



ENERGINET



REPORT

# SECURITY OF GAS SUPPLY 2018

## 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<sup>3</sup>:**

One Nm<sup>3</sup> (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.

## SUMMARY

**An Early Warning was declared in Denmark in 2018 during a cold March, while Danish gas storage facilities were almost emptied. The situation was handled without raising the crisis level further.**

Security of gas supply is increasingly becoming a cross-border issue. Gas systems are extended to diversify sources of supply and secure access to gas. The extension of the European gas system has resulted in market players acting in response to gas prices throughout Europe.

This was also the case when Europe experienced a gas crisis in the spring due to a late cold spell, which resulted in high gas prices in Europe. Initially, gas prices were significantly higher in Germany than in Denmark, and the market players exported gas to Germany. These exports created an imbalance in the Danish system, triggering an Early Warning in Denmark. High withdrawal from Danish gas storage facilities and low stocks in the same period meant that the Early Warning was maintained for three weeks.

The gas supply in the EU is highly depended on countries outside the EU. Russia alone supplies a third of the total consumption. Security of gas

supply is therefore an important issue in the EU, which is now taking a further step towards increased solidarity and strengthened cooperation between the member states to ensure that all households always is supplied with gas.

The Danish security of gas supply is increasingly being strengthened by the national biogas production, as the biogas share of the annual Danish gas consumption is expected to constitute 8% in 2018. The summer of 2018 brought along record biogas sales, reaching 26% of the overall gas consumption on one specific day.

### **Late cold spell in Europe triggers Early Warning in Denmark**

Demand for gas was exceptionally high in Europe in early spring as a result of a late cold spell. The high gas demand pushed up prices quickly, making it attractive for market players on the Danish gas market to export gas to Germany. The system was used to such an extent that the market players



Stenlille Gas Storage Facility

exported more gas than they had available in the system. This resulted in a negative imbalance, and Energinet chose to declare an Early Warning on 27 February 2018.

The Early Warning declaration was necessary to remove a price cap on balancing gas. The price cap was lower than the market price of gas, which gave shippers an incentive to transport more gas from Denmark to Germany than what was actually at their disposal. The price cap was removed with the Early Warning declaration, which meant that the incentive disappeared and the system balance was restored.

As a consequence of the increased exports to Germany, there was an increased risk that the Danish gas storage facilities would be emptied. This was reinforced by high gas prices and high storage withdrawal levels in Denmark in the weeks following the Early Warning declaration. Energinet

**In the coming period, the Danish gas market and gas system will develop even further, and Denmark/ Energinet must increasingly pursue cooperation on energy and security of supply across borders.**

therefore decided to maintain the Early Warning to send a signal to the market that there was a risk of reaching Energinet's emergency storage reserve, which would trigger an Emergency declaration. The Early Warning was called off on 19 March 2018.

#### **Assessment of Danish security of gas supply for the coming winter**

The security of gas supply has been

high in Denmark in 2018 – despite the necessity to declare Early Warning.

In the coming winter 2018/2019, the Danish gas transmission system will remain robust in relation to technical incidents – even with high gas demand, as there will be access to sufficient volumes of gas from the North Sea, Germany and the gas storage facilities.

In addition, the volume of biogas injected into the gas grid will continue to increase. In line with this increase, biogas will begin to make a larger contribution to the security of supply.

#### **Denmark will become dependent on imported gas over the next three years**

Denmark is facing a period of approximately three years in which the North Sea gas supplies will be significantly reduced. The reason for this is that the Tyra complex will be redeveloped in the period 2019-2022. Denmark will thus

**"The gas supply in the EU is highly depended on countries outside the EU. Russia alone supplies a third of the total consumption. Security of gas supply is therefore an important issue in the EU"**

become dependent on gas imports and gas from gas storage facilities for the first time.

The gas transmission system will become less robust and less flexible during this period. 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. The market players will be able to supply Danish and Swedish gas customers with gas if they utilise the import capacity from Germany and the gas storage facilities optimally.

Energinet performs regular analyses of the supply situation and the level of stocks in the gas storage facilities to prevent a crisis situation. It is essential that market players act focused during the redevelopment of Tyra to reduce the risk of interrupting supplies to gas consumers. Energinet is monitoring the storage filling and capacity bookings closely. Since the current bookings are relatively low different market initiatives which can increase the market players' utilization of the capacity in the gas system are considered.

