the volume tariff also has the effect of significantly reducing the volume risk associated with Baltic Pipe and thus supports tariff stability.

Removing the volume tariff means that the capacity tariff will rise, as the cost base must continue to be covered by the total tariff income.

In future, the capacity tariff is expected to be around DKK 34-35 per kWh/h/year.

In the current gas year, the emergency supply tariff is around DKK 0.0062/kWh (average tariff), but is expected to fall to around DKK 0.0044/kWh in the coming years, as a result of the changed security of supply situation following the commissioning of Baltic Pipe.

4. SECURITY OF GAS SUPPLY BACKGROUND

Gas is an important part of the Danish energy mix and is used for domestic heating, in industry and for electricity and district heating generation. Some Danish gas customers are vulnerable to gas supply failures in specific situations, for example private households on cold winter days.

4.1 Security of gas supply in Denmark

Energinet is responsible for ensuring sufficient transport capacity in the transmission system. Energinet is also responsible for ensuring system integrity, including interaction with adjacent systems. However, responsibility for the availability of gas supplies to gas customers on the day of consumption lies with the market players, ie players who purchase gas at the wholesale stage of distribution and gas suppliers who sell the gas to consumers. Energinet will only manage the gas supply in an emergency situation, in which the market players are unable to meet their obligations, in order to avoid a breakdown of the transport system. Energinet also ensures that the gas supply to protected customers, including solidarity-protected customers, is maintained in an emergency supply situation.

The responsibilities of the various players are stated in the Danish Consolidated Gas Supply Act and the Danish preventive action plan and emergency plan. Energinet continuously monitors the supply situation and ensures that the market players are kept up to date, so that they can take the necessary precautions to prevent any critical supply situations.

4.2 EU Security of Gas Supply Regulation

The EU member states face a common challenge, in that they consume far more energy than is produced within the EU. The EU is therefore dependent on large volumes of energy being imported. This is a strategic challenge, which has become particularly evident at a time when political relations with Russia are strained, given that Russia is the EU's largest source of supply. Security of gas supply in the EU is therefore a high political priority, and the framework for security of gas supply is defined in European legislation. The Security of Gas Supply Regulation concerning measures to safeguard the security of gas supply (the 'Security of Gas Supply Regulation') sets the framework for members states' cooperation.

The purpose of the Security of Gas Supply Regulation is to help ensure that all necessary measures are taken to secure an uninterrupted supply of gas to gas customers on cold days with unusually high gas consumption (the '20-year event', which in Denmark is defined as a 24-hour period with a mean temperature of -13°C during a peak-load period of seven days) and in the event of an extended gas system disruption.

One of the fundamental elements in the Security of Gas Supply Regulation is to maintain a well-functioning internal market in the event of situations with gas supply shortages. This means that the market – at national, regional and European levels – helps to strengthen security of supply throughout the EU.

4.2.1 Crisis levels

A crisis situation arises in cases where a normal supply situation cannot be maintained and there is a risk of insufficient gas to supply gas consumers.

DANISH AND EUROPEAN LEGISLATION ON SECURITY OF GAS SUPPLY

DANISH CONSOLIDATED GAS SUPPLY ACT (THE DANISH GAS SUPPLY ACT)

Energinet's tasks
Section 12(1) of the Danish Gas Supply Act states that a transmission company must:

- connect, as required, plants to upgrade biogas (upgrading plants), distribution systems and consumers,
- ensure and measure the quality of the gas supplied to or from the transmission system,
- handle tasks concerning security of gas supply in Denmark,
- cooperate with other transmission companies towards the efficient interchange of gas,
- develop plans to meet future transmission capacity needs,
- ensure a safe physical balance in the company's transmission system

Energinet's contingency arrangements
Under the Danish Gas Supply Act, Energinet is responsible for making reasonable contingency arrangements. This means that Energinet must:

- Prepare risk and vulnerability analyses.
- Prevent risk, were possible.
- Prepare contingency plans.
- Rehearse the key elements in the contingency planning.
- Evaluate and learn from exercises and events.

As a transmission company, Energinet also has a coordinating role in the sector, both on a daily basis and during crises.

DANISH EXECUTIVE ORDER ON MAINTAINING SECURITY OF NATURAL GAS SUPPLY

Energinet's tasks

- Performing the general planning and operational functions required for maintaining security of gas supply in accordance with the Regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply.
- Monitoring the security of gas supply. For this purpose, Energinet prepares and submits an annual report on security of gas supply to the Danish Energy Agency.

Protected customers
The Executive Order contains a description of protected customers in Denmark in accordance with the Regulation concerning measures to safeguard the security of gas supply.

