ENERGINET

REPORT

SECURITY OF GAS SUPPLY 2017

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.

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

Biomethane:
Biomethane is upgraded biogas sent into the gas grid.

Cover: The picture shows a sluice at the compressor station in Egtved (the heart of the Danish gas transmission system). The sluice is used for cleaning and inspecting the transmission pipelines by sending a "pig" through the pipelines.

CONTENTS

SUMMARY

Security of gas supply is high in Denmark. Continuous expansion and improvements of the infrastructure and operations have minimised the technical risks related to security of supply. As a result, there has never been an incident in the Danish gas transmission system that led to interruption of consumers.

Historically, Denmark has been and still is a net exporter of gas seen over the entire year. Much of the gas produced in the North Sea can be supplied to either the Netherlands or Denmark. Only the players' commercial considerations determine where the gas flows.

Gas supplies from the North Sea to the Danish and Swedish gas consumers can be supplemented with gas imports from Germany in the border point Ellund as well as with stored gas. Even though Denmark is a net exporter of gas, gas is imported from Germany during some periods of the year, for example if the players can obtain a price gain. The total storage capacity is approx. 890 million Nm^3, corresponding to about one third of the annual Danish gas consumption.

The connection of biogas plants and upgraded biogas to the gas grid continues to rise. Twenty-one biogas plants are connected, one of which is connected directly to the transmission grid. At the end of 2017, upgraded biogas accounted for approx. 5 per cent of total Danish gas consumption.

Assessment of security of gas supply in Denmark

Energinet finds that the Danish gas transmission system is resistant to technical incidents – even at times of high gas demand. The sources of supply from the North Sea and Germany and from the gas storage facilities are also considered to be ample. Energinet upholds the security of gas supply by purchasing, among other things, storage capacity for use in an emergency situation.

"No security of supply incidents in gas year 2016-2017"

GAS SECURITY OF SUPPLY REPORT 2017

Security of supply in the Danish gas system is assessed on the basis of the Danish Executive Order on maintaining security of natural gas supply (Bekendtgørelse om varetagelse af naturgasforsyningssikkerheden). The report is an annual report from Energinet to the Danish Energy Agency and the players in the gas sector. The report accounts for the development in security of gas supply and future security of gas supply initiatives.

However, Denmark is facing a period of a couple of years where gas supplies from the primary source, the North Sea, will be significantly reduced. The reason for this is that the Tyra platform will be reconstructed in the period 2019-2022. Danish and Swedish gas consumers will continue to be supplied with gas throughout the period, but the supply depends on optimum utilisation of the import and storage capacity. The system will therefore be more vulnerable and less flexible. This may be critical for the supply, for example in the event of exceptionally high demand or in case of technical incidents in the infrastructure.

To prevent a crisis situation, Energinet carries out analyses of the supply situation and the status of the gas storage facilities at regular intervals. The conclusion is that it is important for the market players to act expediently during the renovation of Tyra so as to reduce the risk of interruption of the gas consumers.

The present analysis is based on a renovation period running from December 2019 to March 2022. In a communication to the gas market (REMIT) of 24 November 2017, Maersk announced that the Tyra complex will be closed down as from 1 November 2019, and that the gas flow from Tyra will be resumed on 1 July 2022. The change is not expected to alter the general conclusions of the analysis, which will be updated at the beginning of the new year.

Energinet will cooperate closely with the stakeholders to ensure the best possible utilisation of the capacity available during the reconstruction period.

Energinet assesses that security of gas supply will be very high again after the reconstruction of Tyra. It is expected that the production of gas from the North Sea after the reconstruction will be higher than before the shutdown. In addition, there is access to considerable import capacity from Germany.

Current events

Reduction of storage volume

In 2017, the Danish gas storage company, Gas Storage Denmark, reduced the total storage volume capacity in the Danish storage facilities. The volume capacity was reduced in both storage facilities by approx. 120 million Nm^3 in total.

The volume capacity at the Lille Torup gas storage facility has been reduced because one of the caverns is filled with water after maintenance. The water-filled cavern is a consequence of the Danish Environmental Board of Appeal having reversed a previous approval to discharge the water into the Limfjord. The volume capacity in the Stenlille gas storage facility has been reduced on the basis of a withdrawal test.

CUBIC METRE LIMIT

For gas year 2017-2018, the limit for protected customers is 3.2 million Nm^3/year. In practice, this means that industrial enterprises and gas-fired CHP plants will be protected if they have an annual gas consumption of less than 3.2 million Nm^3/year.

New Gas Security of Supply Regulation

The European countries' gas infrastructure is interconnected, and most countries are dependent on imported gas. Denmark is the only country in the EU which is still a net exporter of gas.

The Gas Security of Supply Regulation stipulates, among other things, to which customers gas supplies must be maintained in the event of a supply crisis and how a crisis situation must be handled. The regulation has just been revised. The revised regulation entered into force on 1 November 2017. A number of elements in the regulation will be implemented on an ongoing basis over the coming 18-month period.

The revised regulation sets the stage for increased solidarity among the countries and mutual help in the event of supply crises. Work is in progress to clarify the impact of the regulation on security of gas supply in Denmark.

Analyses of European gas supply
This year, the European Network of Transmission System Operators for Gas, ENTSOG, has for the first time performed simulations of supply and infrastructure disruptions in Europe. The simulation is one of the new initiatives in the revised regulation. The competent authorities must take the results of the simulations into account when preparing risk assessments, preventive action plans and emergency response plans. The simulations are performed every fourth year.

The results from the SoS simulation show that all countries will be able to maintain supplies to gas consumers in a cold winter with exceptionally high demand. However, according to ENTSOG's assessment, Denmark and Sweden, as the only countries, cannot maintain supplies to gas consumers during a single day and a two-week period of exceptionally high demand without taking additional measures. The simulation runs over a four-year period and is based on reduced supplies from the North Sea, but does not include extra firm capacity in Ellund from 2019 and decreasing gas consumption during the reconstruction of Tyra. ENTSOG's simulation thus shows a more negative forecast than Energinet's own analyses.

Furthermore, each year ENTSOG publishes an assessment of the European supply situation for the coming winter. For winter 2017-2018, ENTSOG assesses that none of the European countries will be threatened by supply failure. Individual countries – not including Denmark and Sweden may, however, experience problems with maintaining supplies to gas consumers or delivering flexibility in the system during periods of exceptionally high demand.

A changing gas sector
In connection with the initial public offering (IPO) of DONG Energy (now Ørsted), Energinet took over the company's distribution grid and established the distribution company Dansk Gas Distribution A/S (DGD). Subsequently, it has been proposed that all distribution grids in Denmark should be gathered in a state-owned company. A political voting agreement was made in May 2017 according to which negotiations were to be initiated with HMN GasNet P/S and NGF Nature Energy Distribution A/S. These negotiations have been initiated, but have not yet been completed.

In 2017, DONG Energy and A.P. Moller – Maersk, both of which have been involved in developing the Danish upstream system, divested oil and gas activities to Swiss INEOS and French TOTAL S.A., respectively. According to the Danish Ministry of Energy, Utilities and Climate, TOTAL will take over all of Maersk's obligations – including the full reconstruction of Tyra.

"It will still be possible to supply gas to Danish and Swedish consumers during the reconstruction of Tyra, with the primary source of supply during the renovation period being Germany"

Future events
Reconstruction of Tyra
In April 2016, Maersk announced that the Tyra platform is sinking and that a solution is to be found which either involved permanent or temporary shutdown. DUC (Danish Underground Consortium) and the Danish state concluded an agreement on 22 March 2017 enabling a reconstruction of the Tyra facilities in the North Sea. Maersk has subsequently announced that Danish gas production will be reduced considerably in the period 2019-2022 during which the reconstruction will place.

It will still be possible to supply gas to Danish and Swedish consumers during the reconstruction of Tyra, with the primary source of supply during the renovation period being Germany.

The Danish gas system will be significantly less flexible and more vulnerable during the reconstruction. This means that optimum use must be made of the import and storage capacity to reduce the risk of crisis situations.

Joint balancing zone for Denmark and Sweden
In 2017, Energinet and Swedegas completed a cost-benefit analysis of a joint balancing zone for Denmark and Sweden. Based on the analysis, the companies decided in the spring 2017 to

Metering and regulating station in Egtved. 42 metering and regulating stations are connected to the Danish gas transmission grid. The stations are used for regulating the pressure downwards, for metering the gas and adding odorant to it before it is conducted into the gas distribution grid. Odorisation consists in the addition of a trace element which ensures that any leaks are detected by their smell.

continue the project. The project will be completed towards spring 2019.

The project is in line with the thoughts in the EU on regional development and interconnection of markets across national borders.

The project will support security of supply in Denmark and Sweden, as it is a precondition that line pack in the Swedish gas system will be increased. There will thus be more gas available in the system for supplying Danish and Swedish gas customers.

Baltic Pipe
In the course of 2017, Energinet and Gaz-System have come a long way in the joint Baltic Pipe project, which will connect the Danish and Polish gas markets directly with the Norwegian gas fields.

"Another 10-15 biogas plants are expected to be connected to the gas grid in the course of 2017 and 2018"

The project has a positive effect for Danish gas customers. Increased gas volumes in the Danish gas system are expected to provide more stable gas tariffs and, in addition, the access to an additional source of supply will strengthen security of supply.

In autumn 2017, companies in the gas market have made binding bids and secured capacity in the Baltic Pipe. It is therefore clear that the demand is sufficiently large to continue working on the technical and economic business case for an investment decision. The new infrastructure is expected to be in operation from October 2022 if a final investment decision to commence construction is made. The final investment decision is expected in 2018.

Green transition
Another 10-15 biogas plants are expected to be connected to the gas grid in the course of 2017 and 2018. If the projects are fully realised, upgraded biogas is expected to account for approx. 10 per cent of Danish gas consumption already by the end of 2018.

The injection of upgraded biogas into the gas grid creates new challenges. Examples of such challenges include handling of higher oxygen content in the gas transported across borders and developing the gas grid to be able to handle an increased injection of upgraded biogas.

THE MARKET ENSURES SECURITY OF SUPPLY DURING THE RECONSTRUCTION OF TYRA

Plans are to reconstruct the Tyra platform in the North Sea, probably in the period 2019-2022. Even though the platform accounts for around 90 per cent of the Danish North Sea gas production, gas supplies to Danish and Swedish gas consumers will be maintained during the temporary shut-down. During this period, gas will be supplied from Germany and from the Danish gas storage facilities.

When Maersk Oil on behalf of DUC (Danish Underground Consortium) concluded a new North Sea agreement with the Danish government on 22 April 2017, Energinet's TSO Gas, which is located in Ballerup, became very busy.

– The agreement meant that Maersk (read: now TOTAL) had an incentive for doing a full reconstruction of the platform complex. We're now looking at an expected 2-3-year period essentially without gas from the North Sea. And as we have the main responsibility for Danish security of gas supply, a temporary stop of 90 per cent of the Danish gas production is not just another day at the office, says Claus Møller Petersen, who is project manager on Energinet's Tyra project.

The way things are at the moment, Danish gas consumers are supplied with natural gas from the North Sea and Germany, but when the Tyra field shuts down for reconstruction, 90 per cent of the gas from the North Sea will be removed from the equation. But this scenario does not keep Claus Møller Petersen awake at night:

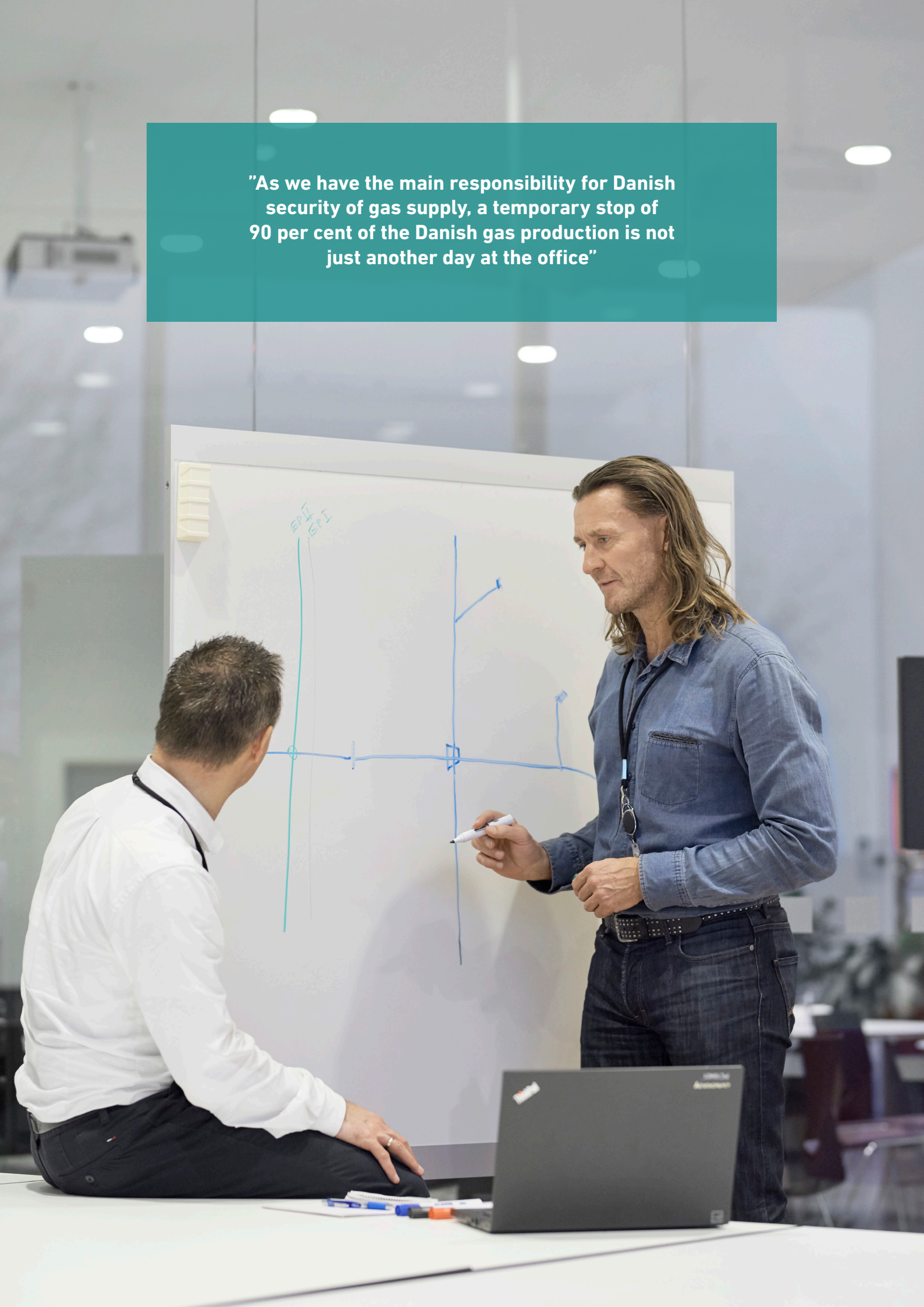
– There will still be sufficient capacity in the gas system to supply the Danish and Swedish gas markets. The primary source of supply during the reconstruction period will be gas from Germany combined with supplies from the Danish gas storage facilities in Stenlille and Lille Torup.