**Energinet Gas TSO cooperates on energy across borders**

In recent years, the Danish gas market has become more oriented towards Europe. For many years, it has been possible to trade gas across borders on virtual hubs and exchanges. This has had an impact on the Danish gas price development, which today follows gas prices in northwestern Europe.

In the coming period, the Danish gas market and gas system will develop even further, and Denmark/Energinet must increasingly pursue cooperation on energy and security of supply across borders.

*The EU takes another step towards strengthening solidarity*

In 2018, Denmark has commenced various tasks aimed at strengthening solidarity across the EU and complying with the Security of Gas Supply Regulation, which requires close

collaboration with other member states. One product is the new regional risk assessments, where Denmark is included in three assessments. For Denmark, the conclusion of the risk assessments is that supply to most of the gas customers can be maintained even in a European supply crisis.

As a result of the formalised solidarity principle, Denmark must enter into agreements with neighboring member states on cross-border supply of gas. The purpose of the agreements is to ensure security of supply to households if European gas supply is significantly reduced. A request for solidarity must be made as a last resort, and the likelihood that the solidarity mechanism is triggered is therefore low. Denmark must enter into agreements with Sweden and Germany.

*Regional balance collaboration*

Energinet collaborates with the Swedish TSO, Swedegas, to establish a joint balancing zone. One objective of the balancing zone is to facilitate cross-border gas trading and strengthen regional security of supply. The joint balancing zone will be implemented in 2019.

*Access to new markets in the EU*

Energinet and the Polish TSO, GAZ-SYSTEM, are working together to establish a new gas transport route from Norway through Denmark to Poland, which is expected to be commissioned in 2022. The Baltic Pipe project will benefit the Danish gas customers, as it will result in a significant increase in gas volumes transported in the Danish system. The increase in gas volumes is expected to help stabilise tariffs, even though Danish consumption is expected to fall. The final investment decision is expected to be taken before December 2018.

## EARLY WARNING

# GAS MARKET TESTED BEFORE TYRA SHUTDOWN

**In February and March this year, the Danish gas market experienced an Early Warning. Low temperatures for the season, reductions in North Sea gas production and large withdrawals from Danish gas storage facilities were the reasons why Energinet maintained Early Warning for approximately three weeks. Early Warning was an instructive rehearsal for the gas market and Energinet in light of the coming years without North Sea gas.**

From September 2019 until July 2022, the supply of gas from the Tyra field to Denmark will be shut down completely. The security of gas supply will be challenged during this period. Gas will be supplied from Germany and the Danish gas storage facilities. During the shutdown, the security of supply will be more dependent than normally on the market players utilising import capacity and the storage facilities optimally.

For 20 days from February to March this year, the Danish gas market and Energinet were given a foretaste of a possible scenario during the redevelopment of Tyra. The unexpected rehearsal commenced on 27 February at 20:38, when Energinet issued a so-called Early Warning declaration to the gas market. The signal was clear: bring more gas to Denmark or Danish gas customers risk being left without gas. Early Warning is the first crisis level on the common European supply crisis scale. The next steps are Alert and Emergency.

Biting cold from Siberia had settled over Denmark and the rest of northwestern Europe. In the preceding weeks, the cold weather had pushed up gas prices to about triple level. The high demand for gas in Europe meant that more gas players exported gas to Germany.

"We were in a situation in which the balance of the Danish system was challenged. Market players could speculate in a negative imbalance and sales of gas to Germany. In a

worst-case scenario, this would mean that the security of supply in the Danish and Swedish gas systems would be compromised," explains Christian Allan Rutherford, Chief Economist in Energinet Gas TSO.

The imbalance price in Denmark did not reflect the actual value of the gas in the gas system. European gas prices thus exceeded the Danish imbalance price, which made it financially profitable to export gas to Germany, despite the imbalance in the Danish system.



## Facts about Early Warning

The Danish security of supply model distinguishes between three crisis levels: Early Warning, Alert and Emergency.

For each crisis level, Energinet has one or more security of supply measures available to increase the probability that the market can continue to supply the customers.



## FACTS ABOUT TYRA

The Tyra gas field in the North Sea will be closed temporarily to be redeveloped. The Danish gas supply from the North Sea will be significantly reduced in the period September 2019 until July 2022.

