

ENERGINET

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MEMO

SUPPLY AND DEMAND 2019-2022

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1. Background

In December 2018 Energinet (Gas TSO) informed about the possible supply and demand situation during the Tyra redevelopment:

<https://en.energinet.dk/Gas/Tyra/Supply-situation>

Energinet gave a description in a memo supplemented with a graphic presentation.

This memo is an updated status for the possible supply and demand situation 2019-2022 based on mitigation initiatives and new demand assumptions. This status is expected to found the basis for the closing of Tyra 19 September 2019 and the following period of 3 winters/years until July 2022.

More details can be found in the graphic presentation.

2. Summary

Despite the preventive actions taken by Energinet, the main conclusions from the 2018 analysis about the situation without Tyra are still valid. This means that Danish and Swedish consumers will continue to experience a robust supply situation without Tyra. The majority of the Danish production in the North Sea is closed down for nearly 3 years and the system becomes less flexible and more vulnerable to incidents occurring. An extremely long and hard winter with disruption of the supply sources will be challenging. However, careful planning and focusing on the optimal use of the capacity in the system will mitigate the risk of supply failure.

Several parameters will influence the actual situation each year during the period 2019-2022, although the supply and demand situation seems improved compared to the situation described in December 2018 due to storage capacity reservations and further yearly capacity reservations in Entry Ellund on the German side.

Based on the now known prerequisites the market players must still:

- prepare themselves by sufficient transport and storage reservations
- keep gas in storage to secure own obligations with special attention the period from February to April where storage filling can be critical (see Safe Storage level curve, SSL <https://en.energinet.dk/Gas/Gas-news/2019/08/21/Launch-of-SSL>)
- consider uncertainties (variation in demand and minor technical incidents)

This should be done to avoid severe imbalances in the transmission system which might lead to crisis level Emergency and possible interruption of supply.

3. Development since December 2018

3.1 Main developments

Compared to supply and demand situation described in December 2018 the situation in 2019-2022 seems improved.

Since the analysis from December 2018 the main developments are the following:

- Danish Energy Agency (DEA) has published Analysis Assumptions 2019: <https://ens.dk/service/fremskrivninger-analyser-modeller/analyseforudsætninger-til-energinet>
- The yearly offered firm capacity in Entry Ellund on the German side has been booked

- Energinet has received an approval from the Danish Utility Regulator (DUR) of methodology of changes to the balancing model (removal of price caps, new price for adjustment step 2 and pricing of imbalances in Emergency)
- The storages have been filled with Danish gas with high calorific value and the full storage capacity in year 2019/2020 has been booked.

The Early Warning in March 2018 showed Energinet that apparently the storage customers tend to accept a low storage filling before end of winter season. In 2019 we didn't have a late winter. However, a late and extreme cold winter can be critical since gas supply from storage and high supply from Ellund is necessary to supply the Danish and Swedish consumption during a cold season (See Safe Storage Level, SSL).

3.2 Important parameters during the Tyra Redevelopment period

The actual situation each year 2020-2022 will depend on several important parameters. The first four mentioned below are the sole responsibility of the commercial players and the others should be considered by the players:

1. The actions/reservations and the risk acceptance by commercial players (suppliers, shippers and storage customers) of a possible Emergency crisis declaration from Energinet and possible need for interruption of customers
2. The booked capacity and the actual storage filling every year must be sufficient to secure supply of Denmark and Sweden until end of storage year in April (See SSL)
3. Shippers capacity bookings in northern Germany (GUD and OGE capacities on PRISMA) and the utilization of these combined with the use of storage capacity
4. Actual weather in spring 2020
5. Possible variation in consumption in Denmark and Sweden compared to analysis assumptions 2019 from the Danish Energy Agency
6. Performance of critical assets (Stenlille storage facility, Egtved compressor station, transmission system in northern Germany)

3.3 Short recap of the Early Warning situation 2018

In spring 2018 Energinet declared crisis level Early Warning and the situation might have escalated to Emergency and possible interruption of customers. Certain market initiatives have been taken to avoid a similar situation and an application has been submitted to the Danish Utility Regulator.

The picture below shows the inventory level in storage facilities in spring 2018.