The Danish gas system was originally designed to have one primary source of supply. Today, Denmark has two: the North Sea and Germany. If a large part of the production in the North Sea is discontinued, the gas system will return to a situation with one primary source of supply – Germany.

Preparing for a worst-case scenario when Denmark goes from two to one primary source of supply during the reconstruction period, the gas system loses flexibility. But it will take an

WHY IS THE TYRA PLATFORM BEING RECONSTRUCTED?

Since 1987, the Tyra platform has been the most important source of supply for Danish and Swedish gas consumers. The Tyra complex has sunk approx. 5 metres since its establishment, and that is the reason for the shutdown. There is a growing risk that a 100-year wave could have serious consequences for the platform complex. Tyra therefore needs reconstruction if we are to continue to extract gas in the Danish part of the North Sea. The Tyra complex is owned by DUC, which stands for Danish Underground Consortium.



”As we have the main responsibility for Danish security of gas supply, a temporary stop of 90 per cent of the Danish gas production is not just another day at the office”

extraordinarily cold and long winter – alternatively a technical incident – before the Danish gas supply runs into difficulties.

– As responsible for Danish security of gas supply, we must be prepared for a worst-case scenario. That's why we're looking into different options to ensure gas to consumers in the event of a serious incident, says Claus Møller Petersen.

The possible measures which Energinet will take in order to ensure a continued high level of security of gas supply during the reconstruction of Tyra are being analysed in the project and will be assessed carefully prior to the final decision. But initial steps have already been taken by Energinet, for instance, to move forward the planned maintenance of the compressor station in Egtved.

Market players have a key role
The players in the Danish gas market play a key role when it comes to ensuring a high level of security of gas supply during the reconstruction period. Energinet has therefore invited all shippers to participate in a user group.

"To maintain a high level of security of gas supply, it's necessary that the market players utilise the capacity in the gas storage facilities by filling them up during the summer months, so there's gas available for the winter periods"

In cooperation with Energinet, they will come up with possible measures which can make it attractive for the shippers to use the Danish gas system and ensure the supply of gas up to, during and after the reconstruction of the Tyra platform.

– To maintain a high level of security of gas supply, it's necessary that the market players make sure to utilise the capacity in the gas storage facilities by filling them up during the summer months, so there's gas available for the winter periods, as well as ensuring optimum utilisation of the connection from Germany, says Christian Rutherford from Energinet.

Faith in the market
Christian Rutherford brought no proposals for measures with him to the first user group meeting on 30 March 2017. Instead, the attending shippers were divided into three groups in which they were asked to discuss and make suggestions for tools that could be used to ensure the best possible utilisation of the capacity available during the maintenance period.

After the meeting, the market players' ideas were linked with ideas from Energinet. These measures were

WHERE WILL THE GAS COME FROM DURING THE RECONSTRUCTION OF TYRA?

The gas system was originally designed to have one primary source of supply: the North Sea. Since then, the pipelines to Germany have been expanded, so that currently there are two large supply routes. The gas system will revert to a situation with one primary source of supply. Supplies from Germany supplemented with upgraded biogas and gas from the gas storage facilities.

Together with colleagues at Energinet, project manager Claus Møller Petersen and group manager Christian Rutherford from Energinet's Gas TSO are preparing for the closing-down of the Tyra platform in 2019-2022. They are working on analysing various types of measures available to Energinet during the reconstruction period.

presented at a new user group meeting on 4 October 2017, at which 15 out of Energinet's total customer group of 20+ shippers were represented. At this meeting, Energinet presented the list of possible measures and improvements, and these were debated.

– The market players found it hard to imagine that something would go wrong. They have believe that the market will function if they get the right price signals, and if the flow is moving in the right direction. But they accepted the challenge and came up with a number of ideas and initiatives that we can make use of on depending on the situation, says Christian Rutherford.

Together, we ensure the best possible gas capacity utilisation

In the first quarter of 2018, Energinet will do a final round of consultations with the market before subsequently reporting the relevant measures to the Danish Energy Regulatory Authority as the tools which are to ensure gas supplies during the maintenance period.

"The players in the Danish gas market play a key role when it comes to ensuring a high level of security of gas supply during the reconstruction period"

So even though gas supplies from the North Sea close down temporarily in the period 2019-2022, and if security of supply were to be challenged, the market players and Energinet will jointly ensure the best possible utilisation of the gas capacity.

Concurrently, Energinet will prevent an increased crisis level by continuously analysing the supply situation and drawing on the new methodological tools.

BIOGAS STRENGTHENS SECURITY OF SUPPLY

Biogas makes the gas greener while contributing to security of supply. Five per cent of the gas in the Danish gas system comes from biogas and, in 2020, this figure will have increased to at least 10 per cent.

Denmark's biggest biogas plant is located in a field at Bevtoft in Southern Jutland. Each year, the plant converts 540,000 tonnes of liquid manure, straw and other residual products into approx. 21 million cubic metres of upgraded biomethane. This corresponds to the energy consumption of 15,000 households or 570 city buses.

"Sønderjysk Biogas's plant at Bevtoft is not only the largest biogas plant in Denmark, it is also the only plant that sends gas made from straw, liquid manure and waste into the transmission grid," says Jeppe Bjerg, senior analyst in Energinet's TSO Gas.

Since 7 July 2016, the biogas plant has been connected to Denmark's main gas transmission grid, from which biomethane can be sent into the regional gas distribution grids, stored or exported directly to Germany or Sweden. Popularly speaking, the biogas is sent directly on to the gas highways.

Security of supply and green gas
In order to send biogas that has a pressure of 3.5 bar, into the transmission grid, the pressure must be increased to approx. 70 bar. This pressure increase takes place at Energinet's compressor and meter station at Bevtoft, which was established for this purpose in 2016.

Energinet is responsible for security of supply and is working to integrate renewable energy in the Danish energy system. And the example from Bevtoft kills two birds with one stone, according to Jeppe Bjerg:

"The volumes of biomethane which the plant sends into the distribution grid and the transmission grid respectively, contribute, together with the other biogas plants, somewhat to ensuring to the security of gas supply in Denmark. The biogas plant supplies 15,000 households with energy each year and, at the same time, Denmark's CO_2 emissions are reduced by 51,000 tonnes."

Better fertiliser and lower CO_2 emissions
The biogas plant captures the greenhouse gases in the liquid manure and leaves behind a fertiliser filled with nutrients. In doing so, the plant creates a better fertiliser for crops and reduces the agricultural sector's climate impact.

The agricultural sector is one of three non-ETS sectors. The other two are vehicles and households, which, according to the EU's climate targets for 2030, must reduce their CO_2 emissions by 39 per cent relative to 2005.

"The production of biogas reduces farmers' CO_2 emissions, and it supplants the use of fossil fuels in the heating and transport sectors and in industry", says Jeppe Bjerg.

"Energinet is responsible for security of supply and is working to integrate renewable energy in the Danish energy system"

BIOGAS PLANTS CONNECTED TO THE GAS SYSTEM

Twentyone upgrading plants have been connected to the gas grid since 2011. The plants have a total capacity of 100 million Nm^3/year. The supply of biogas to the gas system is increasing steadily, accounting for 5 per cent of the gas consumption in 2017. Energinet is currently aware of around 10 projects involving biogas upgrading that may be realised within the next couple of years. It is expected that the majority of the upgrading plants will continue to be connected to the distribution grids.

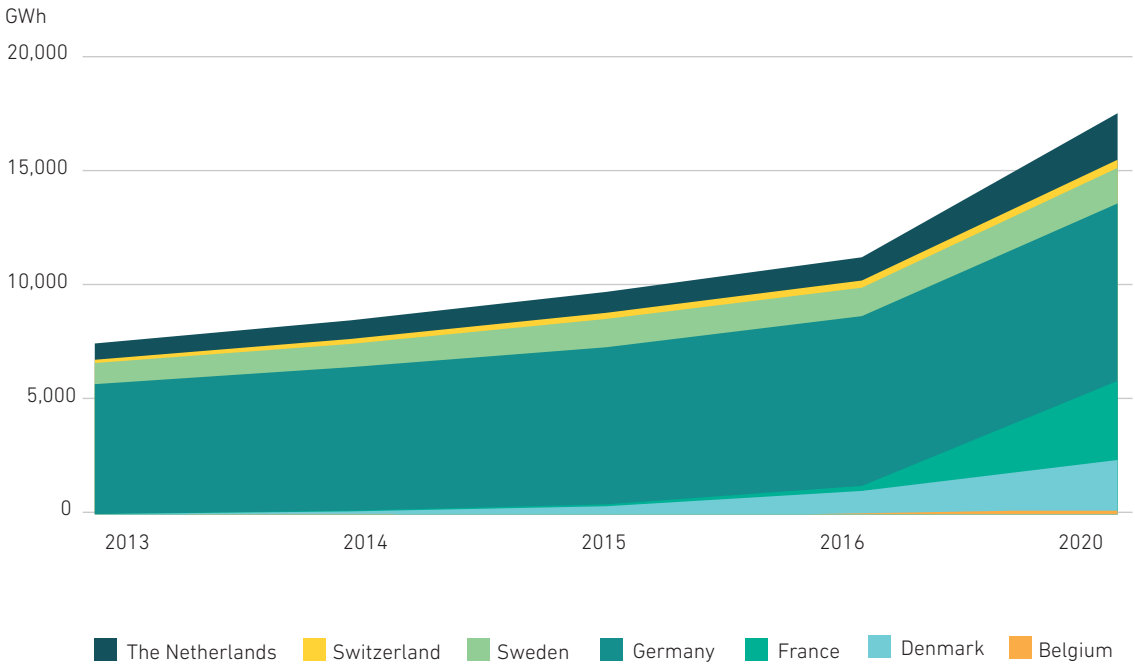
”The way things are at the moment, there are quite a few challenges involved in transporting large volumes of biomethane in the transmission grid, but we are working to solve these”

Different levels of oxygen specifications results in gas beeing denied access to Germany

But sending biogas into the transmission grid is not without its challenges. Christian Meiniche Andersen, head of department in Energinet's TSO Gas, explains that there was a problem on the Danish-German gas border in summer 2016:

"In Germany, some consumers don't want to receive gas with a "high" content of oxygen, but in Denmark, we add oxygen in the upgrading process to remove sulphur from the biogas. At the moment, we therefore only send pure natural gas to Germany from the North Sea. Instead, biomethane is consumed by Danish and Swedish consumers."

FIFTY PER CENT MORE BIOMETHANE IN THE COUNTRIES OF THE GREEN GAS INITIATIVE'S GAS GRID IN JUST THREE YEARS



In 2016, 11 TWh of upgraded biogas was injected into the gas systems in Denmark, Sweden, Germany, France, the Netherlands, Switzerland and Belgium. This is an increase of 50 per cent over the past three years. The growth is expected to continue towards 2020.

Together with Energinet-colleagues, Head of Department Christian Meiniche Andersen and Senior Analyst Jeppe Bjerg in Energinet's Gas TSO are working on preparing and developing the Danish gas system for the green transition. The increase in upgraded biogas injected into the gas grid creates new opportunities in Denmark as well as across borders and presents new challenges for Energinet.

In the long term, it may become physically feasible to send biomethane to Germany, but this requires either that a solution is found for the 'particularly sensitive consumers' in Germany or that oxygen is removed from the gas transported to Germany.

