

REPORT

REPORT ON SECURITY OF GAS SUPPLY 2023

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1. Introduction

In Europe, attention is still focused on security of the gas supply to consumers and industry. There is an attention on the role played by the European gas system – and particularly the European and Danish gas storage facilities – in security of supply, and on how security of supply will be maintained from October 2023 to April 2024¹.

Due to geopolitical unrest on several fronts, and especially Russia's invasion of Ukraine, Europe's dependence on Russian gas has put security of the gas supply at risk, created a new supply situation and changed the gas' infrastructure. Where Russian gas previously accounted for 40% of the EU's gas supply, there is now a political desire to move completely away from Russian gas in the 2023-2026 period. The events paint a picture of a European gas infrastructure that is closely linked overall, and has shown resilience at a time of multiple global risks. The greater dependence on Liquefied Natural Gas (LNG) in Europe also means that gas supplies in the EU are dependent on the global LNG market. This trend is influencing how Denmark and Energinet are handling security of the gas supply.

Danish Executive Order no. 962 of 27 September 2012 on maintaining security of natural gas supply stipulates that Energinet must report on the past gas year² (October 2022 to October 2023), its developments and status. In line with the current legislation, Energinet therefore publishes a report on the supply situation each year, with the aim of describing the overall perspectives of the past year concerning security of gas supply. This document constitutes the Report on Security of Gas Supply 2023.

According to Danish Executive Order no. 962 of 27 September 2012 on maintaining security of natural gas supply, Energinet is responsible for performing the general planning and operational functions required for maintaining security of natural gas supply in accordance with the Regulation of the European Parliament and of the Council concerning measures to safeguard the security of gas supply.

The report describes the security of gas supply situation over the past year and expectations for the coming winter. The report does not look far ahead in time, and is primarily based on data and analyses for the near future. The report on the security of gas supply 2023 presents the overall picture of the security of gas supply in Denmark and the EU, the Danish supply model and the storage situation in Denmark and the EU. The report also describes supply and demand, expected future demand and available supply, and the status of gas system quality and maintenance level. The report also contains forecasts of expected developments and provides a picture of the winter Denmark is likely to face in terms of security of gas supply.

¹ The 2023/2024 reference period.

² The 2022 gas year runs from October 2022 to October 2023.

2. Security of the gas supply in general – background

Gas is an important part of the Danish energy mix and is used by private consumers, in industry and for electricity and district heating generation. Danish gas customers can be affected by and some even vulnerable to events that impact the gas supply. The challenges are at their peak during the cold winter days.

During the October 2022 to October 2023 gas year, security of the gas supply continued to be impacted by geopolitical events, in particular Russia's invasion of Ukraine. This has had a number of direct and indirect effects. We are seeing an increase in Liquefied Natural Gas³ capacities at the European level, and there has been a clear increase in Denmark in the share of total Danish gas consumption met by biogas. Biogas is thus playing an increasingly important role in the Danish gas system. As gas consumption decreases, the share of biogas in the Danish gas system is increasing, **and** 37.9%⁴ of Danish gas was met by biogas in the December 2022 to November 2023 period.

Against this background, in the following sections the report will examine security of the gas supply in Denmark and the EU and describe the Danish supply model.

3. Gas security of supply in Denmark and the EU

The EU's gas infrastructure ensures high supply capacity between member states and supports the gas market, which ensures trade between the European countries. In practice, this means that Danish security of supply is closely linked to security of supply in the EU today. This means that if the EU experiences gas shortages, there will also be greater pressure on the supply to Denmark. Following the Russian invasion of Ukraine and the sabotage of the North Stream pipelines, the EU's security of gas supply has been impacted by a reduction in Russian gas imports, which have not yet been fully compensated by LNG imports.

The strategic Baltic Pipe⁵ gas infrastructure project is a new supply connection in the European market that connects the Danish and Polish gas transmission systems with the Norwegian fields in the North Sea. Baltic Pipe commenced full operation on Wednesday 30 November 2022, and utilisation of the connection is now stable at 80-90% of technical capacity.

The connection improves security of supply in Poland and in countries connected to Poland by gas pipelines. Baltic Pipe delivers Norwegian gas further east than alternative gas routes, and can thus carry gas to the eastern part of the EU. Baltic Pipe thus contributes to security of supply in both Denmark and the rest of the EU.

³ Natural gas converted into liquefied gas, which is easier and safer to transport.

⁴ 37.9% is the average share for the past 12 months.

⁵ Baltic Pipe is a gas pipeline that connects the gas systems in Norway, Denmark and Poland. BP has a capacity of up to 10 billion cubic metres of gas per year.

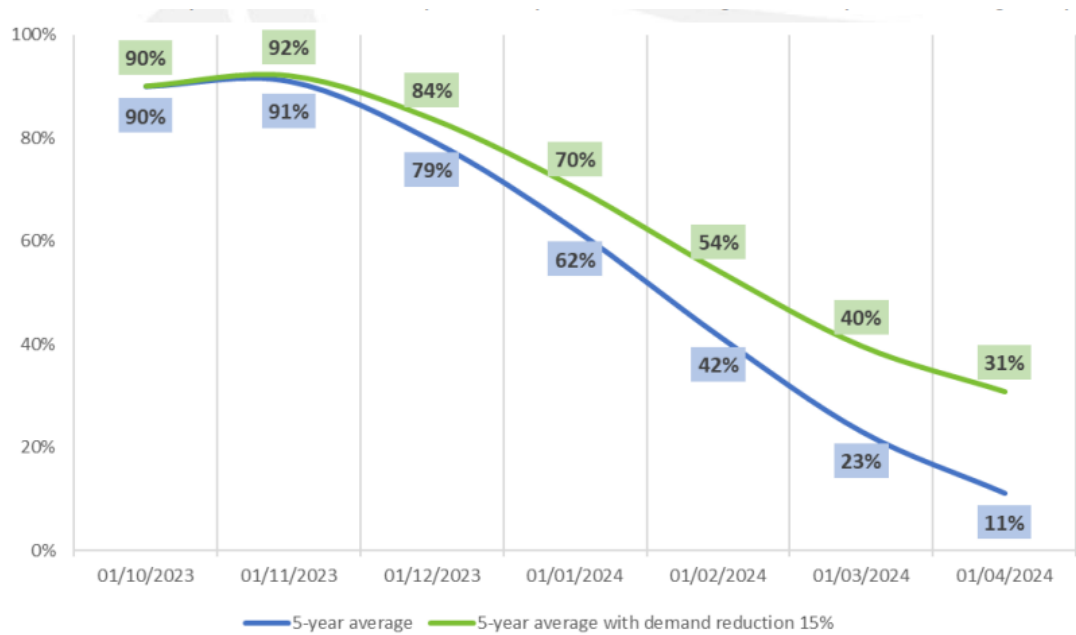


Figure 1 Simulation of EU gas storage levels during winter 2023/2024 with a 15% reduction in the EU's gas offtake (ENTSOG Summer Supply Outlook with Winter Outlook 2023/2024). The figure shows the EU's gas storage levels month-by-month, and that the EU gas storage facilities were full on 1 October 2023, and gas offtake is expected to reduce towards spring 2024.

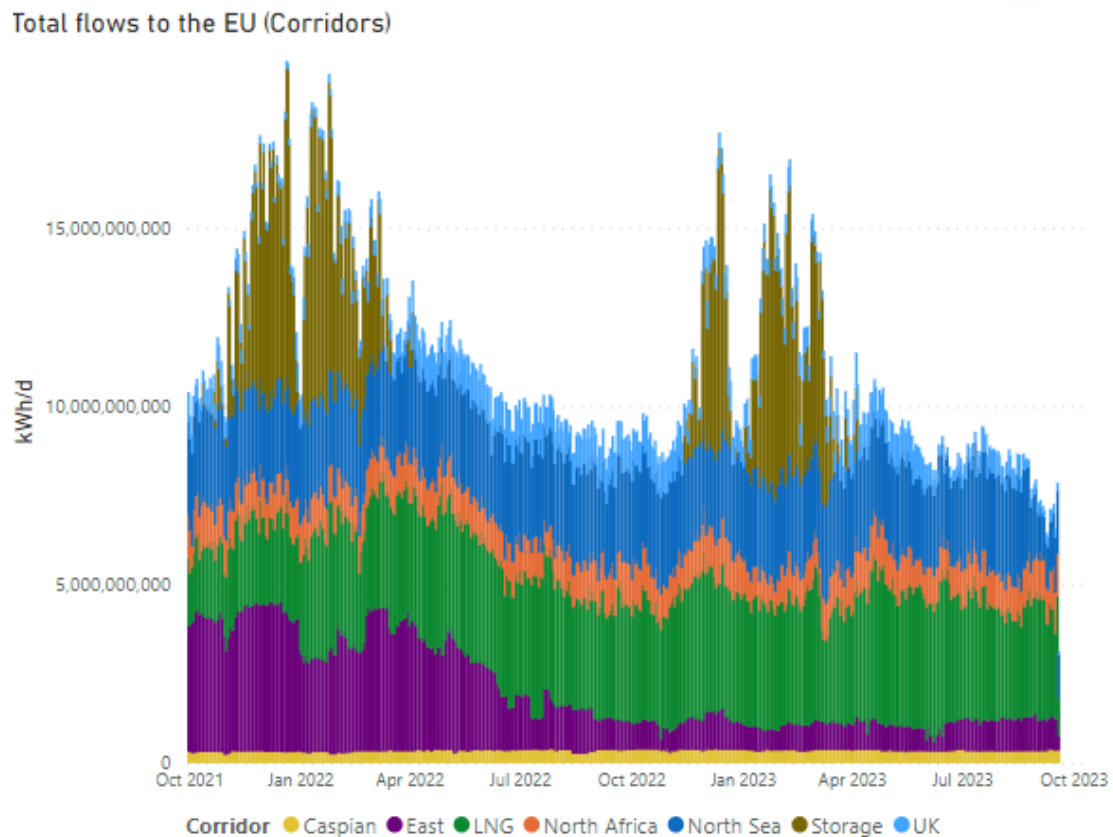


Figure 2 The figure shows supplies to the EU from October 2021-2023. Gas from storage is often the largest source of supply during winter periods. Source⁶: The gas storage facilities in the EU have a total working volume⁷ of 1,111 TWh, which means they have the potential to be the largest source of supply to the market during the winter period. Historically, the highest drawdown from the gas storage facilities into the EU market has been 717 TWh (65%), which was in winter 2020/2021. In Denmark, the winter of 2020/2021 was also the year with the largest historical drawdown.