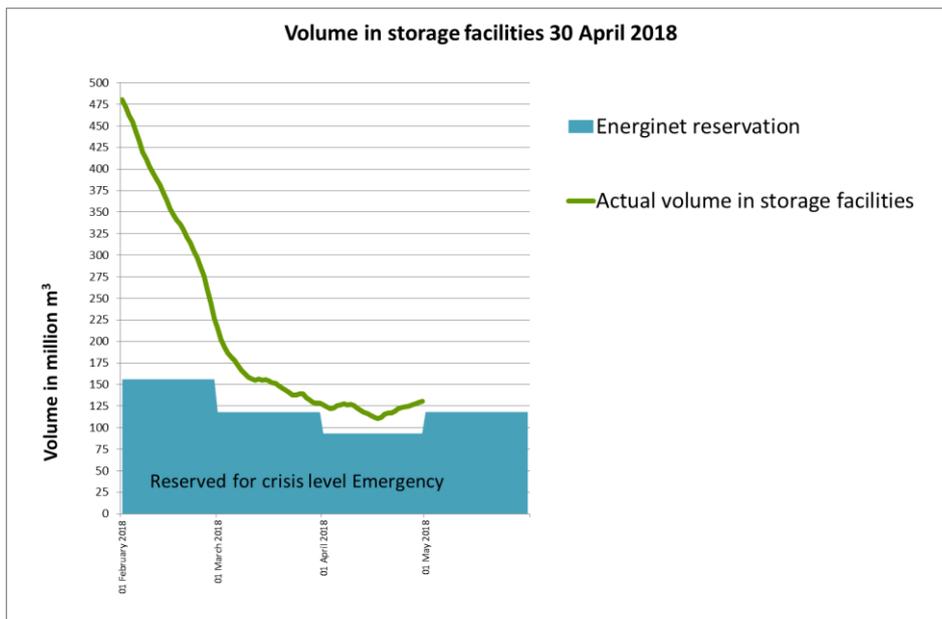


Figure 1. Inventory level in gas storages in spring 2018

The situation was critical in March with a risk of crisis level Emergency despite high flexibility to commercial players.

As illustrated below January was warm, February was cold and March was extremely cold (much colder than January in a cold month in a cold year).

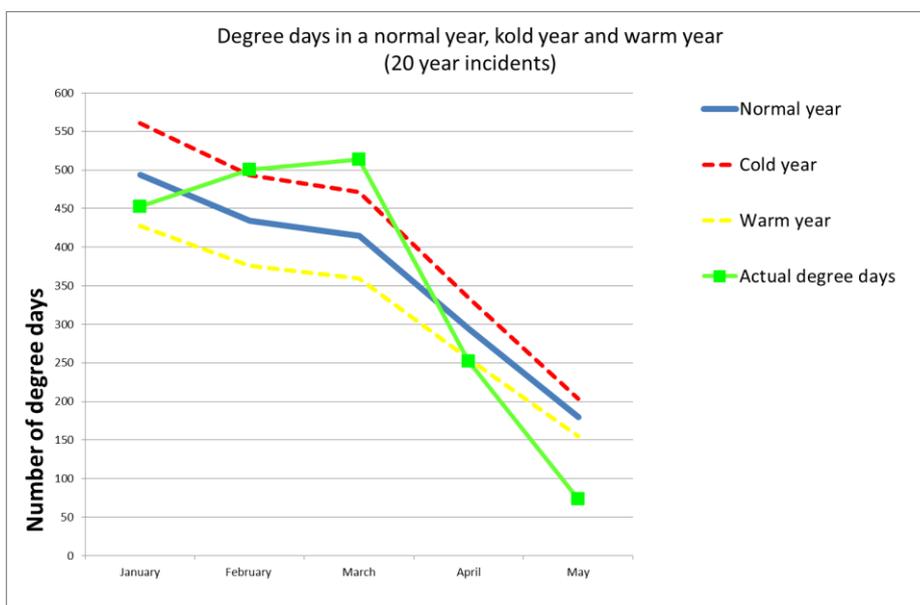


Figure 2. Degree days (17°C minus actual temperature each day) in winter and spring 2018

The degree days were 24% higher than in a normal year and the result was a demand in Denmark of approximately 14% higher than in a normal year.

This picture shows that storage level should take a possible cold spell into account

In 2020, 2021 and 2022 when the supply from Tyra is stopped, the flexibility (Germany and storage facilities) will be much lower than in 2019. Market players must be sufficiently prepared for the above mentioned facts and also take into account the risk of an extreme cold period in spring.

If the Danish gas transmission system ends up with a critical imbalance it will be necessary to declare Emergency to access the Emergency storage volumes and non-market based instruments such as possible interruption of supply might be used.

In spite of the preventive actions taken by Energinet, the main conclusions from the 2018 analysis about the situation without Tyra are still valid. This means that Danish and Swedish consumers will continue to experience a robust supply situation without Tyra. Most of the Danish production in the North Sea is closed down for nearly 3 years and the system becomes less flexible and more vulnerable to incidents occurring. An extremely long and hard winter with disruption of the supply sources will be challenging. However, careful planning and focusing on the optimal use of the capacity in the system will mitigate the risk of supply failure.

4. Supply and demand 2019 and 2020

From October 2019 gas to Denmark and Sweden will be supplied from South Arne, biogas (RES), Germany and storage facilities in Lille Torup and Stenlille. Only Germany and storage facilities can deliver the necessary flexibility, and Germany is the main source of gas (80-85%).

It should be noticed that the basis for the analysis of the supply and demand situation 2019-2022 is the analysis assumptions 2019 from the Danish Energy Agency (DEA). An important parameter is the expected demand in both Denmark and Sweden.

These assumptions are illustrated below. The consumption in 2018 and 2019 is not the actual consumption. The consumption has been corrected to a normal year consumption.