Gas highways do not like odorant

By nature, natural gas is almost odourless, but an odorant is added for safety reasons. The odorant has a very pungent and distinctive smell which ensures that a potential gas leakage can be quickly detected by people nearby.

"We add odorant to the biomethane at our meter and regulator (M/R) stations before it's fed into the distribution grid. However, the odorant-containing gas cannot be sent back into the transmission grid. "We can therefore not reverse the flow of gas from the distribution grid to the transmission grid," says Christian Meiniche Andersen.

"30 years into the future, we imagine that green gas is used for transportation, in industry and in quickly regulating electricity-generating facilities"

The way things are at the moment, there are quite a few challenges involved in transporting large volumes of biomethane in the transmission grid, but we are working to solve these – partly by looking at possible technical solutions for handling oxygen and odorant, and partly by working on harmonising gas quality requirements across the border points.

Biogas in 2050

The Danish Energy Agency's energy scenarios and gas infrastructure analysis all predict that methanised biogas will play a role in Denmark's green energy mix in 2050. The completely CO_2-neutral gas grid of the future represents great value and a potential resource for security of supply:

"30 years into the future, we imagine that green gas is used for transport, in industry and in quickly regulating electricity-generating facilities. The Danish natural gas grid and its gas storage facilities will also constitute an appropriate infrastructure in 2050," says Jeppe Bjerg.

And there are indications that the gas future is green. A new report from the Green Gas Initiative (GGI) shows 50 per cent growth over the last three years in the volume of biomethane in the gas grids in Denmark, Sweden, Germany, France, the Netherlands, Switzerland and Belgium.

1. SECURITY OF GAS SUPPLY

Natural gas is an important part of the Danish energy mix and is used for both domestic heating, in industry and for electricity and district heating generation. Some of the Danish natural gas customers are vulnerable to gas supply failures, for example private households on cold winter days. Vulnerable natural gas customers must therefore be ensured gas in those cases where there is insufficient gas volumes in the system.

1.1 Security of gas supply in Denmark
Being the Danish TSO, Energinet is responsible for maintaining security of gas supply in Denmark. More specifically, Energinet is responsible for ensuring sufficient capacity in the gas transmission system, including gas interchange with the European market, gas from the North Sea, capacity to and from the storage facilities and to the distribution systems.

The availability of gas in the Danish market is a matter for the market players during normal operation and also in crisis situations. If necessary, Energinet may contribute to the availability of gas by using reserved storage volume and withdrawal capacity if the market players are unable to ensure sufficient gas in the market themselves.

1.2 Security of gas supply in a European context
Security of supply in the gas sector is increasingly affected by European regulation as the EU countries face a common challenge in that they consume far more energy than they produce. 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 most important source of supply. In 2016, the EU imported approx. one third of its gas consumption from Russia.

The EU Regulation concerning measures to safeguard security of gas supply (the 'Regulation') sets the framework for cooperation. By creating greater solidarity across borders, it is possible to reduce the vulnerability in the European gas system.

The primary concern of the Regulation is to maintain a wellfunctioning internal market in the context of gas shortages. This means that the market – at national, regional and European level – helps to strengthen security of supply throughout the EU.

1.3 Gas Security of Supply Regulation
The purpose of the Regulation is to make sure that all necessary measures are taken to ensure for the gas customers a continuous supply of gas on very cold days and in the event of a disruption in the gas system.

1.3.1 Crisis levels and protected customers
The Regulation defines the terms "protected customers" as well as "crisis levels".

1.3.1.1 Crisis levels
When normal operation cannot be maintained, and there is a risk of insufficient gas volumes in the system in terms of supplying the gas customers, a supply crisis (crisis situation) has emerged. The escalation of a supply crisis is divided into three crisis levels: Early Warning, Alert and Emergency. The declaration of the individual crisis levels 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 occurring that will result in a deterioration of the supply situation.

- An Early Warning is declared if it is assumed that an incident may occur that will result in a deterioration of

NEW GAS SECURITY OF SUPPLY REGULATION – OUTLINE

1 November 2017:
The Regulation entered into force. ENTSOG has completed crisis simulations across the EU.

December 2017:
The Commission must publish legal non-binding guidelines for technical, legal and financial arrangements regarding solidarity obligations.

Three months after the entry into force of the Regulation:
The member states notify the Commission of their definition of protected customers.

Twelve months after the entry into force of the Regulation:
The gas companies must submit information to the competent authority on their gas contracts if these cover more than 28 per cent of total national gas consumption.

1 October 2018:
The competent authorities notify the Commission of the first common risk analysis in the relevant risk groups and the national risk assessments.

1 December 2018:
The competent authorities must have established the necessary measures (technical, legal and financial arrangements) to ensure that solidarity gas can be supplied in connection with a member state's wish to receive solidarity gas.

Eighteen months after the entry into force of the Regulation:
The member states must have laid down rules on penalties which anticipate situations in which the gas companies fail to submit information to the competent authorities in accordance with the duty of disclosure stipulated in the Regulation.

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 the market is able to handle the situation on its own without having to resort to non-market-based tools.

In the Early Warning and Alert situations, the market is able to handle the crisis situation on its own, and Energinet may apply a number of market-based tools to support the market. If the crisis situation deteriorates to such a degree that the market becomes 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, and the gas supply is still not sufficient to meet the demand.

In an Emergency, Energinet has access to 'non-market-based tools', with the purpose to help maintain the supply of the protected customers.

1.3.1.2 Protected customers

Regardless of the crisis level, protected customers are ensured gas supplies under the Regulation. All private households are protected. Other customer groups may be included in order to achieve the best possible protection of the gas consumers. In Denmark, the Danish Energy Agency has decided that small and medium-sized enterprises, district heating installations and vital institutions such as schools and hospitals also have the status of protected customers.

According to the Regulation, gas supply to protected customers must be ensured for a period of at least 30 days in case of disruption of the single largest gas infrastructure. In Denmark, this includes disruption of the Tyra-Nybro submarine pipeline. The period is therefore

DANISH AND EUROPEAN LEGISLATION ON SECURITY OF SUPPLY

THE DANISH NATURAL GAS SUPPLY ACT

Energinet's tasks
The Danish Natural Gas Supply Act, primarily section 12(1), states that a TSO must:

- connect, as required, plants to upgrade biogas to natural gas quality, distribution grids and consumers
- ensure the quality of the natural gas supplied from the transmission grid
- maintain security of supply in Denmark
- cooperate with other TSOs towards the efficient interchange of natural gas
- develop plans to meet future transmission capacity needs
- ensure that there are sufficient volumes of natural gas in the overall natural gas supply system to maintain the physical balance in the grid.

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

- Prepare risk and vulnerability analyses.
- Prevent risk, where possible.
- Prepare contingency plans.
- Practise the key elements in the contingency planning.
- Evaluate and learn from drills and incidents.

As TSO, 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 natural gas supply in accordance with the Regulation of the European Parliament and of the Council concerning measures to safeguard security of gas supply.
- Monitoring security of natural gas supply. For this purpose, Energinet prepares and submits an annual security of supply report 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 security of gas supply.

REGULATION 2017/1938 CONCERNING MEASURES TO SAFEGUARD THE SECURITY OF GAS SUPPLY AND REPEALING REGULATION NO 994/2010.

The Regulation primarily establishes a legal framework for the following:

- Protection of certain customer groups.
- Definition of supply standard and crisis levels.
- Distribution of responsibilities, solidarity, planning and coordination, both concerning preventive measures and reactions to actual disruptions to supplies at member state level, regional level and EU level.
- Risk assessments, preventive action plans and emergency response plans, including exceptional measures that can be introduced when the market is no longer able to satisfy gas demand.
- Wellfunctioning internal market, even in situations of shortage of supply.

extended to 60 days, which is the expected repair time for the pipeline.

In a crisis situation where Energinet declares the Emergency crisis level, supplies to customers that are not protected customers may be discontinued. Non-protected customers are typically large enterprises with a high gas consumption, which exceeds the cubic metre limit for protected customers. The need for disconnection of non-protected customers will depend on the particular circumstances, and a minimum notice of three days will be given to allow processes using natural gas to be shut down in an orderly way.

To reflect the diverging treatment of the two customer groups in Emergency, they pay different tariffs relating to security of supply – a tariff for protected customers, and another lower tariff for non-protected customers.

1.3.2 European or regional supply crisis

The crisis levels can also be used for European or regional supply crises. The European Commission decides on the crisis levels at EU or regional level. After receiving the European Commission's decision, the Danish Energy Agency passes it on to the Danish system. Energinet then handles the situation based on the Danish model for safeguarding security of gas supply (the 'Danish security of supply model').

If a crisis situation has been declared at EU or regional level, the requirement to safeguard emergency supply in relation to protected Danish gas consumers is reduced from 60 to 30 days, which is the minimum obligation under the Regulation.

In a national crisis situation, capacity restrictions may occur to guarantee gas supplies to protected customers. 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. European solidarity ensures that the flow of gas is not restricted in Emergency at EU level.

"The Regulation requires that the individual member state must prepare a number of documents describing the way crisis situations are handled"

1.3.3 Revision of the Gas Security of Supply Regulation

The Regulation was revised in the course of 2016-2017. The new version of the Regulation entered into force on 1 November 2017.

A key element in the revised Regulation is a strengthened solidarity principle. The revision thus builds on a more regional approach to supply crises, with stricter requirements being introduced for helping neighbouring countries to maintain supply to protected customers. This can be done by freeing up gas from neighbouring countries to the country in crisis by disconnecting non-protected customers. This must take place in return for financial compensation.

Inter-regional agreements must be negotiated in the course of 2018.

Regional risk assessments must also be prepared, to ensure better coordination between countries. Denmark is placed in the following groups: 'Denmark',

'Norway' and 'Baltic Sea'. Denmark is obliged to enter into agreements with Germany and Sweden. According to the Regulation, Sweden is exempt from the obligation to provide solidarity to Denmark.

1.4 Documentation of security of supply
The Regulation requires that the individual member state must prepare a number of documents describing the way crisis situations are handled. The documents contribute to ensuring uniform handling of supply crises in the EU.

- Risk assessment: documentation for compliance with infrastructure and supply standards and the basis for the preventive action plan.
- Preventive action plan: measures needed to remove or mitigate the risks identified.
- Emergency response plan: measures to be taken to remove or mitigate the impact of a gas supply disruption.

1.4.1 Risk assessment
The Regulation concerning security of gas supply states that a full assessment must be made of the risks affecting security of gas supply in Denmark. The most recent risk assessment for the Danish and Swedish gas markets applies to the period 2017-2018.

An assessment must be made of the capacity of the gas infrastructure to satisfy total gas demand when the single largest infrastructure unit in the gas system fails (N-1). The Regulation defines this as the disruption of the largest gas infrastructure unit during a day of exceptionally high demand.

In addition to the N-1 incident, the risk assessment must determine whether protected customers can be supplied for a period of at least 30 days in the case of an incident under average winter conditions.

As stipulated by the Regulation, risk assessments have been coordinated with the authorities in the neighbouring countries, i.e. the German Federal Network Agency, the Swedish Energy Agency and the Danish Energy Agency.

1.4.1.1 Risk assessment of the Danish and Swedish gas markets
For the Danish and Swedish markets, the risk assessment for 2017-2018 shows that the scenarios with the most serious consequences for supplies, are:

- EU gas supply crisis affecting deliveries from Germany.
- Emergency shutdown of the Stenlille gas storage facility.