3.1 The Danish supply model

At a time when security of supply is under pressure, it is important that the supply models of the EU member states encompass tools that can be used in situations where supply is particularly strained.

These tools play a key role in the Danish security of supply model, which is structured within the framework of the Security of Gas Supply Regulation⁸. The security of supply model contains market-based and non-market-based tools that can be activated by the Danish Energy Agency – and also by Energinet in special situations at the various crisis levels.

⁶ ENTSOG Gas Flows

⁷ The working volume (Nm³ in volume units) is the amount of gas (TWh in energy units) that can be withdrawn from the storage facility.

⁸ Council Regulation (EU) 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy

BOX: Energinet's assessment for the coming winter 2023/2024

This box contains Energinet's assessment for the coming winter 2023/2024. The assessment is based on Energinet's figures from its own analyses of the emergency supply need.

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, i.e. an assessment of entry capacities, including storage volumes, in relation to consumption. The Winter Supply 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 2023/2024

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 renovation.

Exit zone: Consumption in Denmark is 20.0 million Nm³/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 Nm³/day.

Dragør: Dragør has exports of 5.6 million Nm³/day.

BP: Up to 27.4 million Nm³/day will be exported at Faxe.

Storage facilities: Total withdrawal of gas from the storage facilities is estimated at 16.2 million Nm³/day, with 8.2 million Nm³/day coming from Stenlille and 8.0 million Nm³/day from Lille Torup. In special operating situations, 18.5 million Nm³/day can be supplied, with 8.2 million Nm³/day coming from Stenlille and 10.3 million Nm³/day from Lille Torup.

Nybro: Supplies in Nybro, which only come from the Syd Arne field, are estimated at 0.4 million Nm³/day.

RES: 2.1 million Nm³ biogas/day is supplied to the gas system.

EP II: Up to 27.4 million Nm³/day is imported at Nybro.

Assessment for winter 2024/2025

The assessment shows that there is sufficient capacity in the gas system to meet demand on a very cold day. The Tyra complex is expected to be ready for operation on 31 March 2024. Tyra will be in full operation at the end of September 2024.

Exit zone: Consumption in Denmark is 20.0 million Nm³/day. For the exit zone, the demand corresponds to Energinet's expectations at a daily mean temperature of -13°C.

Ellund: Ellund has net imports of up to 10.3 million Nm³/day.

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Nybro: Supplies at Nybro are estimated at 8.4 million Nm³/day. This is the total supply from Tyra and Syd Arne.

RES: 2.3 million Nm³ biogas/day is supplied to the gas system.

EP II: Up to 27.4 million Nm³/day is imported at Nybro.

3.2 ENTSOG Winter Supply Outlook 2023

In its Winter Outlook 2023, ENTSOG concludes that it is possible to get through the 2023/2024 winter without supply failures with an average historical winter offtake. If a 20-year event occurs leading to extremely high gas offtake due to low temperatures (cold winter, two weeks or one day of extremely cold weather), there will be a risk of gas shortages across EU member states.

The supply shortage will be more pronounced if Russian gas imports to Europe totally cease, i.e. if gas from Russia via 'Turkstream' (transit through Turkey) and 'Brotherhood' (transit through Ukraine) is also shut down.

The report states that significant new gas infrastructure has been commissioned during the past gas year, from October 2022 to October 2023. This includes more LNG import capacity (see section 6 on the global LNG market for more details).

The supply shortfall from Russia has been partly replaced by LNG, and the last 12 months have seen a significant expansion of LNG import capacity in Germany and the Netherlands. This allows import south of the Danish transmission grid, while ever LNG is available in the global gas market.

The EU's gas offtake was also 12% lower in 2022 compared to the previous three years⁹. Reducing gas consumption is vital to security of gas supply, and the EU has extended its target of a 15% reduction in consumption until March 2024.

ENTSOG's Winter Outlook 2023 predicts that gas storage facilities in the EU risk being close to empty by the end of winter, depending on how mild or cold the winter is. It is possible to offset the missing supply from Russia through increased LNG imports and a reduction in the EU's gas offtake, see Figure 1. If gas storage facilities are empty at the end of winter, the strategic storage filling will have been used, and it will be a challenge to fill the gas storage facilities to a similar level during the summer in preparation for winter 2024/2025.

3.3 EU storage situation

3.3.1 EU measures to secure the gas supply

In response to the risk of gas shortages during the winter on the EU gas market, the European Parliament and the European Council adopted the REPowerEU political initiative in summer 2022¹⁰, under which member states are obligated to fill the EU gas storage facilities to 90% before winter 2023/2024. On 1 October 2023, the EU's gas storage facilities were 96% full, and the gas level in Denmark was at 92%.

⁹ European Natural Gas Tracker

¹⁰ EU Regulation 2022/1032

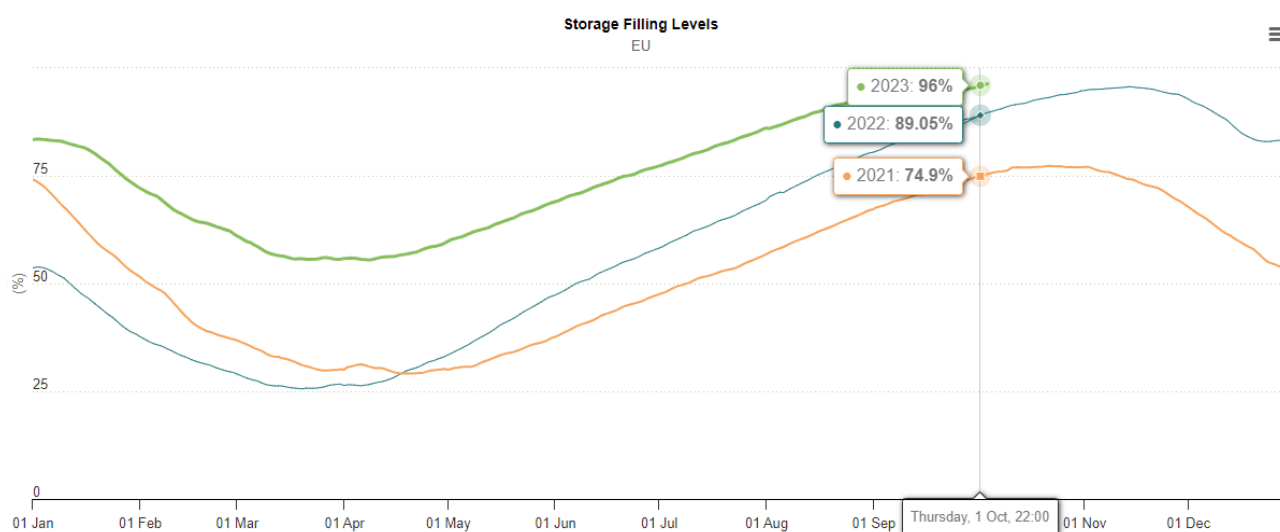


Figure 3 EU gas storage level over the past three years [source: GIE, [Data Visualisation - AGSI \(gie.eu\)](https://www.gie.eu/Data-Visualisation-AGSI)]. The figure shows GIE forecasts of the EU's storage levels over the past three years. The figure shows that storage level was 74.9% at the start of the October 2021-2022 gas year. At the start of the October 2022-2023 gas year, the storage level was 89.05%. At the start of the new gas year on 1 October 2023, the EU's storage level was 96%. This is higher than the previous two gas years, and may be due in part to the EU's requirement of a 90% storage level on 1 November, which came into force in 2022. The figure also shows that the storage level target was already met on 1 October 2023.

To further safeguard supplies, the European Council adopted measures last year in Regulation 2022/1369, 'Save Gas for a Safe Winter', to coordinate a voluntary reduction of the EU's gas offtake by 15% compared with average consumption over the last five years. The measures have been extended by one year until 31 March 2024¹¹. If the necessary reduction in gas offtake does not occur, or a risk of a gas shortage arises, the European Commission or a minimum of five member states can request the Council to declare a *Union Alert*. A *Union Alert* will obligate member states to reduce their gas offtake by 15%. The EU regulation has been implemented in the emergency supply plan¹².

Exceptions to this include member states with limited connections to gas networks in other member states, and member states with gas storage facility levels that surpass the requirements. Member states are free to choose the means by which they limit gas consumption, but will typically prioritise means which do not impact essential services such as households, the health service and defence forces. Recommended ways of reducing gas consumption include reducing heating and cooling in large buildings, or information campaigns targeting households. There is great variation in how the EU countries' fulfil the desired reduction in consumption.

To secure gas supplies in the long term, the EU will accelerate the green transition through both financial and legal means. The European Council will also raise the EU's energy efficiency target for 2030 as part of the 'Fit for 55' plan¹³ for the green transition.

¹¹ EU Regulation 2022/1369

¹² Denmark's emergency supply plan 2023 – published by the Danish Energy Agency

¹³ The EU's Fit for 55 plan for the green transition

3.3.2 Significance of EU gas storage facilities for supply

The primary purpose of the gas storage facilities in the EU, including those in Denmark, is to supply the gas market during the winter period where gas demand is highest due to the heating demand. It is therefore vital for security of supply in the EU that the gas storage facilities are filled in order to smooth out the seasonal imbalance between consumption and supply. On 1 December 2023, the Danish gas storage facilities were filled to 91.5% capacity, down from 97.3% on 25 October 2023. Figure 4 shows the levels in gas storage facilities in the EU. For winter 2023/2024, the strategy of using the gas storage facilities will continue to be of vital importance to the EU.