The Tyra gas field has since 1987 been the most important supply source to the Danish and Swedish gas customers.

the price cap on imbalance prices, which removes part of the market price signal. This meant that there was no longer a financial incentive to exploit the imbalance in the Danish gas system.

### **20 days with close monitoring of the gas market**

The Early Warning for the Danish gas market was maintained for 20 days, but the market was in balance just one day after the Early Warning declaration. The reason why Energinet maintained the crisis level for another 19 days was that there were huge withdrawals of gas from the Danish gas storage facilities.

“We’ve never had such low stocks at this time of the season. The curve for gas stocks was pointing straight downwards, so we maintained the crisis level to make the market aware of the risk involved in the large withdrawals of stocks and to make the market players import gas from Germany instead,” says Christian Allan Rutherford.

In the first spring months, the market players had withdrawn so much gas from the Danish gas storage facilities in

Stenlille and Lille Torup that stocks were nearly limited to the volume of gas reserved for the highest crisis level: Emergency.

Christian Allan Rutherford and his colleagues in Energinet Gas TSO kept a close eye on the Danish gas market. From the Ragnarok meeting room, named after the doomsday prophecy in Norse mythology, they communicated daily with the market on the current stocks in the gas storage facilities and the supply situation.

Senior Engineer Helle Øgaard from Energinet TSO Gas was one of four officers on call who were in close dialogue with Energinet’s gas control centre and adjoining systems during the Early Warning:

“The EU’s Security of Supply Regulation assigns a significant role to the market players in relation to maintaining security of supply, and as Energinet’s principal task is to ensure that gas is readily available, good communication with the market is, in fact, essential.”

As transmission system operator (TSO) for gas, Energinet must provide the market with current information if there is a risk of a critical supply situation occurring.

### **Energinet wants to remove Danish price cap**

On 19 February at 13:00, Energinet called off the Early Warning crisis level on the Danish gas market. The gas volumes withdrawn from the Danish gas storage facilities were back to normal levels. More springlike temperatures had come to Denmark, the North Sea gas had begun to flow again, and the price development was stable throughout Europe.

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Helle Øgaard, Senior Engineer, and Christian Allan Rutherford, Chief Economist in Energinet Gas TSO, worked closely together during Early Warning in February-March 2018.

the European gas market. But the most important thing we learned is that we recommend removing the current price cap, which, in situations like this, gives shippers a financial advantage to work against the balance of the system,” says Christian Allan Rutherford.

Energinet has sent a method notification to the Danish Utility Regulator in which the TSO recommends the cap system to be discontinued. In addition, Energinet examines the possibility of a significant increase in the price of emergency gas at Energinet’s disposal in the Danish gas storage facilities.

#### Rehearsal for the Tyra shutdown

When Total starts the redevelopment of the Tyra complex in September 2019, the Danish gas system will return to a situation with one single primary source of supply from Germany supplemented by smaller volumes from the North Sea, upgraded biogas and gas from

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the gas storage facilities. This means that the market players must utilise the capacity in the gas storage facilities optimally if there is to be enough gas to supply the Danish and Swedish gas markets during the cold months.

“In case of extra hard winters, the supply may be challenged. Therefore, the Early Warning this year was a good learning experience for us in Energinet and for the Danish gas market, because it emphasises how important it is that we work together to maintain security of gas supply in Denmark,” says Christian Allan Rutherford.

Especially in the period between 26 February and 10 March 2018, only half of the normal volume of gas was supplied to Denmark from the North Sea. This was due to maintenance work on the Tyra platform.

If the market fails to supply consumers, despite all efforts and preparations, Energinet has an obligation to supply all so-called protected gas customers as for minimum 30 days. Ordinary Danish consumers are protected gas customers.



90%

ABOUT 90% OF THE DANISH NATURAL GAS FROM THE NORTH SEA COMES FROM THE TYRA GAS FIELD.

## BALTIC PIPE

# THE DANISH GAS SYSTEM WILL HAVE NEW NEIGHBOURS AND NEW USERS

**In 2022, the Danish gas system will probably be connected to the gas systems in Norway and Poland. This will entail advantages for consumers in Denmark, Poland and the rest of Eastern Europe. But first large-scale onshore and offshore construction work is to be done.**

Using the Danish gas system must be as inexpensive as possible. This applies to both households and large work-places in Denmark. It is an important objective for Energinet and a significant factor in the joint project between Energinet and its Polish counterpart GAZ-SYSTEM aimed at connecting the Norwegian, Danish and Polish gas systems with a new pipeline: Baltic Pipe.