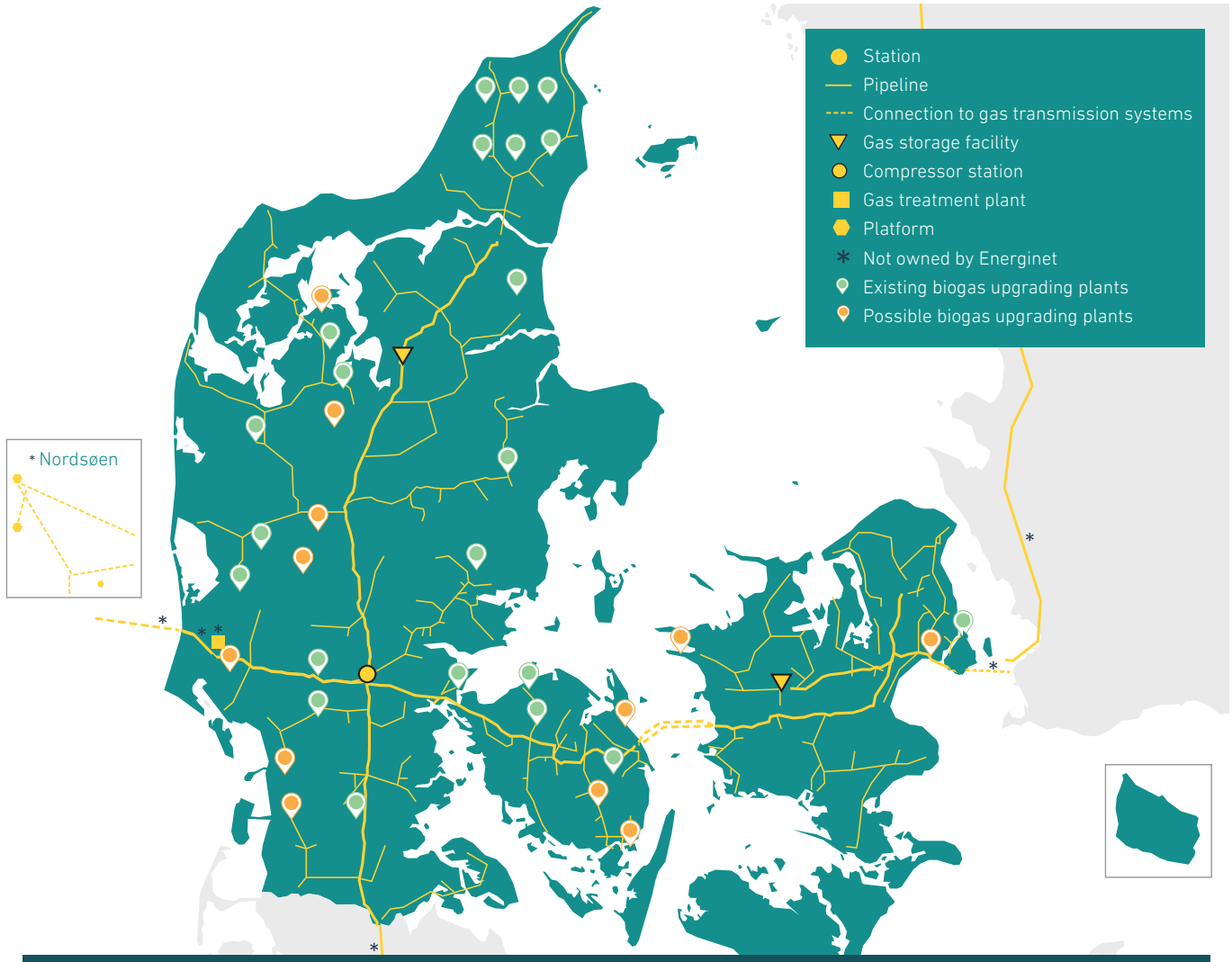
Disruption of supplies from the North Sea also has a major impact on security of supply and is comparable with disruption to deliveries from Germany in the risk analysis.

"Disruption to supplies from the North Sea also has a major impact on security of supply and is comparable with disruption to deliveries from Germany"

An analysis of the consequences of a major incident and/or longer termed high consumption in the gas system concluded the following:

- Supplies from Germany: Following the expansion of the Ellund-Egtved pipeline and the Egtved compressor station, security of supply in the Danish transmission grid is assessed to be so robust that supply failure from the North Sea will not lead to a general supply failure. A gas shortage can only arise in the Danish gas market in the event of a European supply crisis where all gas supplies are affected.
- Emergency shutdown of the Stenlille gas storage facility: In the event of an emergency shutdown of the Stenlille gas storage facility during extraordinarily high gas demand, it could become necessary to use the market-based tools in the security of supply model in the worst case. This is because, in situations of extreme gas demand and supply failure from the Stenlille gas storage facility, congestion arises in the transmission grid between the supply sources in west Denmark and gas consumers in east Denmark. It is assessed that it will not be necessary to declare an Emergency and thus get access to non-market-based tools.

THE DANISH GAS SYSTEM



- Transmission grid, length: approx. 900 km
- Distribution network, length: approx. 17,000 km
- The transmission grid is connected to the distribution network via 43 M/R stations, which regulate the pressure down to the level of the distribution companies' pipeline systems
- Number of gas consumers: approx. 400,000 private households and companies
- City gas networks: Copenhagen, Frederiksberg and parts of Aalborg
- Gas transmission company: Energinet
- Gas distribution companies: Dansk Gas Distribution, HMN GasNet and NGF Nature Energy Distribution
- Storage company: Gas Storage Denmark

Please note that the risk assessment does not yet include an assessment of the supply situation in 2019-2022 when Tyra is expected to be out of operation.

1.4.2 Preventive action plan
The preventive action plan contains a description of the tools needed to remove or mitigate the risks identified. The preventive action plan contains:

- The results of the risk assessment.
- The tools, volumes, capacities and the timing needed to fulfil the infrastructure and supply standards.
- Obligations imposed on natural gas undertakings and other relevant bodies for the safe operation of the gas system.
- Description of cooperation with other member states.
- Information on existing and future infrastructure with relevance to crisis situations.
- Information on all public service obligations that relate to security of gas supply.

In future, regional sections must be incorporated in the individual countries' plan.

1.4.3 Emergency response plan
The emergency response plan contains:

- Definition of roles and responsibilities.
- Detailed procedures and measures to be followed for each crisis level, including schemes for information flows.
- Description of tools and cooperation with other member states and natural gas undertakings for each crisis level.
- Description of the reporting obligations imposed on natural gas undertakings at Alert and Emergency levels.
- Description of possible tools that can be used to supply gas customers in the event of an Alert or Emergency.

In future, regional sections must be incorporated in the individual countries' plan.

An Emergency will not automatically trigger disconnection of gas supplies to Danish non-protected customers. A pro rata model may be used according to which non-protected customers in Denmark and Sweden may be partly disconnected in the event of surplus gas being available after the supply of protected customers.

1.4.4 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 use of the Danish security of supply model. The security of supply model is based on the framework of the Regulation. The overall intention is to avoid situations in which the market is unable to supply gas to customers.

"Energinet supports security of supply by use of the Danish security of supply model"

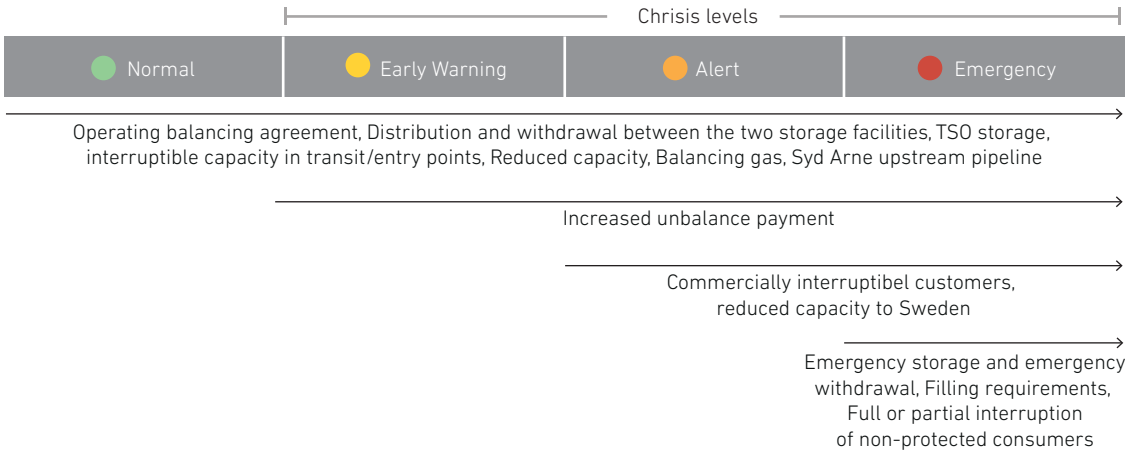
The model contains specific tools which Energinet may use to increase the likelihood that the market can continue to supply the customers when there is a gas shortage. The particular situation being dealt with will largely determine the way the tools are used. The choice of tools therefore depends on both effect and cost. Certain tools can also only be used in certain situations.

The tools available during Early Warning and Alert must support the market's ability to handle a crisis situation and supply Danish gas customers on its own. If the market is unable to handle a crisis situation on its own, it may be necessary to declare an Emergency. In an Emergency, Energinet may use non-market-based tools to safeguard supplies to protected customers, and as an absolute last resort, it may be necessary to fully or partially disconnect non-protected customers.

Of course, Energinet's decision must take into account more detailed circumstances in relation to the incident itself. A situation is more serious if an incident occurs in winter than in summer because consumption in Denmark and Sweden is highly temperature-dependent.

1.5 Contingency planning and exercises
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. Contingency planning is different from security of supply in that it primarily concerns potential crisis situations rather than normal operation.

FIGURE 1: TOOLS IN THE DANISH SECURITY OF SUPPLY MODEL



In the gas sector, contingency planning also concerns the safety of the surroundings and therefore does not only focus on maintaining security of supply. Natural gas is flammable and may explode, and it is therefore important for the contingency arrangements to work preventively and allow for rapid response in order 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 carries the responsibility in the event of a crisis.

Emergency incidents are rare but may have major impact on society unless there is an appropriate rapid response. Emergency incidents often require cooperation with organisations outside the gas supply sector, e.g. the police, fire department and emergency response services.

2. THE PAST YEAR

Security of supply was high last year as there was enough gas in the system to supply the gas consumers. In 2017, the total Danish gas storage volume was reduced. Nevertheless, the total storage volume still corresponds to one third of Danish annual gas consumption.

2.1 Security of supply incidents
No Early Warning, Alert or Emergency incidents were declared in the past year. The only two incidents occurred in 2013, when Early Warnings were declared in March and April.

2.1.1 IT incidents
There have been no IT incidents in the gas system impacting the gas supply in the past year.

2.2 Gas consumption
After having declined for many years, gas consumption has been relatively stable since 2014, but showed a slight increase in 2015 and 2016; see Figure 2. In 2016, gas consumption was approx. 2,593 million Nm^3, and consumption in 2017 is expected to remain in the region of 2,600 million Nm^3.

2016 was slightly warmer than average with 3 per cent fewer degree days than in a normal year. 2017 also appear to be a warm year. In the first nine months of 2017, there have been 2 per cent fewer degree days than in a normal year.

2.2.1 Peak day consumption
The temperature has a major impact on peak day consumption and hence on the load on the transport systems.

In the first nine months of 2017, the peak day consumption in Denmark was 16.7 million Nm^3. The daily mean temperature was -5.8°C on 5 January 2017.

For winter 2017-2018, the peak day consumption has been estimated at approx. 19.2 million Nm^3/day at a daily mean temperature of -13°C, which is the 20-year winter design temperature according to Danish Meteorological Institute statistics.

2.3 Gas supplies from the North Sea
Most of the gas supplied to Denmark comes from Danish gas fields in the North Sea. The gas from the Danish fields is taken onshore at Nybro via two submarine pipelines and sold for consumption in Denmark and exported to Sweden and Germany. Natural gas is also exported directly from the North Sea to the Netherlands. Denmark continues to be a net exporter of gas,

FIGURE 2: ANNUAL NET PRODUCTION FROM THE NORTH SEA DISTRIBUTED ON FLOW, 2012-2016

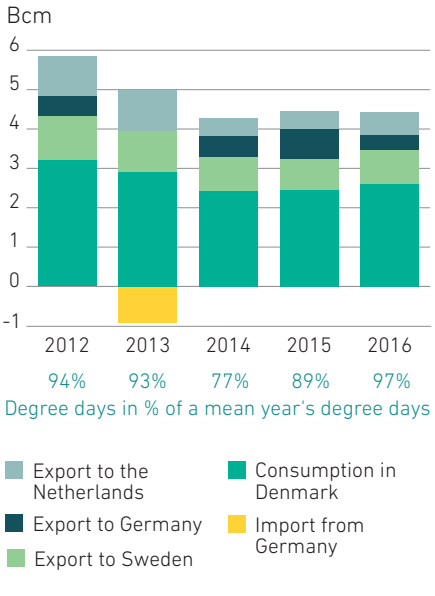


TABLE 1: CAPACITIES AND UTILISATION IN THE TRANSMISSION SYSTEM

Punkt		Capacity Mcm/d	Max flow 2014 Mcm/d	Max flow 2015 Mcm/d	Max flow 2016 Mcm/d
Nybro	Entry	32.4 [2]	16.2	14.6	13.2
Lille Torup Gas Storage Facility	Injection/ Withdrawal	3.6/ 8.0 [3]	3.4/ 4.5	3.5/ 7.3	3.7/ 7.5
Stenlille Gas Storage Facility	Injection/ Withdrawal	4.8/ 8.2 [3]	4.4/ 7.8	5.4/ 7.8	4.8/ 6.8
The Danish Exit zone	Exit	25.5	16.9	5.4/7.8	17.5
Ellund	Entry/ Exit	10.8 [4]/ 20.0	4.6/ 6.0	4.2/ 7.0	4.8/ 9.3
Dragør Border	Exit	8.6 [1]	6.1	6.2	6.0

Note 1: The Swedish system is not designed to receive these volumes at the assumed minimum pressure at Dragør of 44 bar. The firm capacity is stated at 7.2 million Nm³/day.

Note 2: Total capacity of the receiving terminals at Nybro. The potential supplies are smaller today as the Tyra-Nybro pipeline is subject to a capacity constraint of approx. 26 million Nm³/day, and large volumes cannot be supplied from the Syd Arne pipeline.

Note 3: The Danish storage company dimensions the commercial injection capacity conservatively in relation to the pressure in the gas transmission grid. When the pressure 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/Nm³.

but sometimes over the course of the year, the flow is reversed and natural gas is imported from Germany. Annual production distributed on flow and imports is shown in Figure 2.

Supplies to Nybro were approx. 3,636 million Nm^3 in 2016, which thereby which thereby exceeded the Danish and Swedish gas consumption of approx. 3,466 million Nm^3. There were thus net exports of gas from Denmark to Germany in 2016.

In the first nine months of 2017, supplies have been approx. 2,463 million Nm^3. Supplies are expected to be approx. 3,400 million Nm^3 for all of 2017.