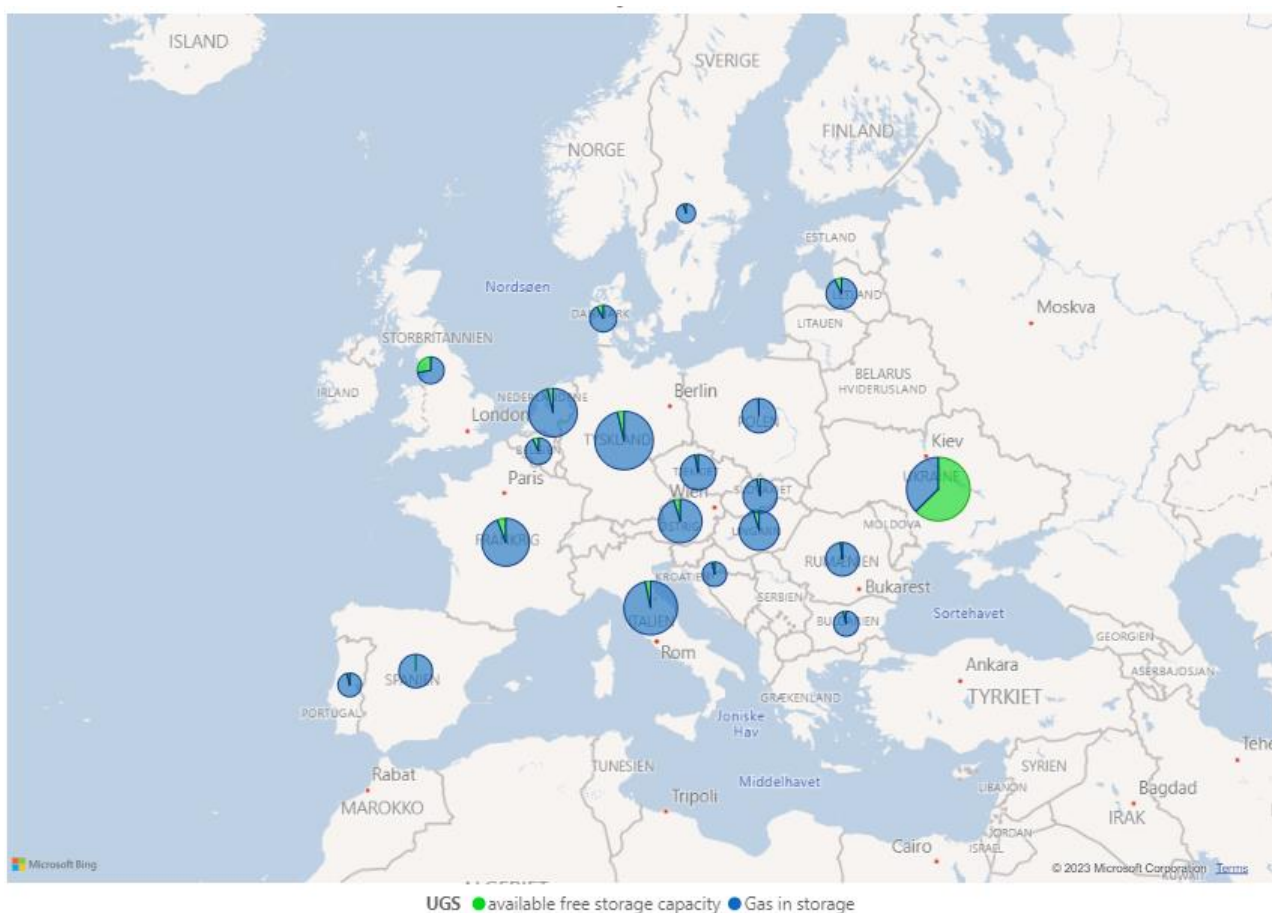


Figure 4 Gas storage levels in the EU on 1 October [ENTSOG Gas Flows]. The figure presents an overview of the gas storage levels for the member states as at 1 October 2023, showing that most member states have high storage levels.

The average EU-wide consumption in the 2022/2023 winter period is approx. 3,300 TWh (2020/2021: 3,319 TWh). Total gas production in the EU and imports cannot meet the forecast demand during the winter period. The EU gas market will therefore depend on supplies from the storage facilities.

3.4 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 importing large volumes of energy, and Russia has been the EU's largest source of

gas supply in the past. With the war in Ukraine and the limitations on gas supplies from Russia, security of gas supply in the EU has high political priority, and the framework for security of gas supply is defined in European legislation. The Security of Gas Supply Regulation sets the framework for cooperation.

The purpose of the Security of Gas Supply Regulation is to safeguard that all necessary measures are taken to ensure gas customers uninterrupted supply of gas on cold days with unusually high gas consumption or in the event of technical disruptions to the gas supply.

One of the fundamental elements in the Security of Gas Supply Regulation is to maintain an efficient 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.

As a result of the current supply situation, the Security of Gas Supply Regulation was amended in 2022 to introduce mandatory storage filling targets. This is in an addendum to the above regulation, which expires in 2025. It entails, among other measures, a mandatory storage filling target of 90% on 1 November.

4. The past gas year (October 2022 to October 2023)

4.1 The gas market

During the October 2022 to October 2023 gas year, the gas market has been through a period with high storage levels, in line with the EU Regulation on measures to safeguard security of gas supply and the Regulation on conditions for access to the natural gas transmission networks¹⁴. The gas year also saw lower prices compared to the October 2021 to October 2022 gas year. Prices on the Danish gas market are closely linked to prices on the German market. The Danish gas market has therefore also continued to be affected by the dramatic reduction in gas supplies from Russia to Europe.

The average price for the entire gas year was approx. EUR 57/MWh. The highest gas price was EUR 168/MWh, on 1 October 2022. The lowest gas price was EUR 24/MWh on 3 June 2023. These were both significantly lower than in the 2021/2022 gas year¹⁵, where the highest gas price was EUR 320/MWh on 30 August 2022 and the lowest price was EUR 65/MWh on 1 November 2021.

¹⁴ EU 2017/1938 concerning measures to safeguard the security of gas supply

¹⁵ October 2021 to October 2022.



Figure 5 The figure shows prices on the Danish gas market (ETF) for October 2022 to September 2023.

There have only been a few days since early March 2023 where the gas price has been above EUR 50/MWh. This is due in part to increasing LNG supplies and the high storage levels in the European gas storage facilities between October 2021 and April 2022. The gas storage facilities were therefore already well filled in autumn 2022, which subdued the gas price. More German LNG terminals began operation in 2023, which helped support higher LNG imports to Europe. However, prices have not yet returned to the same level as before Russia invaded Ukraine.

The Baltic Pipe gas pipeline also began full operation in November 2022. Baltic Pipe supplies Poland with Norwegian gas via Denmark and has a full capacity of 10 billion cubic metres per year. This helps to replace previous Russian gas imports and thus contributes to Danish and European security of gas supply.

Biogas accounted for approx. 33% of Danish gas consumption in 2022. The proportion of biogas had increased to more than 39% by the end of August 2023. This means that a higher proportion of gas consumption can be met by green gas produced in Denmark.

Continued political focus on the gas market

The gas market continued to draw considerable political focus during the past gas year, and the European Commission introduced a market correction mechanism (gas price cap), which came into force on 15 February 2023. Under the Danish gas supply regulation, the price cap only takes effect if this will not jeopardise security of supply. The mechanism is a temporary measure that expires one year after being activated. The instrument is activated automatically if the month price set on the Dutch gas exchange (Title Transfer Facility – TTF) exceeds EUR 180/MWh for three business days and the TTF price¹⁶ for the month ahead is EUR 35 higher than a reference price for LNG on global markets for the same three business days. This market mechanism has not been activated to date.

¹⁶ Dutch price for natural gas.

4.1.1 Trades on the Danish gas exchange

The traded gas volume, i.e. liquidity, on the Danish Exchange Transfer Facility (ETF) rose from 2022 to 2023. 153% more volume was traded on the ETF in 2023 than in 2022. However, trading volume was still 25% less than in 2021. The rise in liquidity is primarily due to Baltic Pipe coming online in the Danish gas system.

4.2 The global LNG market

The global LNG market has become a crucial element in the global energy supply, and much new infrastructure has already been established for this purpose in 2022-2023. The market has seen strong growth in recent years, with Europe becoming the most important LNG importer following the reduction in gas supplies from Russia. LNG accounted for around 40% of the EU's gas imports in 2023.

LNG trading is global and involves transporting LNG in purpose-built ships to receiving terminals all over the world. Countries with surplus natural gas export it as LNG to countries with increasing demand or limited access to conventional gas supplies. The largest exporters are Australia, Qatar and USA. In recent years, Australia and USA, in particular, have invested heavily in export capacity. Countries such as Russia, Malaysia and Nigeria are also major exporters of LNG.

In Europe, France, Great Britain, the Netherlands, Spain and Belgium, in particular, have increased their imports. Investment has also been made in several new LNG receiving terminals in Europe, including three in Germany, which will contribute to Germany's gas supply in the coming years. Japan, China and South Korea are also major importers of LNG. Many LNG shipments have been sold to Europe over the past year, and imports to these countries have therefore dropped as a result.

Continued increases in demand for LNG as well as continued expansion of global production capacity are expected in the coming years.

LNG prices are often contract-based and can vary depending on factors such as oil prices, the market supply situation and demand. There is also the spot market, where LNG is bought and sold in the short term at current prices. LNG spot prices were significantly higher in Europe than in Asia in 2022, due in part to the European energy crisis. Many LNG shipments were also sold to Europe for this reason. Spot prices in Europe dropped during 2023, and are now on par with prices in Asia. This means that it is largely the distance from production to the receiving port that determines where LNG comes from. Much of Europe's gas therefore comes from USA, where it is produced on the east coast.

4.3 Use of the gas transmission system network

Gas consumption declined in Denmark and Sweden during the past gas year compared to the October 2021 to October 2022 gas year. Gas imports from Norway to Denmark via the Nybro EPII terminal and exports to Poland via the CS Everdrup compressor station near Faxe commenced in October 2022.