Solidarity-protected customers
Solidarity-protected customers comprise the most vulnerable customers. It must always be possible to supply solidarity-protected customers with gas, even during an extreme supply crisis where it is necessary to ask neighbouring member states to supply gas under the solidarity mechanism.

REGULATION 2017/1938 CONCERNING MEASURES TO SAFEGUARD THE SECURITY OF GAS SUPPLY

The regulation primarily establishes a legal framework for the following:

- Definition of protected customers and solidarity-protected customers.
- Definition of infrastructure standard, supply standard and crisis levels.
- Division of responsibilities, solidarity, planning and coordination concerning preventive measures and in response to actual disruptions to supplies at member state level, regional level and EU level.
- Regional and national risk assessments, preventive action plans and emergency plans, including exceptional measures that can be introduced when the market is no longer able to satisfy gas demand. The documents must be updated every four years.
- A well-functioning internal market, even if there is a shortage of supply.
- Solidarity in supply crises.

The escalation of a crisis situation is divided into three crisis levels, which must be used in all EU member states: Early Warning, Alert and Emergency. The declaration of the given crisis level depends on the volume of gas available in the system and on whether the market is able to handle the crisis on its own.

Energinet may declare an Early Warning and an Alert if there is a risk of an incident resulting in a deterioration of the supply situation.

- An Early Warning is declared if there is a presumption that an incident may occur which will result in a deterioration of the supply situation, and which may lead to an Alert or an Emergency being declared.
- An Alert is declared if an incident occurs that causes a significant deterioration of the supply situation, but where the market is able to handle the situation.

In Early Warning and Alert situations, the market is able to handle the crisis situation on its own, and Energinet may draw on a number of market-based tools to support the market, including higher imbalance payments and commercially interruptible customers. If the crisis situation deteriorates to such a degree that the market is unable to handle the crisis on its own, Energinet may declare an Emergency.

- An Emergency is declared when all relevant market-based tools have been used up and the gas supply is still not sufficient to meet demand.

In an Emergency, Energinet obtains access to 'non-market-based tools' which are to help maintain supplies to protected customers. Use of emergency storage and interruption of large gas consumers are examples of non-market-based tools.

4.2.2 European or regional supply crisis

The crisis levels can also be used by the European Commission, which adopts crisis level decisions in the event of European or regional supply crises. After receiving the European Commission's decision, the Danish Energy Agency passes it on to the Danish system. From then on, Energinet handles the situation according to the Danish security of supply model.

In the event of a supply crisis at EU or regional level, Denmark must not use tools unduly restricting the flow of gas in the internal market. The European solidarity principle ensures that the flow of gas is not restricted on an unjustified basis in an Emergency at EU level.

4.2.3 Protected, non-protected and solidarity-protected customers

4.2.3.1 Protected customers

In accordance with the Security of Gas Supply Regulation, 'protected customers' must be guaranteed gas supply for at least 30 days in the event of unusually high demand or of disruption of the largest single gas supply infrastructure. Today, gas supplies from Germany are the largest single gas infrastructure. Gas customers which are not protected customers may risk having their gas supply interrupted in a crisis situation where Energinet declares an Emergency crisis level.

All private gas customers (households) are protected, but other customer types may also be included. In Denmark, the Danish Energy Agency makes these decisions. In addition to households, it is possible to include key social services (such as hospitals and educational institutions) and small and medium-sized enterprises, as long as their consumption is not more than 20 % of total consumption, as well as district heating installations as protected customers.

The protected customers comprise around 400,000 private customers, public enterprises, CHP and district heating plants and small enterprises, which together account for approx. 70-75 % of the consumption.

4.2.3.2 Non-protected customers

Non-protected customers are typically large enterprises. The need for disconnection of non-protected customers will depend on the specific situation, and a minimum notice of three days will be given to allow the enterprises an orderly shutdown of processes for which natural gas is used. An Emergency will not automatically trigger interruption of gas supplies to Danish non-protected customers. A model may be used according to which non-protected customers in Denmark and Sweden may be partly (pro rata) disconnected if surplus gas is available after protected customers have been supplied.

To reflect the differential treatment of the different customer groups in an Emergency, two different tariffs apply to security of supply. There is one tariff for protected customers and another lower tariff for non-protected customers.

The non-protected customers comprise approx. 60 large industrial enterprises and central power stations.

4.2.3.3 Solidarity-protected customers

Solidarity-protected customers are defined in the Security of Gas Supply Regulation and comprise the most vulnerable customers. It must always be possible to supply solidarity-protected customers with gas, even during an extreme supply crisis where it is necessary to ask neighbouring member states to supply gas under the solidarity mechanism.

All households are solidarity-protected customers. In addition, a few key social services such as hospitals (not educational institutions) and some district heating installations which supply heating to households and essential social services are also solidarity-protected customers. The likelihood that the national supply is reduced down to the solidarity-protected customers' consumption is small.