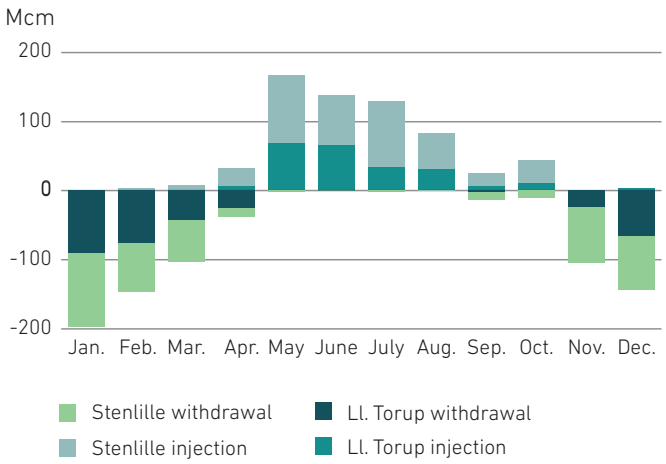
2.4 Use of the transmission grid

The direction of flow between Germany and Denmark in winter 2016-2017 was primarily northbound. Most of the peak day volumes did not come close to the capacity limits in the transmission system's entry and exit points or for storage in 2016.

2.5 Connection of biogas plants

Biogas can be upgraded and injected into the gas grid as biomethane. Since the first demonstration plant was connected in 2011, 21 upgrading plants have been

FIGURE 3: STORAGE WITHDRAWAL AND INJECTION PER MONTH, 2016



connected to the gas grid. One plant is connected directly to the transmission grid at Bevtoft, while the other plants are connected to the distribution grid. The plants have a total connection capacity of over 200 million Nm^3/year.

The volume of upgraded biogas injected into the gas system has been increasing. Injected upgraded biogas accounted for 3.2 per cent of Danish gas consumption from the grid in 2016. At the end of 2017, the production of upgraded biogas is expected to pass 5 per cent of the preceding year's gas consumption.

Energinet is aware of around 15 projects involving biogas upgrading which may be realised and connected to the Danish distribution or transmission grid in 2017 and 2018. Overall, these plants increase the total connection capacity by approx. 100 million Nm^3/year to approx. 300 million Nm^3/year.

Upgraded biogas has combustion characteristics similar to chemical natural gas, but may contain residual oxygen from desulphurisation. The threshold value for the oxygen content in the Danish gas system is higher than for the oxygen content in the German system, which meant that Energinet in summer 2016 faced specific challenges with oxygen from upgraded biogas with respect to the southbound flow via Ellund. The challenges were dealt with operationally, and by reducing capacity at the point. Energinet has subsequently established a cross-over connection near the first biomethane plant on the transmission grid to route the biogas for consumption in Denmark and to strengthen the operational possibilities of ensuring that the gas is not sent to Germany.

The oxygen content in upgraded biogas is still a focus point for Energinet. Energinet is working towards a balanced approach as regards capacity and infrastructure risk on the one hand and access for upgraded biogas on the other hand.

2.6 Use of gas storage facilities

The two Danish gas storage facilities, Lille Torup and Stenlille, have a total volume of 890 million Nm^3. This corresponds to around one third of Danish annual consumption. Energinet expects demand for withdrawal capacity in normal situations to vary between 10 million Nm^3/day and the current capacity of around 16 million Nm^3/day.

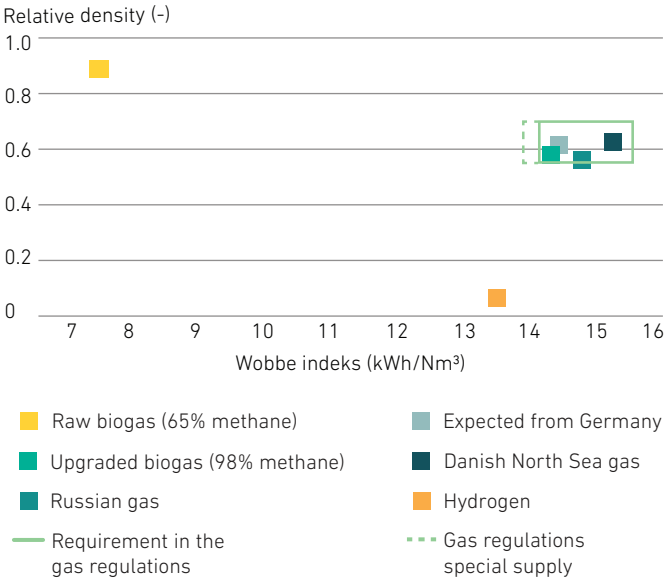
The volume capacity in both storage facilities was reduced in 2017.

Lille Torup's gas storage volume has been reduced by approx 60 million Nm^3, as one of the gas storage facility's caverns is filled with water due to maintenance. This is a consequence of the Danish Environmental Board of Appeal having reversed a previous approval and having decided that the water from the cavern must not be discharged into the Limfjord as originally planned.

Stenlille's gas storage volume has been reduced by approx 60 million Nm^3. The volume reduction was made on the basis of a withdrawal test.

The Danish gas storage facilities are an essential and integral part of the Danish gas system, in relation to the market, capacity, security of gas supply and daily operation. Most of the storage facility volume is used by commercial users.

FIGURE 4: ILLUSTRATION OF GAS QUALITY FOR DIFFERENT TYPES OF GAS



Note: In the future, new types of RE gases, such as hydrogen, may be introduced into the Danish gas system. Energinet is in the process of investigating how ready the gas system is for the gas quality which characterises new RE gases.

Gas consumption varies over the year and over each day. Market players can use the Danish gas storage facilities to store gas to exploit the price differences, for example 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; see Figure 3. In winter, when supplies from the North Sea can no longer cover Danish consumption or exports to Sweden and Germany, gas is withdrawn from the storage facilities again.

The two gas storage facilities can also provide storage capacity for emergency supplies, for example in the event of a major supply failure.

2.7 Gas quality

Energinet is responsible at all times for ensuring that the quality of the gas supplied from the gas transmission system complies with the Rules for Gas Transport and the Gas Regulation. The gas is supplied from different sources of supply (the North Sea, via Germany, the Danish gas storage facilities and biomethane) with different gas quality.

Under normal supply conditions, it is a requirement that the upper Wobbe index for natural gas is in the range 14.1-15.5 kWh/Nm^3 (50.76-55.8 MJ/Nm^3). The relative density of natural gas quality must not be below 0.555 or above 0.7.

The transported gas complied with the quality requirements in 2016.

2.8 The gas market

In the winter 2016-2017, the Danish market was generally well supplied. The European gas markets were also well supplied during the winter. There were stable supplies to the market, and the temperature was generally above normal levels. In addition, growing interest in LNG contributed to spreading the supply on several sources.

From January, Denmark has been a low-price area compared with Germany, and has thus primarily been an exporter of gas.

Gas year 2016-2017 saw a marked deterioration of the price correlation between Gaspoint Nordic and the markets in Germany and the Netherlands. The development is partly ascribable to local congestion in Germany and the Netherlands, which supports the price in these markets, while a well-supplied market in Denmark has forced the price down. The falling liquidity, where one trade may have a relatively high impact on prices compared with larger markets as a result of few players entering into few trades on Gaspoint Nordic, has probably also played a large role.

2.8.1 Reduction in trading on the gas exchange

After last year's record year, activities on

FIGURE 5: FLOW VIA ELLUND AND PRICE SPREAD BETWEEN DENMARK AND GERMANY, GAS YEAR 2016-2017

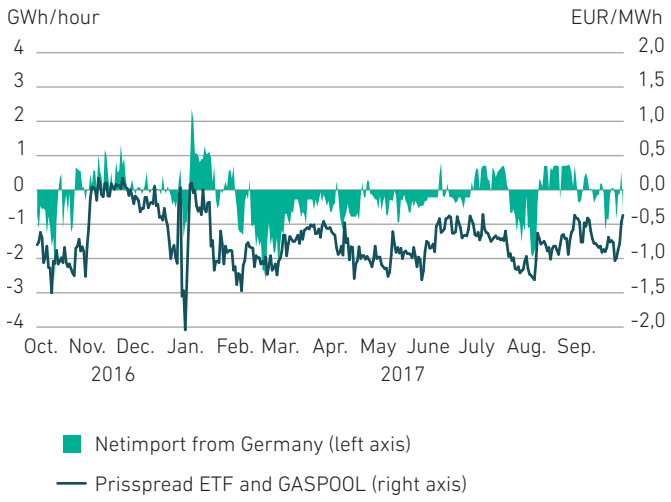
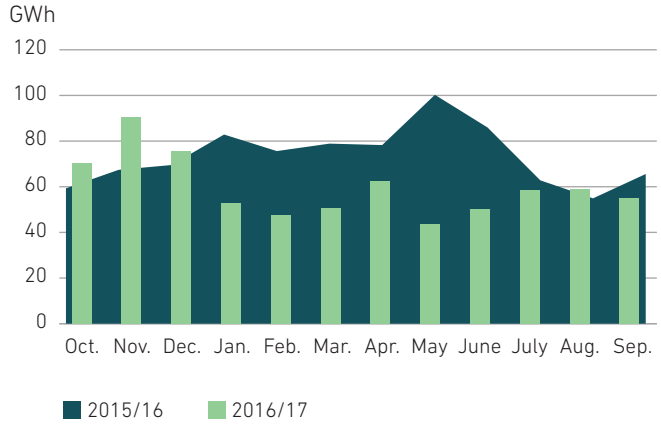


FIGURE 6: GAS VOLUMES SOLD ON GASPOINT NORDIC, GAS YEARS 2015-2016 AND 2016-2017



Gaspoint Nordic decreased during winter 2016-2017. Since the turn of the year, the monthly traded volumes on Gaspoint Nordic, with the exception of August, have seen a consistent decline compared with the same month last year. At the same time, the proportion of bilateral trades in Denmark has risen.

2.9 Incidents and exercises

In January 2017, Denmark was hit by high water levels, and in this connection, Energinet's gas facilities in Dragør were threatened by flooding. Both on the electricity and gas sides, Energinet was invited to join the police's local and national coordinating teams. Through the work on the Copenhagen local emergency preparedness staff (LBS) and the work on the National Operational Staff (NOST), Energinet was ensured assistance with the protection of the substation at Dragør, if this were to become necessary. The cooperation worked really well, both internally at Energinet and with the police.

Gas system exercises are organised so that they are performed in respect of all significant elements over a five-year period. No major exercises were performed in the gas system in 2017, but a number of minor tests and exercises were performed in respect of individual elements.

3. THE COMING WINTER

It is expected that there will be sufficient capacity in the gas system to supply the Danish gas consumers if the coming winter turns out to be very cold. The overall supply outlook for Europe also looks good for the coming winter. Only if the winter becomes unusually cold, a few countries – excluding Denmark and Sweden – may experience reduced flexibility in the system.

3.1 Capacity bookings

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

Annual capacities for gas year 2017-2018:

- **Ellund exit,** export of gas to Germany: Annual capacity of approx. 10,000 kWh/h has been sold. No annual capacity was sold in the previous year. The total capacity for sale at Ellund exit is 10 million kWh/h.
- **Ellund entry,** import of gas from Germany: No annual capacity has been sold, apart from the capacity from the long Open Season contracts[1] for approx. 3.1 million kWh/h. The total capacity at Ellund entry is 7.7 million kWh/h.
- **Dragør exit,** export of gas to Sweden[2]: Annual capacity of approx. 0.9 million kWh/h has been sold, which is less than the year before where 1.1 million kWh/h was sold. The total capacity for sale at Dragør exit is approx. 3.7 million kWh/h.
- **Nybro,** which is connected to the submarine pipelines from the North Sea: Sales have increased to 3.6 million kWh/h compared with 3.1 million kWh/h the year before. The total capacity for sale at Nybro entry is 16.5 million kWh/h.
- **Exit zone,** supply of gas to Danish end users (distribution areas): In the first nine months of 2017, slightly more than 3 million kWh/h have been ordered. Last year, annual bookings in the exit zone were about 6.3 million kWh/h. Capacity can be ordered all year round (calendar year). A part of the annual capacity will therefore be booked by the end of the calendar year 2017. It is expected, however, that the total capacity sold will be significantly lower due to the change in the capacity tariff between short and long-term products. More than 12 million kWh/h are offered at the exit zone.
- **BNG entry,** biogas upgraded to natural gas quality and injected into the transmission system: More than 200,000 kWh/h have been sold, which represents more than a doubling relative to the previous gas year, where annual capacity was approx. 84,000 kWh/h.

3.2 Cubic metre limit

A 'cubic metre limit' is determined and published each year by the Danish Energy Agency, and is used to decide which customers are protected.

For gas year 2017-2018, the limit for protected customers is 3.2 million Nm^3/year. In practice, this means that

[1] 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, companies must submit financially binding bids and may thereby acquire capacity on the connection.

[2] The Dragør point is connected to the Swedish transmission system. The point is primarily used for exports of gas to Sweden, but capacity may also be ordered commercially in back-flow, from Sweden towards Denmark.