The import day volumes exceeded the assumed capacity limits in 2022 at the following points:

- Ellund Entry (imports from Germany): The peak day volume for Ellund Entry was 12 million normal cubic metres per day (Nm³/day)¹⁷ in 2022, which exceeded the capacity limit of 10.8 million Nm³/day.
- Injection at Lille Torup gas storage facility: The peak day volume for injection at Lille Torup was 4.3 million Nm³/day in 2022, which exceeded the capacity limit of 3.6 million Nm³/day.
- Injection at Stenlille gas storage facility: The peak day volume for injection at Stenlille was 5.6 million Nm³/day in 2022, which exceeded the capacity limit of 4.8 million Nm³/day.

The conclusion is that even though overall gas consumption has decreased, there is still a need for the full capacity of the gas system to still be utilised.

4.3.1 Gas supplies from the North Sea

The Danish North Sea region has production from approx. 55 platforms in 21 oil and gas fields. Total is responsible for production at 16 of the fields, while INEOS¹⁸ is the operator for three fields, Hess for one field and Wintershall for one field.

4.3.2 Ellund

Apart from Danish biogas production, gas supplies to Denmark while the Tyra field was shut down primarily came from Germany via a pipeline in Southern Denmark. This border point is called Ellund, which has dual flow direction and both imports and exports to and from Denmark.

The flow between Denmark and Germany in 2022 was predominantly northwards, i.e. gas imports to Denmark. In 2022, the total northbound flow via Ellund was 1,856 million Nm³. The peak day volume of 12 million Nm³/day occurred on 11 May 2022.

The highest import volumes from Germany were seen in May 2022, and started to decline sharply when Baltic Pipe began operation in October 2022. With the opening of Baltic Pipe, Denmark gained another large source of supply. Market players chose to import much of their gas from Norway via Baltic Pipe, and gas imports from Germany therefore declined correspondingly. The peak daily volume of 12 million Nm³/day was above the commercial Ellund Entry capacity limit.

4.3.3 Baltic Pipe – Faxe

Gas flow from Norway via Baltic Pipe began in October 2022 with transit to Poland. As the sold capacity was released to the market, the utilisation of Baltic Pipe increased. This happened at the Nybro EPII terminal, where the gas is received into the Danish gas system, and at the Everdrup compressor station, where the gas is compressed and sent to Poland. Like the other entry/exit points, the actions of commercial players¹⁹ determine how much capacity on Baltic Pipe is utilised.

¹⁷ Normal cubic meter per day.

¹⁸ INEOS is a global chemical manufacturer, operating 194 plants in 29 countries. It produces petrochemicals, specialty chemicals and petroleum products.

¹⁹ Commercial players are Danish and foreign shippers in the gas sector.

4.3.4 Use of gas storage facilities

European gas prices have a major impact on use of the gas storage facilities – when market players choose to inject gas for storage, and when they choose to withdraw gas^[1]. Market players purchase storage capacity²⁰, which entitles them to store gas. In connection with withdrawal and injection, gas storage facility customers must also purchase withdrawal and injection capacity.

Each year, the Danish gas storage facility operator, Gas Storage Denmark (GSD), calculates the maximum withdrawal capacity at a daily level. The capacity is offered in a virtual storage facility, and GSD subsequently decides which of the two physical gas storage facilities the gas should be stored in. Denmark has two physical gas storage facilities, located in Lille Torup in Jutland and Stenlille on Zealand.

In October 2022, the peak day volume for injection into gas storage was 90.72 GWh (7.9 million Nm³/day) and for withdrawal it was 180 GWh (15.7 million Nm³/day). The peak day volume²¹ for injection was 9.7 million Nm³/day, due to special pressure conditions which made it possible to offer the market extra injection capacity.

In 2022, the two Danish gas storage facilities saw the highest demand ever for gas injection. The average daily injection was 6.2 million Nm³/day in May, and 4.4 million Nm³/day in June. In comparison, the highest monthly rate in 2021 was 3.0 million Nm³/day. The high demand for injection arose due to gas prices in May being lower than in the subsequent summer months. This meant that storage customers could realise a gain by bringing as much injection as possible forward from summer to spring.

On 1 May 2022, 7.03 TWh of storage capacity had been sold, including the quantity Energinet purchased as storage for emergency gas for use in an emergency supply situation. This is described in more detail in section 4.1 on security of gas supply in Denmark and the EU. In comparison, 6.76 TWh had been sold by the same time in 2021. Storage capacity for the rest of the year was almost sold out before the end of May. As of 1 June 2022, a total of 9.21 TWh had been sold.

In November 2022, the storage volume was increased from 9.23 TWh to 9.94 TWh, in part based on better knowledge of the gas quality of the gas stored over the summer, which was higher than had been assumed earlier in the year.

The peak storage level was reached in mid-November 2022 with 9.81 TWh of stored gas.

No projects were conducted in 2022 that involved capacity adjustments.

4.3.5 Biogas in the gas system

The biogas share has steadily increased during the October 2021 to October 2022 gas year. However, this has since stagnated at around 40% in recent months. This trend is due to a combination of the decline in total gas consumption, and a few large biogas plants coming online.

²⁰ Storage capacity.

[1] A gas storage year runs for 12 months from 1 April.

²¹ Day volume refers to the total amount injected on a given day. The injection rate (Nm³/hour) may vary throughout the day, and may therefore be higher and/or lower than the daily average at times.

Gas consumption fell sharply in 2022, and has held at around the same level in 2023. This pulled up the annual average for the biogas share in the first half of 2023.

Three new biogas plants were connected at the end of 2022, including two large plants. Small biogas plants differ from large ones in that they are most often operated by farmers as a side activity. This means that they often have limited resources to invest in optimum plant economy when purchasing them. The large plants are typically owned by investment funds, biogas companies or large groups of farmers. More thought has usually been given to the optimal business case for these plants²². In addition to this more general difference, another difference may be the connection capacity. For example, < 1,000 Nm³/h for small biogas plants and < 5,000 Nm³/h for large biogas plants²³.

The increase in biogas production has been limited since then. In 2023, the only increase in connected biogas production was due to the expansion of an existing plant and the conversion of a biogas plant that did not previously perform upgrading or have a connection to the gas system.

A total of 58 biogas plants are connected to the Danish gas system – one of which is connected directly to the transmission system. The biogas plants have a total connected capacity of just over 11 TWh per year. The actual realised production was just under 7.8 TWh in the past gas year.

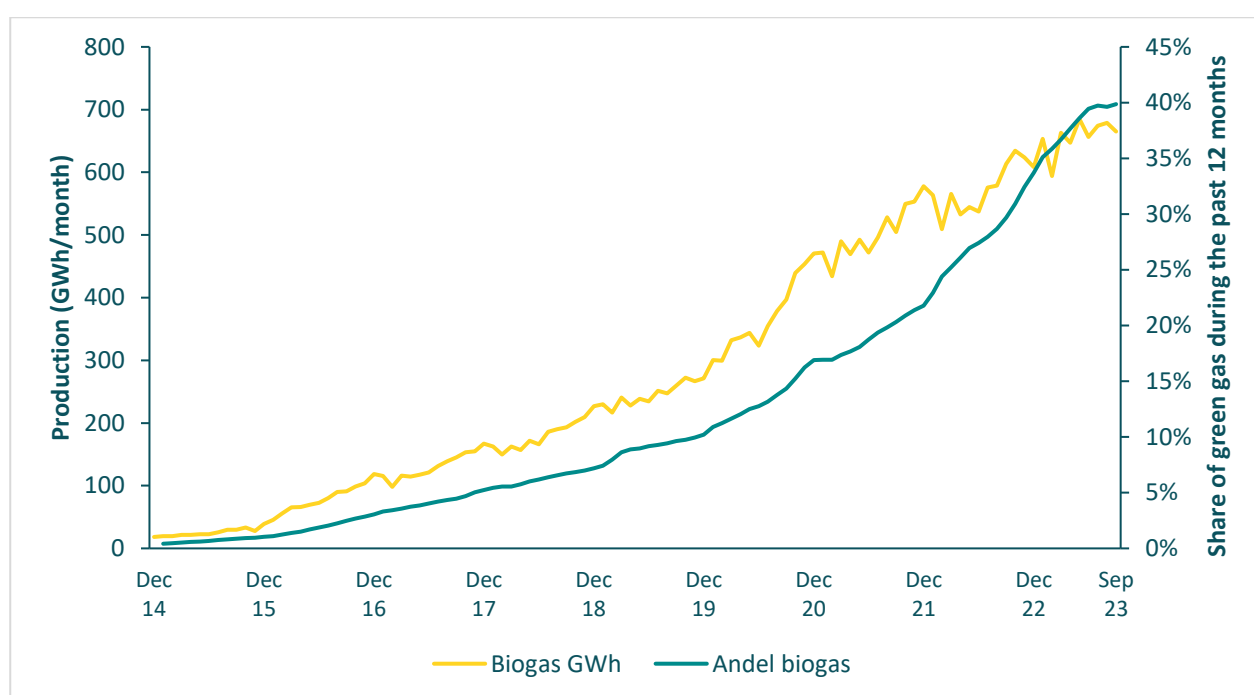


Figure 6 The figure shows biogas production and the proportion of biogas in the gas system for past 12-month periods. The figure shows an increase in the proportion of biogas in total gas consumption over the past 12 months.

²² This is a general assumption shared among farmers in the agricultural sector and among biogas companies.

²³ The figures are examples and not the actual threshold values.

4.3.6 Biogas pockets

The decline in consumption in 2022 has led to a faster rise in biogas surpluses in certain parts of the distribution system than was previously expected. This has led to greater challenges with 'biogas pockets' in several locations. A biogas pocket is a geographical area in the distribution system with high biogas production, but without matching gas consumption or sufficient infrastructure to utilise all the biogas. Gas surpluses therefore arise during some periods. These gas surpluses cannot be distributed to the transmission system unless there is sufficient capacity to inject the gas into the gas transmission system, called 'reverse-flow capacity'.

In central Jutland, a mobile reverse-flow plant in Karup was quickly put into operation over the summer. The Karup plant played a major role in alleviating biogas pockets in the area over the summer. However, a major breakdown at the reverse-flow plant in Viborg meant that a biogas pocket still arose in the area. This required periodic reductions in biogas production throughout central and northern Jutland while the problem was being resolved. It is estimated that total reductions of approx. 10-15 GWh of biogas were necessary.