“The costs of using the Danish gas system will increase in the coming years, as some consumer segments are switching to other fuels. Thus, there will be fewer consumers to pay for the joint bill for operating the gas system,” explains Jeppe Danø, Director, Gas System Operator.

The challenge of increasing costs of using the gas system is carried by the approximately 400,000 households and business customers using the gas system. In particular Danish food and packaging producers are frequent users of the gas system. This applies to, for example, slaughterhouses.

“Linking the Norwegian, Danish and Polish gas systems more closely to each other mean that volumes 3-4 times larger than now will soon be transported through the system. And this means a wider distribution of the costs so that we avoid increasing prices, which also means that we can use the gas system to transport biogas from rural to urban areas,” says Market Director Jeppe Danø.

### A European project

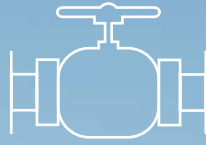
The idea for the Baltic Pipe project originated from Poland, which – like a number of other Central and Eastern European countries – is challenged by being dependent on Russian gas to keep the wheels turning and houses heated. They perceive this as a security policy vulnerability, which Baltic Pipe can help them mitigate. In addition, the project is expected to increase competition on the European gas market.

Baltic Pipe is also an opportunity to make inroads into the large coal consumption in Eastern Europe, which has negative impacts on both climate and regional air quality. To the extent that coal is replaced by gas, CO<sub>2</sub> emissions can immediately be halved. At the same time, the gas-fired power plants are so flexible that they can contribute to supporting the increasing volumes of fluctuating wind power from the growing number of wind turbines constructed.

As the Baltic Pipe project has a positive effect on several EU member states, it has been designated as a project of common interest. This means that the EU contributes to fund the project.

### Construction work

The establishment of the Danish gas system in the 1980s was one of the largest construction projects in Denmark. With Baltic Pipe, there is a need for a significant upgrade of the existing gas system to enable it to handle the increased gas volumes.



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Bolette Ejsing Dahl, Senior Project Manager in Permits and Rights, and Jeppe Danø, Director in Gas System Operator, are working together on the Baltic Pipe project.

In the North Sea, a submarine connection must be established to the existing Norwegian gas system with a new pipeline, brought ashore west of Varde. The new pipeline will continue from the Egtved compressor station and across Funen to Zealand and onwards to a compressor station near Næstved. The pipeline will continue into the Baltic Sea, where it will cross over to Poland and the extensions to the Polish gas system. All in all, this is a distance of about 900 km.

The actual performance of the construction project is essentially no different from when the existing gas system was established. When the pipeline has been covered, the clearest trace of the pipeline will be the compressor station on Zealand. From here, gas will be led through the pipeline and further on beneath the Baltic Sea.

#### Respect for landowners

A project of this size will inevitably

affect a number of landowners along the route where new pipes are to be laid and where the compressor station is to be located. Already from the start of the project, it has been essential to find the routing which creates the least possible inconvenience, and the construction work will therefore take place in relatively sparsely populated areas.

“We’ve had a group of people engaged in studying detailed maps and plans, and we’ve been in dialogue with local authorities and landowners to find the routing that will cause the least possible inconvenience,” explains Bolette Ejsing Dahl, Senior Project Manager in Permits and Rights. “So, all in all, we have a good solution. But it’s clear there will be some landowners who want a different solution.”

In connection with the project, a number of studies of the presence of animals and plants will also be

conducted so that they are disturbed as little as possible, and it will be examined whether there are archaeological finds and any occurrences of ammunition from previous wars. This creates new knowledge about the local areas which the pipeline crosses.

#### Project implementation

The project is carried out under a tight schedule as it must be completed in 2022, as the Poles will then be short on gas. The total investment costs are approximately DKK 12 billion, which will be shared equally between Denmark and Poland. The project is based on user fees, which means that the costs will not be incurred by the Danish State.

When the project has been completed, the Danish gas system will thus have Norway and Poland as neighbours, and both Danish and Eastern European consumers will share the cost of using the system.

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