Under the Security of Gas Supply Regulation, gas customers who are protected, but not solidarity-protected, must have access to financial compensation for the loss they may incur as a result of an interruption of their gas supply resulting from activation of the solidarity principle. This will typically be small and medium-sized enterprises as well as some district heating installations and essential social services. The non-protected customers, who already have to be disconnected in an Emergency, are not entitled to compensation.

4.2.4 Solidarity

The EU's objective is that vulnerable natural gas customers must be ensured gas in cases where insufficient gas supplies are available. In the most recently revised Security of Gas Supply Regulation from 2017, this has resulted in a formalised solidarity principle between the EU member states. The member states may, as a last resort in an Emergency, request a neighbouring member state to take solidarity measures. This provides access to extra gas in situations where there is a risk that vulnerable gas customers cannot be supplied.

The member state requesting solidarity must pay financial compensation to the neighbouring member states which supply gas under the solidarity mechanism. The compensation is calculated based, among other factors, on the loss incurred by enterprises due to disruption of their gas supply.

The Danish Ministry of Climate, Energy and Utilities has negotiated an international agreement on gas solidarity with Germany, and an agreement with Sweden is expected soon. Under the Security of Gas Supply Regulation, Sweden is exempt from showing solidarity with Denmark, as Denmark is Sweden's only source of supply.

4.3 Documentation of security of supply

The Security of Gas Supply Regulation requires that the individual member state must prepare a number of documents describing the way crisis situations are handled: risk assessment, preventive action plan and emergency plan.

The aim is to ensure uniform handling of supply crises in the EU.

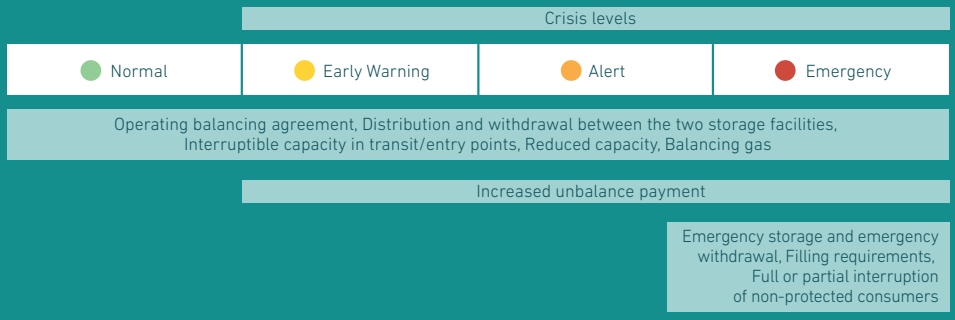
THE DANISH SECURITY OF SUPPLY MODEL

The gas market plays a key role in the Danish security of gas supply. Energinet supports security of supply by using the Danish security of supply model. The security of supply model is structured within the framework of the Security of Gas Supply Regulation.

The model contains specific marketbased and non marketbased tools, which Energinet can use at the various crisis levels. The use of these tools will largely depend on the type of situation to be dealt with. The choice of tools therefore depends on both the effect and cost of the individual tool. Certain tools can only be used in certain situations.

Of course, Energinet's decision will take account of the wider circumstances in addition to the incident itself. It will often be more serious if an incident occurs in winter than in summer because gas consumption is highly temperature dependent.

FIGURE 12: TOOLS IN THE DANISH SECURITY OF SUPPLY MODEL



These documents must be regularly updated as required, and at least every four years. The current documents were prepared in 2019 and cover the 2018-22 period.

Risk assessment
Each member state in the EU must prepare a national assessment of all relevant risks to security of gas supply. Joint assessments must also be prepared for the most important cross-border risks to security of gas supply for the various regional risk groups. The national risk assessment and the regional risk assessment for the 'Denmark' group are further described in section 4.3.1 below. The national risk assessment incorporates the results from the risk assessments in the regional risk groups.

Preventive action plan
A preventive action plan must be prepared containing the measures needed to eliminate or mitigate the risks identified in the national risk assessment and the relevant regional risk assessments. Regional sections have been incorporated in the individual national action plan.

Emergency plan
An emergency plan must be prepared containing the measures to be taken to eliminate or mitigate the impacts of a gas supply disruption. Regional sections have been incorporated in the individual national emergency plan. The European Commission is currently discussing a number of questions it has in relation to the plan with the Danish Energy Agency, such as the disconnection of Sweden in crisis situations.

4.3.1 Risk assessment

4.3.1.1 National risk assessment

In the risk assessment, an assessment is made of whether the gas infrastructure is designed to supply total gas demand on a day with unusually high demand due to breakdown of the largest infrastructure in Denmark.