Biogas pockets have also been a problem for quite some time in Southern Jutland, due to delays in the grid connection at distribution level for the reverse-flow plant at the Terkelsbøls distribution grid. The biogas plants in the area have therefore been operating with reduced production for an extended period. It is estimated that the reduction in production has been around 15-40 GWh of biogas.

4.4 Gas consumption

The energy crisis in 2022 led to a sharp drop in gas consumption, which continued into the first half of 2023. Since early summer, gas consumption has been rising relative to 2022. This is probably due to relatively low gas prices compared to 2022. Gas consumption for the October 2022 to October 2023 gas year therefore ended significantly lower than in previous years. While gas consumption between 2015 and 2020 was around 30 TWh/year, consumption for the previous gas year²⁴ was around 22.6 TWh (not adjusted for degree days) and was down to approx. 19.5 TWh (not adjusted for degree days) for the past gas year. It is uncertain whether the decline will continue in the coming gas year, or if the trend of rising gas consumption will continue.

²⁴ October 2020 to October 2021.

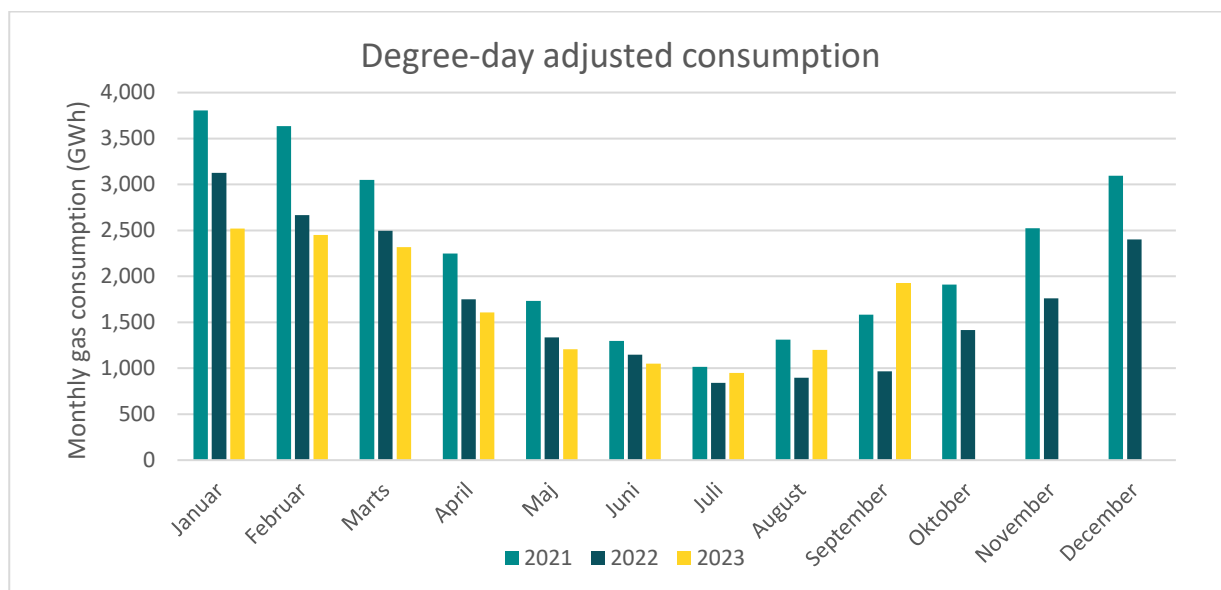


Figure 7 The figure shows monthly gas consumption for 2021, 2022 and 2023.

4.5 Gas quality

Energinet is responsible for ensuring 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*²⁵. The gas quality requirements under normal supply conditions are that the Wobbe index²⁶ for the gas must be in the range of 50.76-55.8 MJ/Nm³ (14.1-15.5 kWh/Nm³), and the relative density of the gas must be between 0.555 and 0.7.

In Denmark, the composition and hence the quality of the gas at any given time will depend on the sources of supply and the volumes from each source. The current supply situation in the Danish gas transmission grid is primarily impacted by the renovation of the Tyra complex (resulting in particularly low levels of Danish North Sea gas in transmission) and the introduction of Baltic Pipe (which dominates as a supply source). For the October 2023 to October 2024 gas year, the gas quality in the Danish grid has primarily reflected the quality of the Norwegian gas. This is expected to continue throughout winter 2023/2024.

The transported gas complied with the quality requirements in 2022/2023, and has not caused any problems for consumers. Figure 8 shows the Wobbe index values measured at Egtved for the gas in transmission. The figure shows that the Wobbe index lies within the specified range, and that the gas quality remained relatively stable throughout the year – except for a change in the Wobbe index coinciding with Baltic Pipe coming online in early November 2022, after which the Norwegian gas quality dominates.

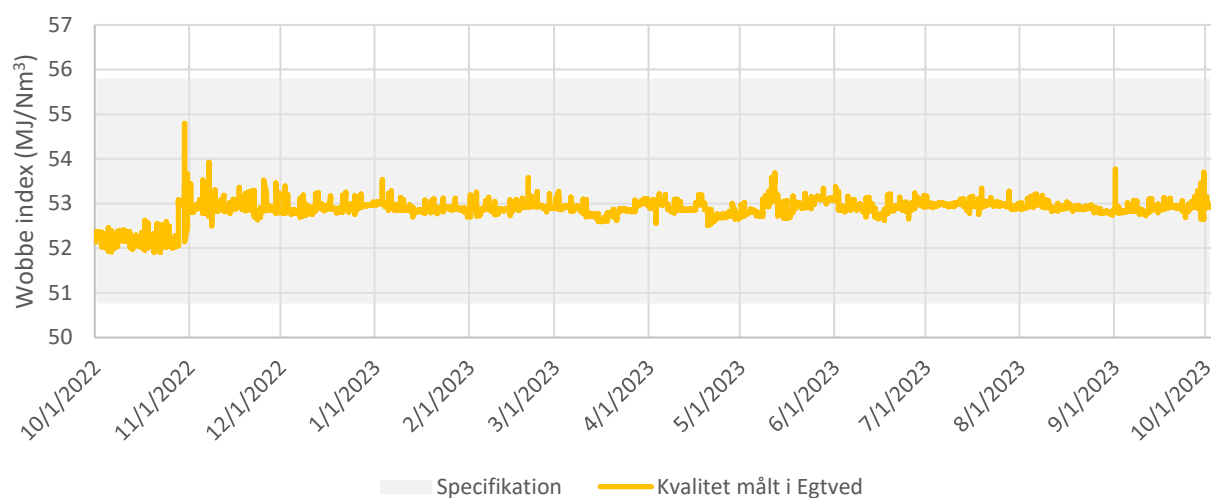


Figure 8 Wobbe index in the Danish transmission grid, measured at Egtved East.

²⁵ Executive Order no. 230 of 21 March 2018 under the Danish Gas Supply Act.

²⁶ The Wobbe index is the calorific value and density of the natural gas

5. Winter 2023/2024

5.1 Capacity orders

Shippers must book capacity with Energinet when they want to transport gas in the transmission grid. Table 1 below shows an overview of capacity orders at the various points in the gas market model. The gas market model is explained in the section on the 'Gas market'.

Points in the market model	Annual orders (kWh/h)	Quarterly orders (kWh/h)
Entry		
RES entry – biogas upgraded to natural gas quality	656,142	180,506
Nybro Entry – natural gas from the Danish North Sea	80,000	0
Ellund Entry – gas imports from Germany	2,201	700
North Sea Entry – gas imports from Norway	11,060,608	650,000
Faxe Entry – gas imports from Poland	0	0
Exit		
Joint Exit Zone – gas supply to end users in Denmark and Sweden	1,647,520	732,540
Faxe Exit – gas exports to Poland	10,593,608	0
Ellund Exit – gas exports to Germany	26,311	70,077

Table 1 Overview of capacity orders at the various points.

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

The gas system must have the necessary capacity and gas supplies to individual consumers must be maintained. If supplies cannot be maintained to all consumers and an Emergency crisis level has been declared, non-protected customers are not guaranteed supply. This is ensured by assessing the gas offtake from each meter and regulator station, which adjusts the gas offtake in each area. The assessments are performed by Energinet on the basis of reporting from the Evida distribution company.

Energinet deems that the meter and regulator stations and the distribution system throughout Denmark have sufficient capacity to cover the supply requirement for winter 2023/2024.

The declining gas consumption combined with increased biogas production in the distribution grid is expected to reduce the capacity requirement in the coming years. The rise in biogas production in the distribution network has made it necessary to expand the distribution network, so that biogas can be transported from producers to consumers. As a result, meter and regulator stations with very limited supply volumes are expected to become superfluous over time, and the closure of two meter and regulator stations is currently planned. It is currently unclear how many meter and regulator stations it may be possible to close.

6. Developments in the Danish gas system

6.1 Expected use of the gas system

The expected long-term use of the gas system must be considered, to assess whether it needs to be adapted to future needs. Energinet bases its long-term analyses on the picture of supply, consumption and exports presented in the Danish Energy Agency's analysis assumptions for Energinet 2023. The analysis assumptions provide an overview of the likely trends in annual imports, exports and consumption of pipeline gas in the Danish transmission and distribution systems in the 2023-2050 period.

6.1.1 Supply projections 2023-2050

Danish import capacity increased when Baltic Pipe and the connection to the Europipe II terminal (EPII) came online in October 2022. Import capacity will be further increased in winter 2023/2024 when the Tyra field resumes operation. Due to these changes to the supply picture combined with the expected reduction in Danish and Swedish consumption and a higher volume of green gas (RE gas) in the gas system, gas imports from Germany are expected to turn into net gas exports to Germany on an annual basis. This change is expected in 2024²⁷.

Since Baltic Pipe and the connection to the EPII terminal began operating, the largest component in pipeline gas in Denmark has been transit gas from Norway to Poland. After the Tyra field reopens, the EPII terminal will also be Denmark's largest gas supply source. Analysis Assumptions (AF) 2023 assumes that all of the imported gas from Norway will be fully transited through Denmark and exported to the Polish market, supplemented by supplies from the Danish North Sea region once the Tyra field resumes operation. However, the technical import capacity from Norway permits larger imports than shown in Figure 8, leaving the way open for gas imported from Norway to supply Danish and Swedish customers or be exported to Germany.