ENERGINET'S WINTER OUTLOOK 2018-2019

To assess the supply situation in the coming winter, a reliability evaluation of the gas system is carried out. This evaluation looks at whether the system capacities can ensure supplies to consumers during each 24-hour period in winter 2018-2019. The Winter Outlook assessment is used to evaluate the capacity in the gas system based on a winter's day with a temperature of -13°C.

The assessment indicates that there is ample capacity in the gas system to meet demand on a very cold day.

The assessment for gas year 2018-2019 is:

- Total transport: Total net transport has been estimated at 25.0 million Nm^3/day.
- Exit zone: Consumption in Denmark is 19.1 million Nm^3/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 0 million Nm^3/day, i.e. imports and exports cancel each other out.
- Dragør: Dragør has exports of 5.9 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 Nm3/day coming from Stenlille and 8.0 million Nm^3/day from Lille Torup. The distribution of withdrawals is optimised to achieve the highest possible grid pressure.
- Nybro: Supplies at Nybro are estimated at 8.8 million Nm^3/day.

industrial enterprises and gas-fired CHP plants will be protected if they have an annual gas consumption of less than 3.2 million Nm^3/year.

3.3 Gas quality during the coming winter

Energinet expects gas quality in the coming winter to be based on a combination of North Sea gas, gas from Germany and biomethane.

In the coming winter, Energinet expects gas quality to vary as follows:

- The Wobbe index for the Danish North Sea gas is expected to vary from 14.7 kWh/Nm^3 to 15.5 kWh/Nm^3.

RISK ASSESSMENT OF THE EUROPEAN GAS MARKET

Twice a year, ENTSOG prepares forecasts for the supply situation in Europe in the coming summer and winter (Summer Supply Outlook and Winter Supply Outlook).

In addition, as something new based on the revised Regulation, ENTSOG prepares an analysis of security of supply in Europe every four years, to identify where and when problems with maintaining supplies to gas consumers may arise.

ENTSOG's forecast for the coming winter:
- In case of a cold winter, none of the European countries face the threat of supply failure.
- During a two-week period of exceptionally high demand in a cold winter, a few countries may experience significantly lower flexibility in the gas system. During a single day of exceptionally high demand in a cold winter, Bosnia risks having to disconnect gas consumers.
- At the beginning of gas year 2017-2018, stocks in Europe were at the lowest level in five years.

ENTSOG's simulation of security of gas supply in Europe:
- In case of a cold winter, none of the European countries face the threat of supply failure.
- During a two-week period and a single day of exceptionally high demand in a cold winter, Denmark and Sweden may risk having to disconnect gas consumers.
- In the event of outage of Ellund combined with exceptionally high demand during a two-week period or a single day, Denmark and Sweden may risk having to disconnect a major part of the gas consumers.

The result of ENTSOG's simulation cannot be compared directly with Energinet's own analyses. The reason for this is that ENTSOG's simulation runs over four years and is thus based on reduced supplies from the North Sea. On the other hand, the simulation does not take into account that extra firm capacity will be offered at Ellund from 2019 and that consumption is expected to decline. Moreover, ENTSOG's simulation does not include extra measures in Denmark and Sweden. ENTSOG's simulation thus shows a more negative forecast than Energinet's own analyses.

- The Wobbe index for gas imported from Germany is expected to be lower than that for Danish North Sea gas. Energinet estimates that the average Wobbe index for gas from Germany will be 14.7 kWh/Nm^3, varying from 13.9 kWh/Nm^3 to 15.5 kWh/Nm^3.
- The Wobbe index for upgraded biogas injected into the gas system is expected to be lower than that for Danish North Sea gas. Upgraded biogas resembles chemical natural gas and normally consists of a mixture of methane and CO_2. Biomethane typically has a Wobbe index at the lower half of the variation range permitted in the Gas Regulation, i.e. from 14.1 kWh/Nm^3 to 14.8 kWh/Nm^3.

3.4 Distribution and dimensioning
Supplies to the individual M/R stations in the transmission system and to individual consumers must be maintained in normal situations as well as in crisis situations with very low daily mean temperatures. This is ensured by analysing the systems and assessing natural gas demand from each M/R station. The assessments are made jointly by the distribution companies and Energinet. Station capacities are estimated to be sufficient to cover the supply requirement for winter 2017-2018.

The analyses include the three largest distribution companies, NGF Nature Energy Distribution A/S, Dansk Gas Distribution A/S and HMN GasNet P/S.

3.4.1 NGF Nature Energy Distribution A/S
The M/R stations supplying NGF Nature Energy Distribution are deemed to have sufficient capacity to cover the supply requirement for winter 2017-2018.

NGF Nature Energy Distribution's expected capacity requirements were calculated based on empirical data and customers' capacities. NGF Nature Energy Distribution then adjusted the numbers taking into account the simultaneity of various types of consumption.

Work is actively being done on the pressure in the distribution lines to create flexibility for biogas production. The pressure will be changed in the distribution lines from 18 bar in the winter period to 13 bar in the summer period.

3.4.2 Dansk Gas Distribution A/S
The M/R stations and distribution systems in Dansk Gas Distribution's area are deemed to have sufficient capacity to cover the supply requirement for winter 2017-2018.

Dansk Gas Distribution's expected capacity requirements have been calculated based on existing and new capacities in the underlying distribution grid. Regular analyses of gas consumption are performed, such as consumer transition from gas to district heating.

No new upgrading plants for biogas were connected to the distribution grid in 2017. A total of four biogas plants are connected with an agreed capacity of upwards of 5,500 Nm^3/hour of biomethane. In addition, agreements have been made with upgrading plants with a total capacity of approx. 8,250 Nm^3/hour, which are expected to be connected to the distribution grid in 2018.

In September 2016, Energinet took over DONG Energy's distribution grid and established the distribution company Dansk Gas Distribution A/S. Politically, plans are for Energinet to take over the distribution grids from NGF Nature Energy Distribution A/S and HMN GasNet P/S in the long term.

3.4.3 HMN GasNet P/S
The M/R stations and distribution systems in HMN GasNet's distribution area are deemed to have sufficient capacity during winter 2017-2018.

HMN GasNet has received upgraded biogas since 2014. Ten upgrading plants had been commissioned as of 1 September 2017. The contract volume for the commissioned plants comes to 71 million m^3/year. This corresponds to a maximum supply of approx. 8,100 m^3/hour. Supplies from the plants in the past year totalled 54 million m^3.

As of 1 September 2017, ten plants are under construction/being expanded. The contract volume for plants under construction comes to 63 million m^3/year, corresponding to maximum supplies of approx. 7,200 m^3/hour.

A CHANGING GAS SECTOR

The gas sector is changing. The distribution grids are to be gathered in a state-owned company, and the original players in the Danish gas sector have been replaced.

In connection with the initial public offering (IPO) of DONG Energy (now Ørsted), the Danish government decided that the company's distribution grid was to be sold to Energinet. Energinet took over DONG Energy's distribution grid on 30 September 2016 and established the distribution company Dansk Gas Distribution A/S (DGD). On the basis of the analysis 'An efficient gas sector' (En effektiv gassektor) prepared by the Danish Energy Agency, the Danish government proposed, in its supply strategy from September 2016, that the focus should be on consolidating the gas sector. In a voting agreement of 30 May 2017, a number of parties represented in the Danish Parliament agreed that negotiations were to be initiated with HMN GasNet and NGF Nature Energy Distribution. These negotiations have been initiated, but not yet completed.

Another consequence of the IPO of DONG Energy is the divestment of the company's submarine pipelines. It appears from the agreement on the IPO of DONG Energy that the submarine pipelines must remain state-owned and that an attempt should be made to sell them to Energinet.

A replacement of active companies in the Danish part of the North Sea has taken place in the course of 2017, with new and large foreign companies entering the market. Main players in the North Sea which have contributed to developing the Danish upstream system have divested, or are investigating the possibilities of divesting, their oil and gas activities. Both DONG Energy and A.P. Moller – Maersk have divested oil and gas activities. DONG Energy announced the divestment of DONG E&P A/S to Swiss INEOS on 24 May 2017 (the divestment was finalised on 29 September 2017), while A.P. Moller – Maersk announced the divestment of Maersk Olie & Gas A/S to French TOTAL S.A. on 24 August 2017. Finally, Hess also announced that they are looking into the possibilities of divesting their activities in Denmark.

The sale of A.P. Moller – Maersk's oil and gas activities to TOTAL S.A. takes place right before a period with new challenges for the Danish gas market, including the reconstruction of the Tyra platform in the period 2019–2022, and Danish gas production will therefore be reduced significantly during that period. TOTAL has announced that they are taking over the agreements that Maersk has entered into with the Danish state.

4. THE FUTURE DEVELOPMENT

The future development for the supply situation is analysed to assess what might affect security of supply in the long term. The analysis helps to identify whether further initiatives should be implemented. The main focus is on changes in the supply of gas and demand in the Danish and Swedish markets, but changes in storage and infrastructure capacity are also important.

4.1 Reconstruction of the Tyra complex 2019-2022

On behalf of DUC, Maersk has announced that the Tyra complex is to be reconstructed in order to secure Danish gas production for many years to come. The reconstruction will imply considerably reduced production because 90 per cent of Danish gas production passes through the Tyra complex. Seen in a historical light, it is remarkable that such a substantial part of a market's gas supply is taken out for a prolonged period of time. The reconstruction of Tyra is expected to take place in the period 2019-2022.

During the reconstruction of Tyra, Denmark and Sweden will depend on gas imported from Germany and on supplies from the two Danish gas storage facilities. To secure the supply of gas to the Danish and Swedish consumers it is necessary that the market players make optimal use of the import and storage volume capacity.

To support the market players, Energinet remains updated on the supply situation at all times, ensuring that updated information about the development is given to the market players. In this way, the market players are provided identical information so that they are in a position to apply the necessary measures to prevent a critical supply situation.

The most recent evaluation of the supply and demand situation during the reconstruction of Tyra was made in August 2017 based on the information that no gas will be delivered via the Tyra-Nybro marine pipeline in the period December 2019 – March 2022: https://energinet.dk/Gas/Tyra/Forsyningsbilledet

The evaluation will be updated in January 2018 on the basis of new information published by Maersk in an announcement to the market (REMIT) of 24 November 2017. It appears from this announcement that the Tyra complex will be closed as from 1 November 2019, and from that date no gas will be delivered via the Tyra-Nybro marine pipeline. It is expected that the gas flow from Tyra will be resumed on 1 July 2022.

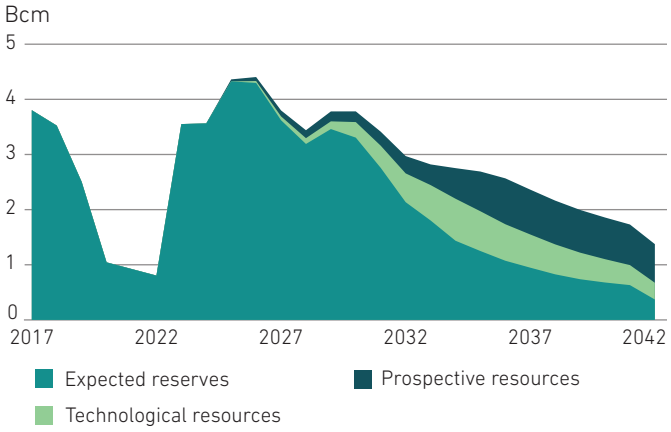
The evaluation from august 2017 show that the Danish and Swedish gas consumers will continue to be supplied during the reconstruction of the Tyra complex. Nevertheless, the gas system will get more vulnerable and less flexible if the demand becomes unusually high or a technical incident happens that may reduce the supply to the consumers.

Since the first announcement made by DUC in April 2016, Energinet TSO-Gas has been working to prepare the gas market as well as system operations in Energinet for handling the future situation.

Work is on-going in respect of analysing various types of suitable measures, from providing increased physical capacity, for instance by increasing the withdrawal capacity in Lille Torup, the storage volume in Stenlille as well as the import capacity from Germany.

Further measures will be increased information to and dialogue with the market players, for instance by regularly publishing system information for them to act on and by facilitating incentive-regulating market initiatives.

FIGURE 7: EXPECTED RESERVES, 2017-2042



Source: Danish Energy Agency.
Note: The expected development is a forecast for extraction from existing fields and new sources with existing technology. The technological resources are an estimate of the extraction potential through the use of new technology. The exploration resources are an estimate of the extraction from future new sources as a result of ongoing exploration activities and future new calls for tenders.

Work is also ongoing with a view to adjusting and supplementing Energinet's emergency supply tools and products. Energinet expects a recommendation to be ready during the first 6 months of 2018.

4.2 Gas supplies to Denmark

The primary sources supplying the Danish gas market are own production in the North Sea and imports from Germany. In addition, biogas production accounts for a small, but increasing, share of gas supply in Denmark.

4.2.1 North Sea production

The total reserve estimates have been generally increased from 2022, due to changes in risk assessments and several expected expansions. The expected reserve estimates have been significantly increased, while the contribution from technological reserves and prospective resources has been reduced[3].

Natural gas supplies to Denmark are determined by the proportion of North Sea production which is exported to the Netherlands and Germany (via Denmark). The distribution is determined by the commercial players.

4.2.2 Biomethane production

So far, the contribution to security of supply from biogas has been low, as the share in the natural gas grid has been very small, and as there are ample opportunities for natural gas supplies from the North Sea and Germany. At the end of 2017, biogas accounts for 5 per cent of gas supplies to Danish customers. With an expected increase to approx. 10 per cent in 2020, the contribution will become more noticeable.