Examples of two types of scenarios which could affect supplies to Danish gas consumers during the Tyra shutdown are given below.

Scenarios affecting the supply to Denmark:
- Technical incidents in the North German gas transmission system
- European supply crisis.

Scenarios affecting operation of the Danish gas transmission system:
- Outage of the Stenlille gas storage facility
- Outage of Egtved compressor station
- Rupture in the pipeline from Egtved to Dragør.

The national risk assessment forms the basis for the following conclusions:

Supplies from Germany
Supplies from Germany may be interrupted both as a consequence of a European supply crisis and in the event of technical disruption in the North German gas transmission system. The German TSO, Gasunie Deutschland, has assessed that, in all likelihood, it will always be possible to maintain at least 65 % of the anticipated supplies in Ellund in connection with the lowering of the supply pressure, which is acceptable to Energinet. Together with an expansion of the withdrawal capacity in the Lille Torup gas storage facility, this will provide sufficient security of supply for the Danish gas market.

However, there is low probability that it will be necessary to declare an Emergency and thus gain access to non-market-based tools.

Stenlille gas storage facility
In the event of an emergency shutdown at Stenlille gas storage facility in a situation with unusually high gas demand, a bottleneck will occur in the transmission system between the supply sources in the west and the gas consumers in the east. In this case, it may be necessary to use the market-based tools in the security of supply model, as action must be taken relatively quickly. As a last resort, it may be necessary to declare an Emergency and thus obtain access to non-market-based tools.

4.3.1.2 The joint risk assessment for risk group Denmark
The regional risk groups are defined in the Security of Gas Supply Regulation. Denmark is in the following three groups: Denmark, Norway and Baltic Sea. The Danish Energy Agency coordinates risk group Denmark, where a joint risk assessment is prepared for the Danish and Swedish gas markets.

As stipulated by the Security of Gas Supply Regulation, the Danish Energy Agency has coordinated the regional risk assessment with the authorities in the neighbouring member states, i.e. in particular the German Federal Network Agency and the Swedish Energy Agency, but also the Netherlands and Luxembourg. The Danish Energy Agency participates actively in the other two groups. In 2022 due to the commissioning of Baltic Pipe, Denmark will also participate in the regional risk assessment groups: Ukraine, Belarus and North East, and Poland will join the risk group Denmark.

The scenarios which affect the supply in Denmark also affect the supply in Sweden. This is because the Swedish gas system is connected to the Danish gas system, and is completely dependent on it. An outage of the Egtved compressor station in Central Jutland, for example, will affect the gas supply to Eastern Denmark as well as the gas supply in Sweden.

In risk group Denmark, it was decided to focus on the most likely scenario for outage of the largest infrastructure for the region: a technical incident at the compressor station in Northern Germany (Quarnstedt), which is critical to supplying gas to Denmark. Gasunie Deutschland has stated that, in the event of an outage of the compressor station, it will still be possible to supply 65 % of the firm capacity in Ellund, which will be sufficient to supply both the Danish and Swedish gas markets.

4.4 Emergency planning
In the field of energy, the purpose of contingency planning is to ensure that the most important parts of society's energy supply are maintained and continued in crisis situations. Emergency planning is thus different from security of supply in that it does not target normal operation. In the gas sector, emergency planning also focuses on

the safety of the surroundings. Gas is highly flammable, making it important for the contingency arrangements to work preventively and to react quickly to contain accidents.

Contingency planning in the Danish electricity and gas sector is organised in relation to the sector responsibility principle. This means that the player with day-to-day responsibility for a given sector also has responsibility in the event of a crisis. Emergency incidents are rare but can have major impacts on society, unless there is an appropriate rapid response.

Emergency incidents often require cooperation with organisations outside the gas supply sector, such as the police, fire department and national emergency response services.

4.5 Information security

Digital development of the energy sector is essential to the efficient and secure operation of the energy system in the future. Digitalisation will increase dependence on secure and stable IT systems, making the gas system more vulnerable to IT disruptions, faults or cyber attacks.

Energinet has three general information security objectives:

- Availability: Systems, data and information are available when needed.
- Integrity: Data and information are complete and reliable and have not been distorted.
- Confidentiality: Data and information may be confidential and require protection from unauthorised access.

Data integrity and the availability of critical control systems, in particular, are crucial to security of supply.

Information security breaches or IT downtime at Energinet have not had serious impacts on the Danish gas supply. Information security is a strategic focus area, and, for several years, Energinet has had a special focus on safeguarding supply-critical IT systems and training in contingency situations where systems are unavailable. Various system tests, controlled hacker attacks and information campaigns have been regularly conducted internally at Energinet.

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