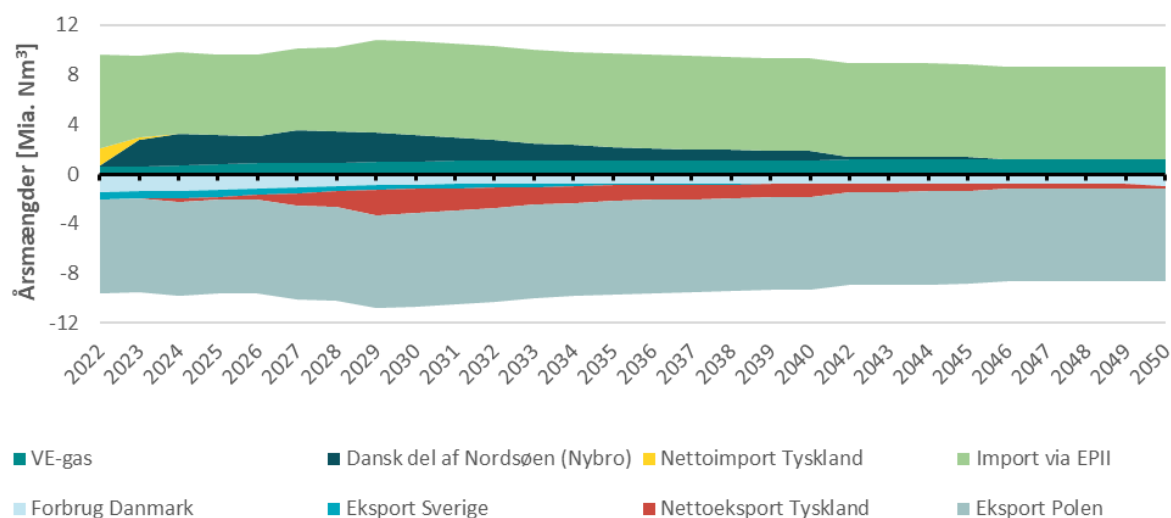


Figure 9 Probable supply picture for 2023-2050 based on AF23. The volumes have been converted from energy units (kWh) to Nm³ using a fixed upper calorific value of 12.1 kWh/Nm³ for all points. Positive figures indicate imports, while negative figures indicate exports and consumption. Imports equal the sum of exports and consumption for each year.

²⁷ AF23 (Analysis Assumptions 2023).

6.1.2 North Sea supplies in the long term

The volume of gas supplied to Denmark from the Danish North Sea region via Nybro depends on the North Sea production of sales gas²⁸ and the export distribution to the Netherlands (via the North Sea) and Denmark.

North Sea production is calculated in the Danish Energy Agency's *Resource Statement and Forecast 2023*²⁹, where the volume of sales gas produced is expected to increase when the Tyra field reopens in winter 2023/2024.

Export distribution is determined by the market players. AF23 forecasts that after the Tyra field reopens, 80% of the gas produced in the Danish North Sea region will be sent to Denmark.

From Denmark, the gas supplies can potentially be further transited directly to Germany, Poland and Sweden. While the Tyra field has been undergoing renovation, gas from the Danish North Sea region has only accounted for a small part of the total Danish gas supply.

6.1.3 Biogas production

Biogas production is expected to continue increasing steadily in the coming years as a result of the planned subsidies and the political goal of 100% green gas in the gas system by 2030³⁰. The rate of increase is expected to be slightly lower in the first year than predicted in AF22 due to challenges and delays in the upcoming tender.

However, the general picture is the same, which shows that Denmark's gas consumption will be 100% met by green gas at around the end of the decade. Based on the political aim, in terms of volume, this means that the current level of approx. 7.5 TWh/year realised production will almost double to just over 13 TWh/year over the next approx. 10 years. Combined with the drop in gas consumption (which has to be roughly halved), this will bring the expected biogas share to more than 100% by the end of the decade.

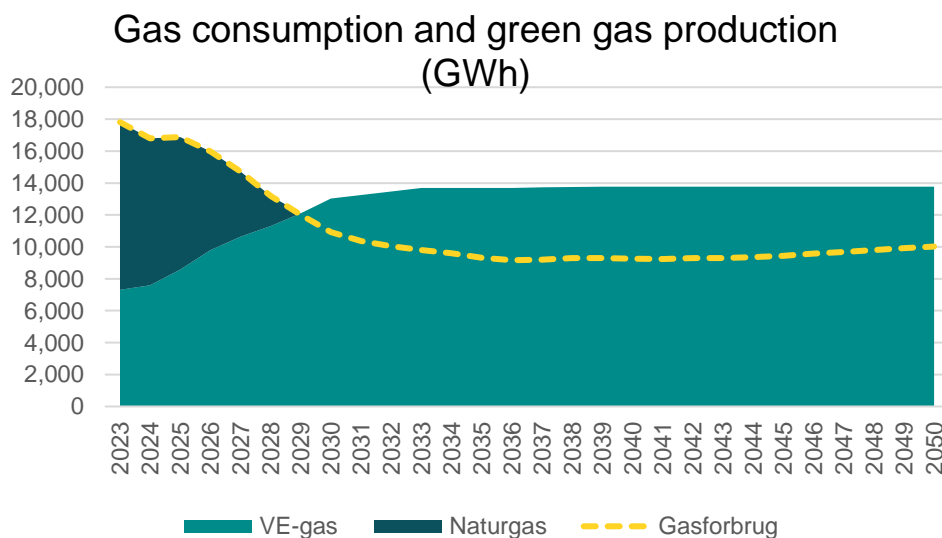


Figure 10 Gas consumption and green gas production (GWh).

²⁸ A general definition of sales gas could be that it is raw natural gas or biogas that has been processed to meet the gas quality specifications. A more technical definition/explanation could be that sales gas is production less reinjected gas and gas consumption for fuel and flaring (gas combustion with no utilisation)

²⁹ Danish Energy Agency's Resource Statement and Forecast, 31 August 2023

³⁰ AF23 (Analysis Assumptions 2023).

6.1 Consumption trend

Gas consumption is expected to decline over the coming years³¹, particularly up until 2030, when gas consumption is expected to have dropped to around 10 TWh/year. This corresponds to about half of the consumption in the past gas year, as shown in Figure 10.

The sharp drop in consumption, which is significantly below the AF22 forecast, is due to expectations in AF23 of continued high gas prices. If this expectation is not met, the drop in consumption will presumably also not be quite as large.

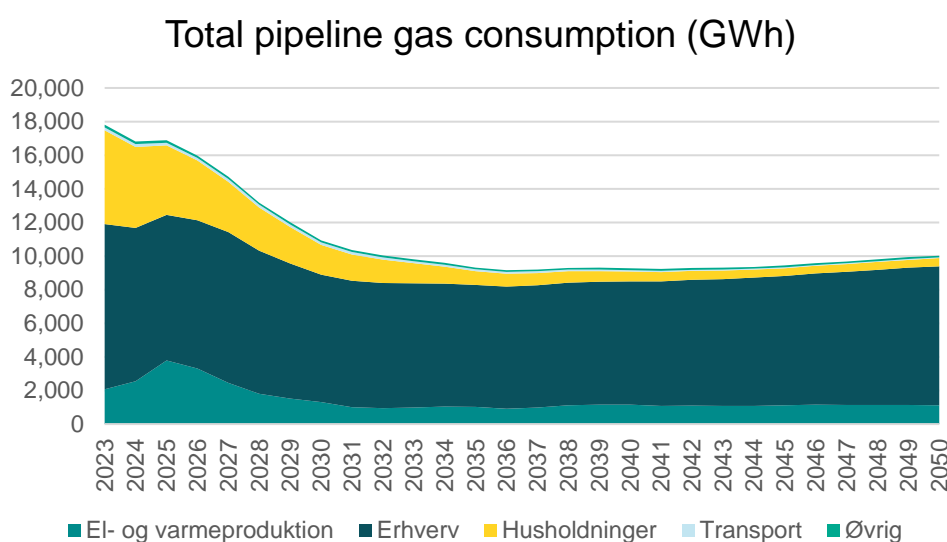


Figure 11 Total pipeline gas consumption for 2023-2050.

6.1.1 Trends in consumer segments

The expected decline in gas consumption is largely due to the expectation that gas consumption for heat production will fall sharply. This applies both to individual heat generation in households, which is expected to decline by 80% over the next 10 years, and to gas for electricity and heat generation, which is expected to decline by 50% over the next 10 years. However, a brief minor rise in gas consumption for electricity and heat generation is expected during the next few years, due to expectations of favourable competitive conditions for local combined heat and power (CHP) and district heating plants.

For businesses, a decline in consumption is expected in several subcategories. This is offset by an expected increase in consumption for companies that have primarily used fuel such as coal in the past, and want to convert to gas consumption instead.

Gas consumption for businesses and industry can be expected to be more price sensitive in the future, as customers will more easily be able to switch between different types of fuel. This is because many companies invested in alternatives to gas when prices were at their highest during the energy crisis in 2022. Overall, this means that the gas system is expected to become more price sensitive. This may create challenges for gas system planning and increase the risk of biogas pockets.

³¹ AF23 (Analysis Assumptions 2023).

6.1.2 Consumption trend in Sweden

The consumption trend in Sweden is based on AF23³². The forecasts for Swedish gas consumption are therefore usually assumed to match the forecasts for gas transport to Sweden via the Danish gas infrastructure, as Sweden is only supplied with pipeline gas from Denmark. However, Sweden is also supplied with LNG.