Aarhus University[4] assesses that the maximum technical potential for biogas will be 50-100 PJ, depending on whether the straw resource and energy grasses can be used in gas production going forward. Today, approx. 12 PJ of biogas are produced for energy purposes, corresponding to approx. 300 million Nm^3 of natural gas.

4.2.3 Supply situation 2017-2040.

The supply situation[5] during the reconstruction of Tyra in the period 2019-2022 requires special attention, and Energinet prepares expectations for this on an ongoing basis.

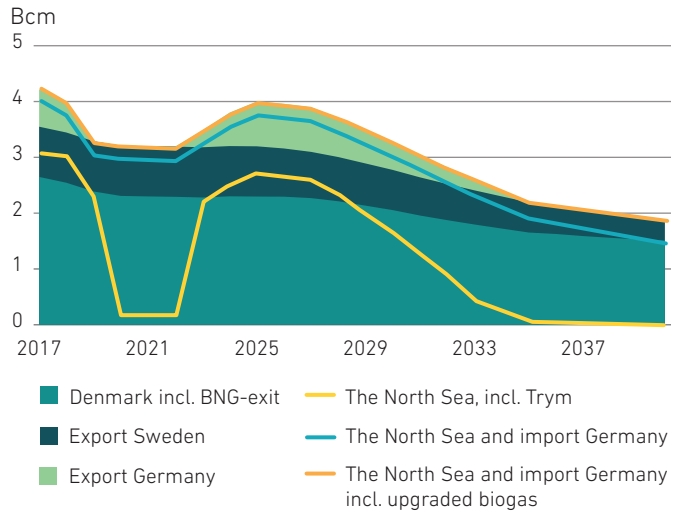
The Danish gas system will become more vulnerable when reconstruction of the Tyra complex starts. However, the Danish gas system has been expanded with sufficient capacity between

[3] Energinet bases this on the Danish Energy Agency's most recent projection of North Sea production from June 2017. In this, it is assumed that Tyra is being reconstructed in 2019-2022.

[4] 'Scenarios for use of biogas for heavy-duty vehicles in Denmark and related GHG emission impacts', S.S. Jensen, M. Winther, U. Jørgensen and H.B. Møller (2017, articles from the Transport Forum at Aalborg University).

[5] Supply situation 2017-2040 is based on the Danish Energy Agency's forecast for Danish gas production and Energinet's gas consumption forecast. The Danish Energy Agency's forecast for gas production from the Danish North Sea gas fields in 2017 and Energinet's forecast (Analysis Assumptions June 2017) for gas consumption in Denmark and Sweden.

FIGURE 8: SUPPLY SITUATION 2017-2040



Germany and Denmark which, together with the gas storage facilities, provide the requisite flexibility in the system to supply Danish and Swedish gas consumers. However, it is a condition that the market players make optimum use of the capacity during the reconstruction period.

The gas market prices are expected to be affected by the fact that, during this period, Denmark has one primary source of supply only and thus less flexibility in the market. Large price fluctuations may therefore occur during periods with, for example, high demand or fewer gas supplies.

The supply situation is Energinet's best estimate of how the supply situation may look. The estimate is subject to uncertainties.

Energinet is in continuous dialogue with stakeholders about developments in relation to the Tyra platform. Energinet will regularly provide information on timing, consequences and initiatives in connection with the shutdown.

Security of gas supply is very high today, and is expected to be even higher in 2022 after the reconstruction of Tyra, as the production from the North Sea is assumed to be higher than today, and as it will still be possible to supply large volumes from Germany and the Danish storage facilities.

4.3 Consumption trend in Denmark and Sweden

The total natural gas, biogas and biomethane consumption in Denmark, excluding field consumption in the North Sea, is expected to decrease to approx. 2,280 million Nm^3/year in 2030. Natural gas consumption in Denmark is expected to decrease to approx. 1,800 million Nm^3/year in 2030. Consumption of biogas and biomethane is expected to increase from the current level of approx. 300 million Nm^3/year to approx. 480 million Nm^3/year in 2030.

4.3.1 Changes in consumer segments

Gas consumption for electricity and heat generation is expected to continue to decline. The declining gas consumption is driven primarily by the cancellation at the end of 2018 of the basic amount paid to local CHP plants, which is expected to result in the decommissioning or conversion of CHP plants[6].

Consumption by individual heating systems is expected to decline by approx. 40 per cent up until 2030, due to energy savings and conversion to other forms of heating. Gas consumption by businesses is expected to remain virtually unchanged for a number of years, but will start to decline in 2030 as a result of transition. The use of gas in industry is sensitive to market conditions, and may vary due to conversions or changes to the number of manufacturing companies[7].

The transport sector's gas consumption is expected to increase in the entire

[6] The projection for the electricity and district heating sector stems from Energinet's simulations based on Analysis Assumptions 2017.

[7] The projection of gas for individual heating systems and businesses is based on the Danish Energy Agency's Base Projection 2017.

[8] The projection for the transport sector originates from an analysis of the expected development of electricity and gas for transport performed by Energinet in 2017.

period up until 2030. However, the growth in gas consumption is expected to be smaller at the end of the period as a result of increased electrification. The expected development is, however, subject to considerable uncertainty[8].

Swedish consumption of natural gas is based solely on supplies from Denmark and a small proportion of biogas produced in Sweden. Plans are to construct an LNG receiving terminal in Gothenburg, but it is expected that Denmark will remain Sweden's primary source of natural gas supply.

Natural gas consumption in Sweden is expected to reach a maximum of approx. 800 million Nm^3 in 2017. In the period 2017-2025, consumption is expected to be approx. 900 million Nm^3 per year. After 2025, Energinet expects natural gas consumption in Sweden to decline in line with Danish consumption.

4.3.2 Sensitivities in gas consumption

Any assessment of future gas consumption is subject to uncertainty, especially concerning gas consumption for CHP, transport and the process industry.

The possible outcomes for gas consumption have, among other things, been assessed on the basis of Energinet's scenarios , describing a number of alternative developments for the entire energy system and especially for gas for CHP, transport and heating.

The assessment is that gas consumption in a normal year in 2030 could vary by +/- 600 million Nm^3 compared to the central estimate. This means that the range of possible outcomes is about 1,200 million Nm^3. In addition to this range of possible outcomes, gas consumption will fluctuate from year to year due to weather conditions and electricity, CO_2 and fuel prices.

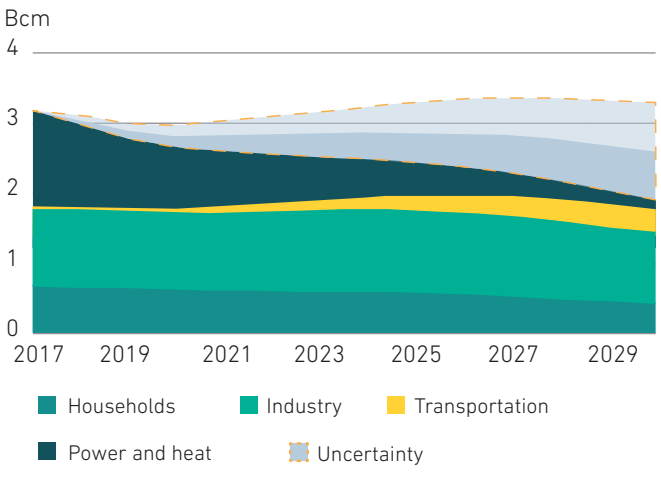
Trends which may result in lower gas consumption:

- A higher share of gas-fired CHP plants changing operating patterns or closing down.
- Transition to biomass in the process industry.
- Faster reduction in natural gas consumption for heating.
- Lower gas consumption in the transport sector.

Trends which may result in higher gas consumption:

- Slower reduction in gas consumption for domestic heating.
- Faster rollout of gas in the transport sector, e.g. sea transport and transport.
- Improved conditions for gas-fired CHP, such as higher CO_2 and electricity prices.

FIGURE 9: EXPECTED GAS CONSUMPTION DISTRIBUTED ON APPLICATIONS, 2017-2030



Note: Industry includes the service industries and comprise gas for heating and process heating.

4.4 Gas storage capacity

Energinet purchases gas for storage to supplement supplies to protected customers in Emergency situations. During the period where the Tyra complex is out of operation, the procurement of

supplies for emergency supply situations is expected to be increased from the current approx. 100 million m^3 to approx. 200 million m^3.

With Tyra in operation, Danish and Swedish customers can be supplied with gas from both the North Sea and from Germany. During the reconstructionn of Tyra, the primary source of supply will be Germany (Ellund). In addition, the storage facilities during this period are a necessary prerequisite for supplies to the market being able to meet seasonal demand and for the ability to maintain supplies to gas consumers in the event of outage of Ellund. Energinet must ensure supplies to protected customers for up to 30 days in case of failure of the single largest source of supply (see the Regulation) during the reconstruction of Tyra.

One of the caverns in the Lille Torup gas storage facility will remain water-filled during the reconstruction of the Tyra complex. The storage volume capacity at Lille Torup has thus been reduced by approx. 60 million Nm^3. The storage volume at Stenlille has also been reduced by approximately 60 million Nm^3. In addition, the working volume in the storage facilities will decrease by around 10-12 per cent, corresponding to approx. 100 million Nm^3 when the storage facilities in 2020 are filled with gas from Germany with a lower calorific value than gas from the North Sea. The total working volume in the storage facilities will thus be lower during the reconstruction of Tyra relative to today.

The storage capacity during the reconstruction of Tyra is a central element in ensuring supply, and the reductions mentioned in the storage volume thus represent an extra challenge.

4.5 Infrastructure after 2017

Energinet's investments in import capacity from Germany have improved the long-term Danish security of gas supply in recent years. But in the long term, when supplies from the North Sea eventually decrease, the supply situation may become more vulnerable. It may therefore be necessary to establish new, or expand existing, infrastructure to maintain security of supply.

Energinet is currently examining the possibilities of establishing a connection from the Norwegian gas fields through Denmark and onwards to Poland – the Baltic Pipe project.

In addition, Energinet is contributing to achieving the task of ensuring the best possible way of injecting the steadily increasing biogas production into the natural gas grid.

4.5.1 Baltic Pipe

The Baltic Pipe project comprises the establishment of a connection from the Norwegian gas fields in the North Sea to the Danish gas system and further on through the Baltic Sea to Poland.

"The storage capacity during the reconstruction of Tyra is a central element in ensuring supply, and the reductions mentioned in the storage volume thus represent an extra challenge"

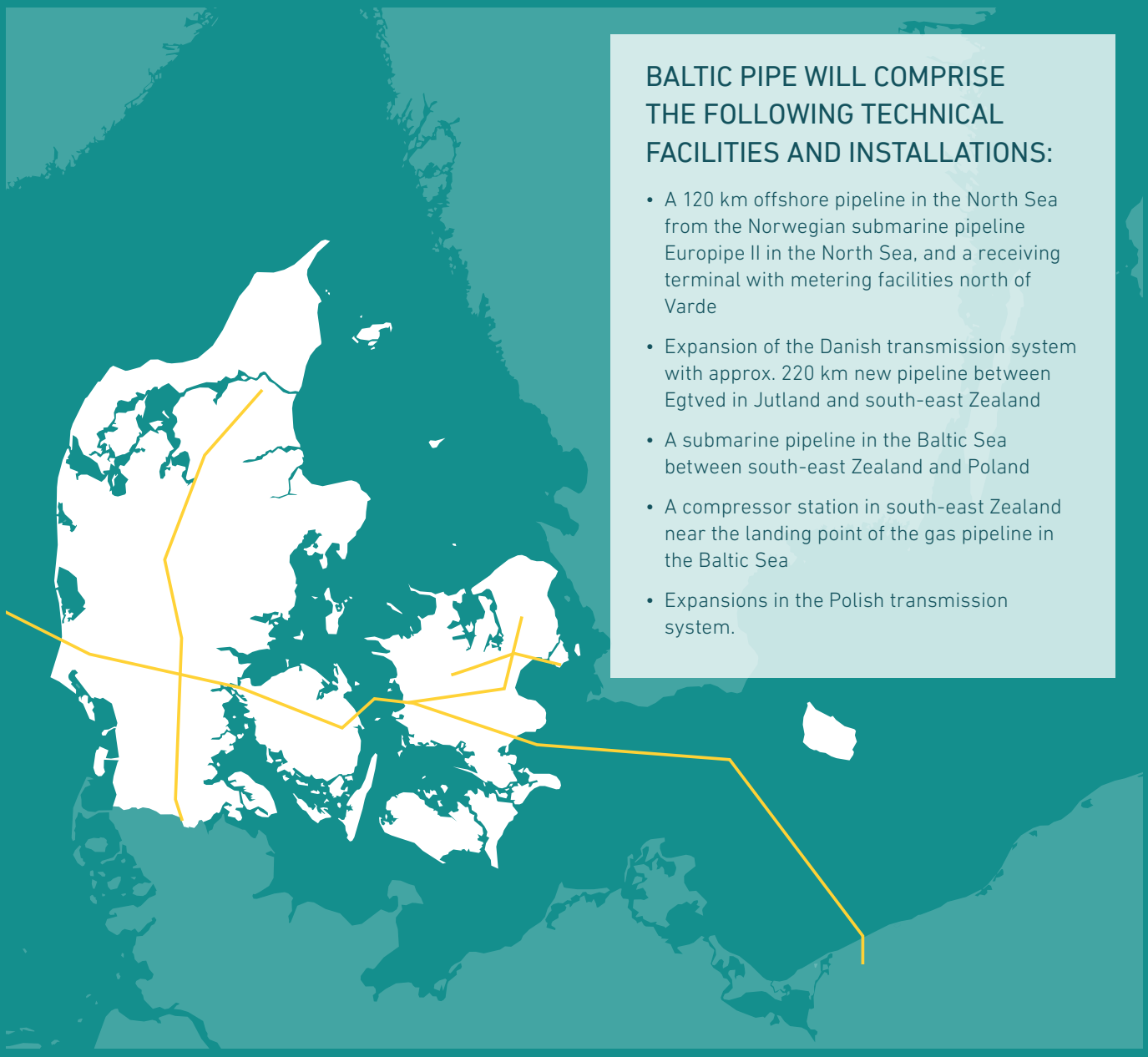
In autumn 2017, companies in the gas market have made binding bids and secured capacity in the Baltic Pipe. It is therefore clear that the demand is sufficiently large to continue work on the technical and economic business case for an investment decision. The Danish Minister for Energy, Utilities and Climate will make the final investment decision regarding the project by the end of 2018.