According to the Swedish Energy Agency, Energimyndigheten, the long-term forecast for Swedish gas consumption is stagnation during the 2020-2050 period. The Swedish Energy Agency bases this forecast on an expected decline in gas consumption, and increased LNG consumption in Swedish industry. Danish gas transit to Sweden is thus expected to gradually reduce. Approx. 6,953 GWh of gas is expected to be supplied to Sweden in 2022. This is expected to drop to around 4,612 GWh in 2030.³³

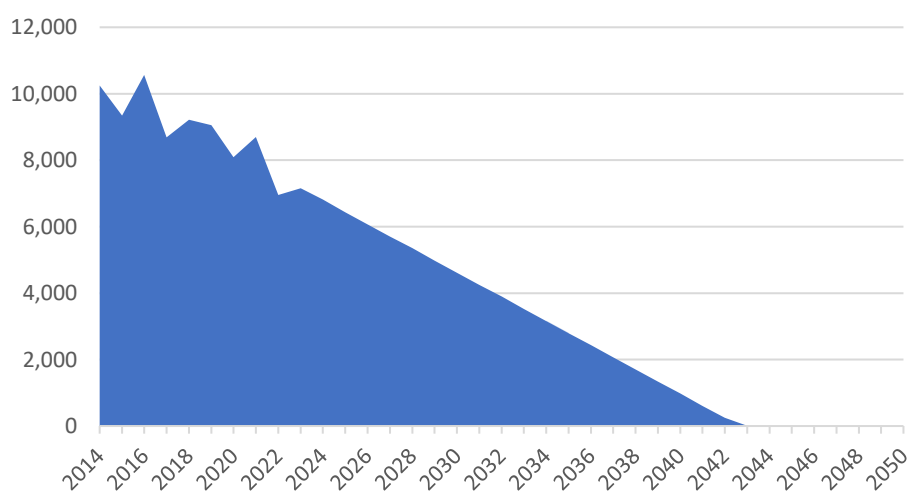


Figure 12 Expected gas transit from Denmark to Sweden.

6.2 Gas market trend

6.2.1 The Danish gas market

Since Baltic Pipe commenced operation, the Danish gas market has become a gateway for access to the Polish and Eastern European gas markets. Baltic Pipe has also resulted in a more robust market, as Denmark is no longer dependent on one primary source of supply. However, Denmark is still supplied from the North Sea, Germany and Norway.

The Tyra field is still undergoing renovation, and the first gas is expected to be injected into the gas grid on 31 March 2024. Full production capacity of 8.1 MCM/day is expected on 1 October 2024. This could potentially cause Danish gas prices to fall and become cheaper than prices in Germany, as Denmark will become a gas exporter.

6.2.2 The European gas market

Following the reduction in gas supplies from Russia, Europe has become much more dependent on LNG. This means that the gas is now traded in a much larger global market, as LNG transport is not subject to the same physical

³² Danish Energy Agency's Analysis Assumptions 2023.

³³ This data is based on AF22, where the Swedish Energy Agency has submitted data to the Danish Energy Agency.

constraints as a traditional pipe system. LNG supplies to Europe are in competition with supplies to Asia, which means that greater demand for LNG in Asia can affect supplies to Europe.

As a result of the same trend, Poland is importing gas from Germany through the Danish transmission grid and Baltic Pipe. Gas fees Germany has introduced have followed the gas across the border and raised prices in the Danish gas market.

6.2.3 Development of Danish gas infrastructure

To ensure the continued utilisation of the Danish gas system, it is important to maintain the existing infrastructure while also developing the gas system to match future lower gas consumption and a high degree of local green gas production.

6.2.4 Further development of the gas system

Historically, the Danish gas system served to distribute imported gas via the transmission grid out to gas customers. Today, that system is increasingly being turned upside down. Gas is now largely produced locally as biogas in the various distribution networks. If all the gas produced cannot be used in the distribution grid, the surplus gas must be moved up into the transmission grid (see section 3.2.6 on biogas pockets).

The need to move gas from the distribution grid to the transmission grid requires new infrastructure to handle this.

Five reverse-flow plants have been established, where gas from the distribution grid can be deodorised, compressed, measured and regulated, before being returned to the transmission grid. Another six 'fast track' reverse-flow plants and a compressor station were planned and approved in 2022. Their task will be to handle local biogas surpluses.

Changes to the gas system of varying scope are also occasionally needed in response to developments in society. For example, gas pipes in west Funen had to be rerouted due to changes to the railway line, and there are plans to reroute pipes at Kildedal in Ballerup due to urban expansion.

6.2.5 Maintenance of the gas transmission grid

The Danish gas system is continuously monitored and maintained to ensure that it functions efficiently and has sufficient capacity to meet the needs of commercial players. Operation and maintenance of gas facilities is regulated by legal guidelines, including the GPTC guide³⁴ and the supplementary provisions issued by the Danish Working Environment Authority, to maintain high safety standards.

To maintain a robust gas system, parts of the system will undergo major reinvestments in the years ahead. Maintenance is performed regularly as needed. Continuous assessment of each element's current condition, age and importance to the gas system is essential in order to set priorities and carry out ongoing reinvestments.

Energinet Gastransmission operates, maintains, expands and adapts the Danish gas transmission system to meet current and future requirements. The need for investments in the gas transmission system must be identified in order to find the best solutions across the entire supply chain, in cooperation with Energinet System Operator. This is crucial to maintaining a reliable gas infrastructure. The life time of physical assets is typically 30-50 years. As needs arise, these will be taken into account in the management of the physical assets – from design and installation to operation and maintenance and final asset disposal.

³⁴ Guidelines for the construction, manufacture, maintenance and operation of natural gas facilities.

6.2.6 Crisis levels

A crisis situation arises when there is a risk that all gas consumption cannot be maintained. 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. The Danish Energy Agency is normally responsible for declaring the three national crisis levels. Energinet can declare the crisis level if the incident requires immediate action.

Early Warning and Alert are declared 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 is likely to result in a deterioration of the supply situation that may lead to an Alert or an Emergency being declared.
- 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 both Energinet and the Danish Energy Agency may make use of a number of market-based tools to support the market, including higher imbalance payments. If the crisis situation deteriorates to such a degree that the market is unable to handle the crisis on its own, Energinet or the Danish Energy Agency may declare an Emergency.

- An Emergency is declared when all relevant market-based tools have been exhausted 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 supplies and interruption of non-protected gas consumers are examples of non-market-based tools.

In addition to the Early Warning, Alert and Emergency crisis levels, the EU adopted a regulation in July 2022 on coordinated measures to reduce demand. Under this regulation, the EU may declare an EU crisis level called 'Union Alert', which triggers a mandatory obligation to reduce gas demand in all EU member states and aims to uphold security of gas supply.

6.2.7 European or regional supply crisis

The crisis levels can also be used by the European Commission, which makes a decision on crisis level in the event of European or regional supply crises. After receiving the European Commission's decision, the Danish Energy Agency passes it on in the Danish system. Energinet, Evida and the Danish Energy Agency then handle the situation based on the Danish emergency supply plan. In the event of a supply crisis at EU or regional level, Denmark must not utilise tools that unduly restrict the flow of gas in the internal European market.

6.2.8 Protected and non-protected customers

Under EU legislation, not all gas customers are guaranteed to be supplied if an emergency supply situation arises in the gas system. Non-protected customers are not guaranteed to have their gas needs met in the event of a serious supply crisis. In the event of a supply crisis in the Danish gas system, the Danish Energy Agency or Energinet will decide whether the specific conditions make it necessary to fully or partially disconnect the gas supply to non-protected customers.

Protected customers

Under the emergency supply plan for security of gas supply, protected customers are the solidarity-protected gas customers, educational institutions and government administration. Small and medium-sized enterprises whose annual gas consumption is below the fixed cubic metre limit are also protected customers.

Under the Security of Gas Supply Regulation, protected customers must be guaranteed gas supply at extreme temperatures for a peak-load period of seven days, for 30 days in the event of unusually high gas demand and for 30 days in the event that the largest single gas supply infrastructure goes offline at average winter temperatures.

Gas customers which are not protected customers may have their gas supply interrupted in an emergency supply situation where Energinet or the Danish Energy Agency 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 Danish gas consumption, and district heating installations, as protected customers.

Protected customers in Denmark comprise around 360,000 private customers, public enterprises, SMEs, social services and CHP and district heating plants, which together account for around 70-75% of Danish consumption.

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 gas is used.

An Emergency will not automatically trigger interruption of gas supplies to Danish non-protected customers.

To reflect the differential treatment of the different customer groups in an Emergency, two different tariffs apply to security of supply.

Up until 1 August 2023, non-protected gas customers could make a request to Energinet to become protected gas customers for the October 2023 to October 2024 gas year³⁵. In their request, non-protected gas customers must document that their future annual gas consumption would be significantly reduced compared to consumption data for the past three years, as a result of changed production conditions or the company's transition to other energy sources.

³⁵ The current gas year, October 2023 to October 2024.

There have been non-protected gas customers who wanted to change their status and become protected gas customers during the October 2022 to October 2023 and October 2023 to October 2024 gas years. Energinet has received six requests from non-protected gas customers who wish to be protected in the October 2023 to October 2024 gas year. Of the six requests, Energinet has granted two. By comparison, Energinet received 18 requests last year and granted three of them.

The non-protected customers comprise around 85 large industrial enterprises and central power stations.

The cubic metre limit

A cubic metre limit is set and published by the Danish Energy Agency based on Energinet's recommendation prior to the gas year, and is used to decide which customers are protected. For the October 2023 to October 2024 gas year, the limit for protected customers is 2.0 million Nm³/year (equivalent to 24.3 GWh/year), compared to 2.3 million Nm³/year (equivalent to 28 GWh/year) last gas year³⁶. Due to the decrease in the cubic metre limit, the number of non-protected customers has risen compared to the 2022/2023 gas year.

6.2.9 Solidarity

The EU's objective is that non-protected gas customers must be ensured gas in cases where insufficient gas supplies are available. This has resulted in a formalised solidarity principle between the EU member states in the Security of Gas Supply Regulation. 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 state or 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.

Denmark has international agreements on gas solidarity with Germany and Sweden.

While Baltic Pipe has connected the Danish and Polish gas transmission systems, no solidarity agreement has yet been concluded with Poland, but negotiations have begun. In 2022, the European Council adopted a regulation setting out the default rules for solidarity. The regulation initially applies until the end of 2023, with the possibility of extension. Until Denmark has concluded a solidarity agreement with Poland, or for as long as the regulation applies, the default rules will apply in an emergency supply situation where either Denmark or Poland requests solidarity.