The Baltic Pipe project has gained PCI status (Projects of Common Interest), which means that the project has common European interest as it will help to diversify European gas supplies and integrate European markets.

Like other countries in Central and Eastern Europe, Poland is predominantly dependent on gas from Russia. The Baltic Pipe project will give Poland, Denmark and other countries in the region access to Norwegian gas. Baltic Pipe will also give Denmark indirect access to the global market for liquefied natural gas (LNG) via the Polish receiving terminal.

Access to two alternative sources of supply will generally increase security of supply in Denmark. It must now be investigated how Baltic Pipe will affect the

BALTIC PIPE PROJECT

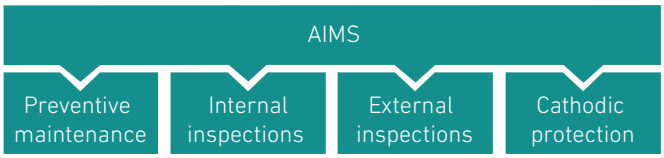


BALTIC PIPE WILL COMPRISE THE FOLLOWING TECHNICAL FACILITIES AND INSTALLATIONS:

- A 120 km offshore pipeline in the North Sea from the Norwegian submarine pipeline Europipe II in the North Sea, and a receiving terminal with metering facilities north of Varde
- Expansion of the Danish transmission system with approx. 220 km new pipeline between Egtved in Jutland and south-east Zealand
- A submarine pipeline in the Baltic Sea between south-east Zealand and Poland
- A compressor station in south-east Zealand near the landing point of the gas pipeline in the Baltic Sea
- Expansions in the Polish transmission system.

The gas pipeline will have a total length of approx. 6-800 km and is being planned with a view to being ready for operation in 2022.

The total expansion will be able to transport 10 billion Nm^3 of gas from Norway to Poland. Danish gas consumption totalled 2.6 billion Nm^3 in 2016.



Danish supply situation in relation to the revised EU Regulation, which, among other things, sets out stricter requirements for solidarity among the EU countries.

Denmark's interest in the Baltic Pipe project also concerns ensuring low and stable gas tariffs in the years ahead. Danish gas consumption is expected to decline in the coming years. This means that there will be fewer and fewer consumers to cover the costs of operating and maintaining the gas grid. If Baltic Pipe is established, expectations are that the gas flow in Danish pipes will triple, resulting in stagnation or a drop in tariffs.

4.5.2 Biogas plants and grid expansion

The first biogas plant was connected directly to the Danish transmission grid in July 2016. The plant is connected at Bevtoft in Southern Jutland. Most biogas plants are connected to the distribution grid.

As more biogas plants are connected to the distribution grid, there are more instances of biogas production exceeding local consumption. There is therefore a need to be able to return biogas from the distribution grid to the transmission grid so it can be used in a larger area. This leads to the need for a number of minor improvements to the gas transmission system.

Specifically, it is expected that there is a need to return gas at three M/R stations: Aalborg, St. Andst and mid-Funen. Each project will be implemented in close cooperation with the distribution companies.

The focus is on upgrading biogas so that it can be injected into the natural gas grid and thus be better utilised. It is Energinet's responsibility and task, in cooperation with other players, to promote the injection of upgraded biogas into the gas grid. In addition to the physical establishment of injection facilities, this also involves market support where the development of rules on biogas transport and certificate handling are the tools currently employed to solve the task.

Energinet has in 2017 startet working on strengthen the joint grid planning with the distribution companies with the purpose to safeguarding socioeconomically effective solutions and grid reinforcement. In accordance with the Danish Energy Agency's announcement of principles for the distribution of costs upon connection, Energinet is cooperating with the grid companies to ensure joint decision-making criteria for decisions on connection, uniform service standards etc.

4.5.3 Integrity of the gas tranmission grid

The gas infrastructure is covered by a comprehensive Asset Integrity Management System (AIMS) to support secure and cost-efficient operation of the gas transmission system. Many service operations in gas facilities are mandated by law and are carried out in accordance with the law.

In 2016, TSO Gas was certified under the ISO 55001 Asset Management system. Asset management has three focus areas:

- Risk-based approach: We are dependent on our assets, and outages may have serious consequences.
- Efficiency: Focus on making things more efficient and constantly improving what we do.
- Methodology: Supporting effective procedures and transparency, and reducing the risk of outages.

Overall, this approach is expected to improve the planning of initiatives and investments, rationalise maintenance costs, and ultimately improve security of supply by always having the right measures in place.

4.6 Infrastructure in Europe

Every two years, ENTSOG publishes a Ten Year Network Development Plan (TYNDP). The plan provides an overview of the long-term challenges for the European gas system until 2035. Work on the TYNDP involves analysing security of supply and the development in the European gas market.

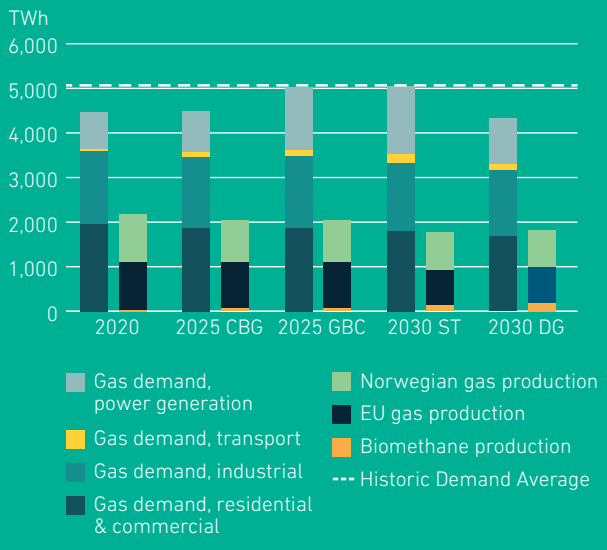
The most recent development plan was published in April 2017 (TYNDP 2017). ENTSOG is already working on the

DEMAND AND CONSUMPTION IN EUROPE IN THE LONG TERM

Demand
European consumption of natural gas decreased until 2014, with a weak rise in 2015. TYNDP 2017 shows a decline in European gas consumption in three of the four future scenarios. Demand trends vary from country to country. For example, Denmark is one of the countries seeing the strongest decline in demand.

Production and imports to Europe
Supply in Europe is secured through the countries' own production, imports from Russia and Norway in particular, LNG imports and gas in the storage facilities.

It is assumed in TYNDP 2017 that Europe's own natural gas production will come to just under 120,000 m^3 in 2017. Own production is expected to decline to upwards of 50,000 million m^3 in 2035. This will probably increase the need for imports to the European gas market.



Notes: The figure is based on data from the ENTSOs TYNDP 2018 Scenario Report from 2017. The pillars refers to different scenarios: CBG Coal Before Gas, GBC Gas Before Coal, ST Sustainable Transition and DG Distributed Generation.

next plan (TYNDP 2018) as the ENTSOs for electricity and gas (ENTSO-E and ENTSOG) from now on are to follow the same time line.

As part of the work on the publication of the next TYNDP, the ENTSOs have during 2017 worked together on developing joint scenarios for the analyses in TYNDP 2018.

ENTSOG's TYNDP contains one Danish project, the Baltic Pipe project, which also has PCI status.

4.7 Gas market development

4.7.1 Joint Balancing Zone – Denmark and Sweden

During the past year, Energinet and Swedegas, the Danish and Swedish TSO, have been working on a project to merge the two balancing areas Denmark and Sweden into one common area (see also Energinet's System Plan 2016). The purpose of the project is, among other things, to create a larger market area where synergies and cost reductions in the operation of the overall Danish-Swedish system can be achieved.

To be able to make a decision on the project, Energinet and Swedegas have jointly performed a cost-benefit analysis where also the market participants in Denmark and Sweden were involved for commenting. Based on this analysis, it was decided in spring 2017 that the project is to be completed towards spring 2019.

4.7.2 Overrun charge

In February 2017, Energinet introduced a less strict principle for overrun charge – for overrun towards the exit zone of the booked capacity for each gas day. For a daily product, gas suppliers are now only required to pay for the hour with the highest offtake instead of paying for all hours with over-runs.

The new principle offers shippers more flexibility, as a higher offtake than

assumed at the time of booking will not be punished, but only costs a daily product.

4.8 Transmission tariffs
Energinet's finances are based on a self-financing principle. This means that income and expenses must balance. Differences in income and expenses are called over- or under-recovery, and are transferred to next year's budget. Most of the income is collected in the form of tariffs.

Transmission tariffs are fixed so as to cover the costs of transmission grid operation, grid expansion and security of gas supply.

4.8.1 Current method
In 2016, Energinet obtained approval of an adjustment to the tariff method, which entered into force as of gas year 2017-2018. The method can be considered as a uniform method with an extra element (the capital costs involved in the Ellund-Egtved expansion), which is distributed as follows:

- One third of the compressor CAPEX costs are allocated to the Ellund entry point.
- One third of the compressor CAPEX costs and two thirds of the pipeline looping CAPEX costs are allocated to the exit zone and Dragør exit.
- One third of the compressor and pipeline looping CAPEX costs are allocated to the emergency supply tariff.

4.8.2 Transport tariffs
Transport tariffs have risen in recent years. This is due to the inclusion of less excess revenue and smaller volumes of transported gas. Transport tariffs are expected to continue to rise in the long term if the volumes of transported gas continue to decline.

4.8.3 Emergency supply tariffs
In addition to the transport tariff, end users also pay emergency supply tariffs. End users are divided into two customer groups:

- Non-protected customers: Around 47 industrial companies and central power stations, which together account for approx. 22.6 per cent of annual gas consumption in Denmark.
- Protected customers: Around 400,000 private customers, public enterprises, CHP and district heating plants and small businesses, which together account for approx. 77.4 per cent of consumption.

There are differences in the treatment of the two customer groups in an Emergency, which means there are two different tariffs – one tariff for protected customers and another lower tariff for non-protected customers.

The overall cost of tools which can be used in an Emergency will be allocated between protected and non-protected customers in a ratio of 85/15. The emergency supply tariffs will still be different for the two customer types.

The weighted emergency supply tariff was DKK 0.0011/kWh in 2016-2017, and is DKK 0.00047/kWh in 2017-2018. The unchanged level is the result of initiatives with opposite price effects:

- A decrease in the total costs of purchasing security of supply tools.
- The inclusion of larger excess revenue.
- Drops in volumes.

4.8.4 Harmonised transmission tariff structures in Europe (new method)
The European tariff network code was published in mid-March 2017. The aim is to strengthen the internal gas market by harmonising the tariff structures across national borders, increasing transparency and reducing the transaction costs for consumers. The tariff method must continue to support a competitive Danish gas transmission system.

Energinet will develop the current tariff method to make it compliant with the European network code in 2017 and 2018.

The new method is expected to be implemented on 1 October 2019.

4.9 Information security

Increased use of IT has created major development opportunities in the energy sector, both in terms of business and technology. The use of IT is one of the most essential preconditions for the ability to operate a costefficient and reliable energy system.

The stronger dependence on IT also means that the gas system will become more vulnerable if IT disruptions or faults occur in the systems. A modern energy system must be designed to prevent and withstand cyber-attacks and thus critical situations for the energy supply.

Information security is defined as all security measures aimed at protecting information assets, whether these are physical, electronic or oral information.

Energinet has three information security objectives: Availability, integrity and confidentiality. All three information security objectives are important. Data integrity and the availability of critical control systems, in particular, are crucial to security of supply.

Historically, information security breaches or inadequate IT uptime have not had serious impacts on Danish gas supply.

Today, IT is vital to the operation of energy systems, and the threat situation has changed significantly in recent years. Energinet therefore finds it important that a new Danish executive order on IT disaster recovery for the electricity and natural gas sectors has been adopted, which entails a focus on the implementation of security measures in the entire value chain.

Information security is a strategic focus area and, for several years, Energinet has had a special focus on securing 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.

INFORMATION SECURITY OBJECTIVES:

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

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