6.3 Documentation of security of supply

The EU Security of Gas Supply Regulation requires each member state to prepare a number of documents describing the way crisis situations are handled. They must perform risk assessment and formulate a preventive action plan and emergency plan. The aim is to ensure uniform handling of supply crises in the EU.

These documents must be regularly updated as required, and at least every four years. The risk assessment, preventive action plan and emergency plan were all updated in 2023.

³⁶ October 2022 to October 2023.

6.3.1 Risk assessment

Each member state in the EU must prepare a national assessment of all relevant risks to security of gas supply. Joint regional risk assessments must also be prepared for the most important cross-border risks to security of gas supply for the regional risk groups defined in the Security of Gas Supply Regulation. The results from the risk assessments in the regional risk groups are incorporated in the national risk assessment.

6.3.1.1 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.
- Technical incidents at the gas terminal in Kastø (the Norwegian transmission system).
- Pipe rupture on EPII.
- 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 of the pipeline from Egtved to Dragør.
- Cyber attacks.

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

Supplies from Norway

“Supplies from Norway can be interrupted either due to a breakdown at the Kastø gas treatment plant or rupture of the EPII gas pipeline³⁷. The probability of this occurring is deemed to be very low. The gas received from EPII is expected to be sent on to Poland via Baltic Pipe. The gas coming from EPII is expected, to essentially be transported on to Poland via Baltic Pipe.”

Supplies from Germany

“Supplies from Germany can be interrupted due to a European supply crisis, caused by Russia’s invasion of Ukraine. Technical disruptions in the north German gas transmission system are also possible. The German TSO, Gasunie Deutschland, has assessed that, likely, 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 in 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

³⁷ See the section on the gas market for more details.

“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 Emergency³⁸ and thus obtain access to non-market-based tools.”

Cyber attacks

“IT-related attacks on Denmark’s infrastructure are a heightened risk due to the current security policy situation in the EU. Both as a result of the war between Ukraine and Russia, but also a heightened threat from China.”

Preventive action plan

“A preventive action plan must be prepared containing the measures needed to eliminate or mitigate the risks identified in the risk group’s overall assessment. 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 joint risk assessment for risk group Denmark consists of six connected countries: Denmark, Sweden, Germany, Poland, Luxembourg and the Netherlands. While gas is produced in these member states, primarily in the Netherlands and Denmark, the risk group is highly dependent on gas imports. Historically, these imports have come primarily from Russia. Following Russia’s invasion of Ukraine, Risk Group Denmark and the other member states agreed with the Commission’s Joint Research Centre (JRC) that the most critical identified risk was a scenario where the EU was left without Russian gas supplies.

The joint risk assessment entails performing calculations on scenarios for both a technical incident and a volume incident.

Calculations for the technical incident are based on the infrastructure standard (N-1). The result of the calculation for the risk group is 196.3%, which is far above the required 100%. Calculations for the volume incident are based on an S-1 incident, which means a complete halt of the largest source of supply to the region, namely Russian supplies.

The conclusions from this assessment show that regional demand needs to be reduced by at least 5-15% to avoid restrictions in the member states in the risk group. This scenario has been carried out by most member states in the risk groups.

However, the extent of the required reduction depends on whether the gas storage facilities are to be emptied to maintain security of supply in the short term, or whether a certain storage level must be preserved to ensure long-term security of supply. The results indicate that a higher storage level reduces the risk of restrictions.

The general conclusion is that cooperation and solidarity between member states is needed to avoid further restrictions.

³⁸ See the section on emergency preparedness and emergency incidents.

6.4 Emergency preparedness

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.

6.5 IT incidents and preparedness level

There have been no IT incidents that impacted the gas supply in the gas system during the 2022/2023 gas year. However, Russia's invasion of Ukraine has put the energy sector in an elevated preparedness and crisis level. The preparedness level has been *green*, which indicates a slightly elevated preparedness level, and the crisis level has been characterised as *Early Warning*. These preparedness levels have activated parts of Energinet's emergency preparedness, for which no drills have been performed.

The Balticconnector gas pipeline, which runs between Estonia and Finland, was also damaged earlier this year. This has raised the preparedness level, and means that Energinet will pay greater attention to the risk of future incidents. The recent incidents involving North Stream 1 and 2, Russia's invasion of Ukraine, and the leak from the Balticconnector gas pipeline have together raised the overall awareness and preparedness for events of a similar nature in the future.

6.5.1 Emergency incidents

In connection with Russia's invasion of Ukraine, large parts of the emergency preparedness in the energy sector have been activated since February 2022.

As sector leader, Energinet announced an elevated sector preparedness level in the electricity and gas sector on 24 February 2022. Gas was raised to yellow level and electricity to green level.

Specifically, this increased emergency preparedness level means that specific measures are imposed which companies in the electricity and gas sectors must implement – to increase the security of, for example, facilities, buildings, and installations. These specific measures vary, depending on the type of facility, and are not communicated publicly for security reasons.

The Danish Energy Agency declared an Early Warning³⁹ on 20 June 2022, as did most of Europe.

³⁹ Slightly elevated preparedness level.

Immediately after the explosions on North Stream 1 and 2, the Danish Energy Agency recommended that Energinet raise the sector emergency level to the second highest level – orange. Further emergency measures were taken. The emergency preparedness level for the gas sector has since been lowered to green, where it remains.

6.6 Information security

Critical incidents in the European gas system are also changing the reality cyber security⁴⁰ has to manage.

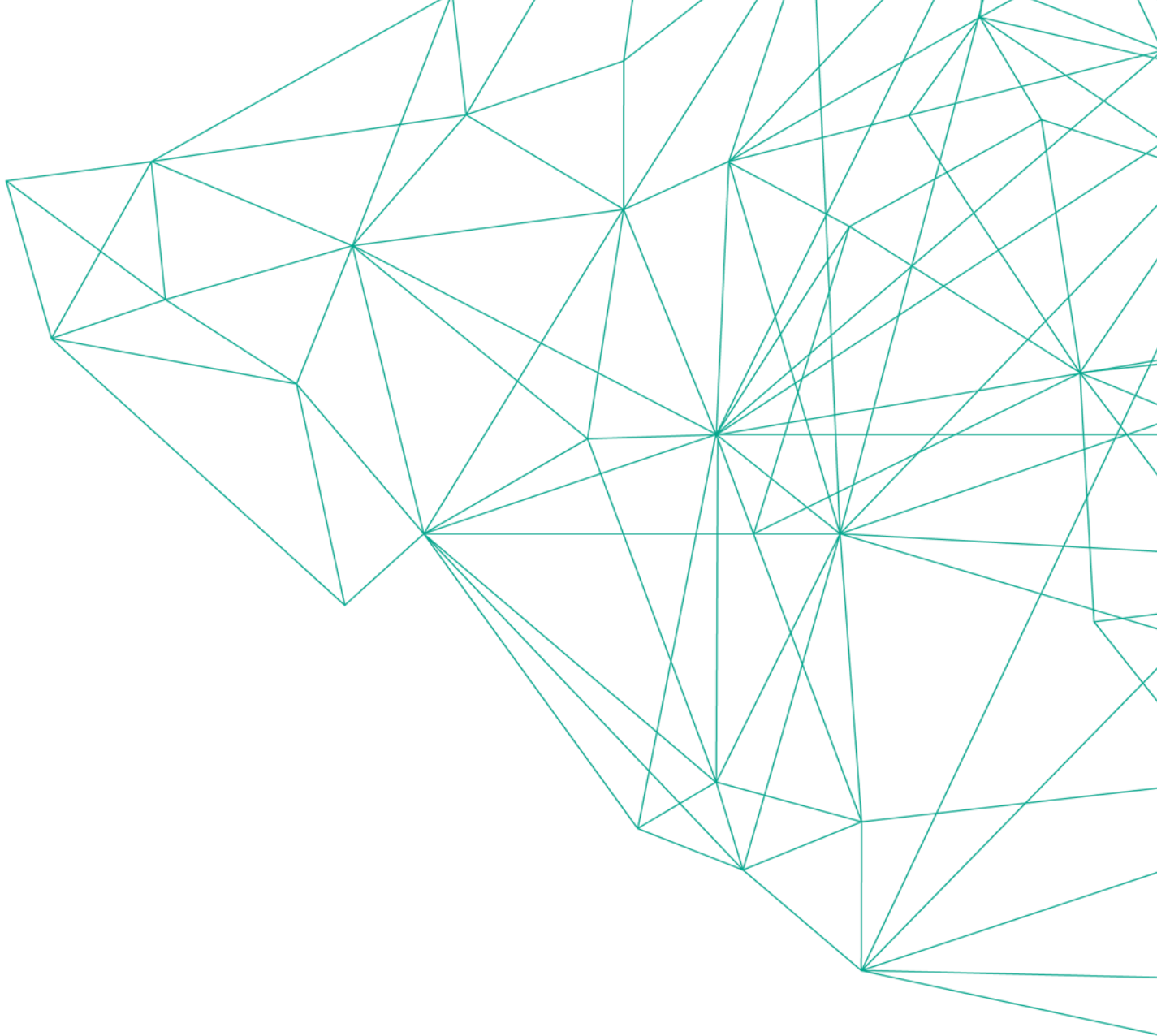
The information systems of the future will be more data-centric and digitalised, which places new demands on the way data must be secured. This is happening at the same time as daily operations must continue to be secure and stable, and are becoming increasingly dependent on information and system availability.

Energinet also conducts large-scale construction projects with a high degree of international attention and cooperation. This creates new risks of stakeholders having a conflicting agenda, which could potentially impact Energinet's ability to carry out critical projects.

The war in Ukraine and the associated transition to a hybrid war far from Ukraine's borders have also had an impact and have increased awareness of the role cyber security has in securing critical infrastructure – particularly within Energinet's area of electricity and gas supplies.

These changed requirements impact on the traditional perceptions and protection mechanisms in various ways. Energinet is therefore in the process of implementing a number of strategic initiatives aimed at supporting and improving the measures already in place, so Denmark continues to ensure it has a stable energy system in the future.

⁴⁰ Cybersecurity is a set of processes and technology solutions that help protect important systems and data from unauthorised access.



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