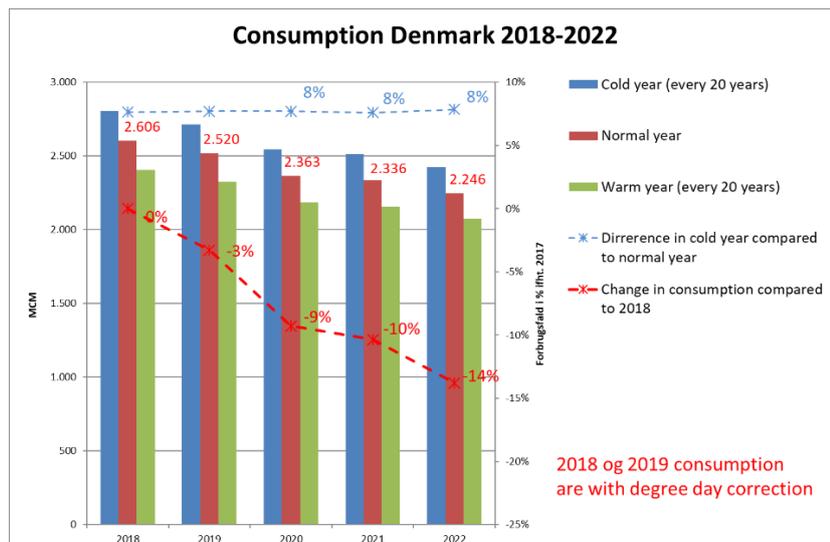


Figure 3. Gas demand in Denmark 2018-2022

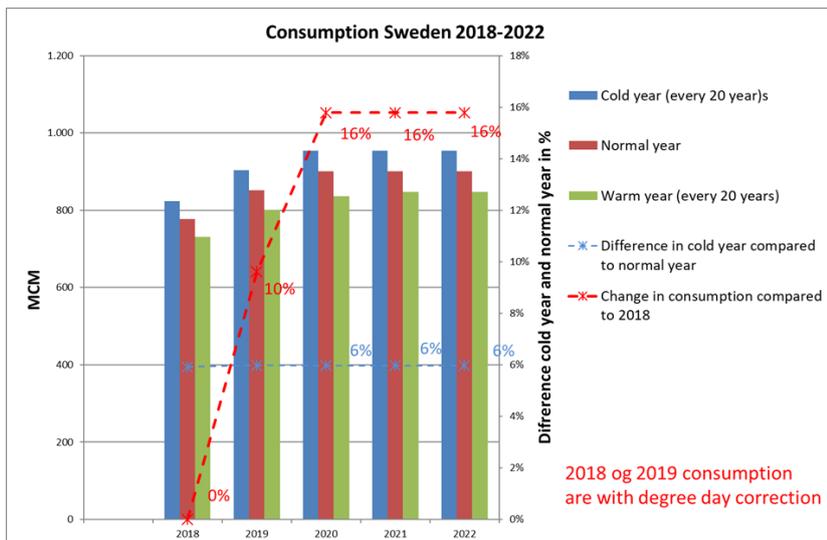


Figure 4. Gas demand in Sweden 2018-2022

The basis for these analyses is the analysis assumptions 2019 from DEA.

Based on analysis assumptions 2019 the supply and demand picture in 2020 might look like illustrated below. It is assumed that closing of Tyra is materialized as indicated by Total, the storage facilities are nearly emptied close to the picture we saw in spring 2018 and the storage volume capacity is nearly fully utilized in storage year 2019-2020.

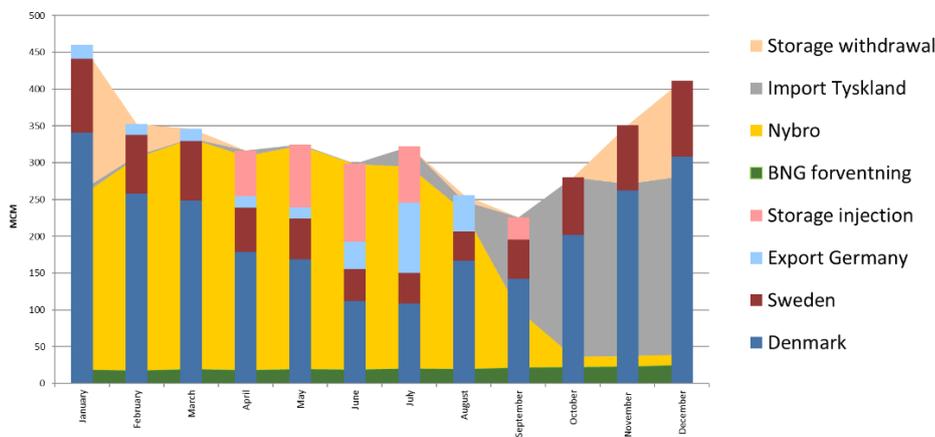


Figure 5. Supply and demand 2019

The supply and demand picture in 2020 might look like illustrated below

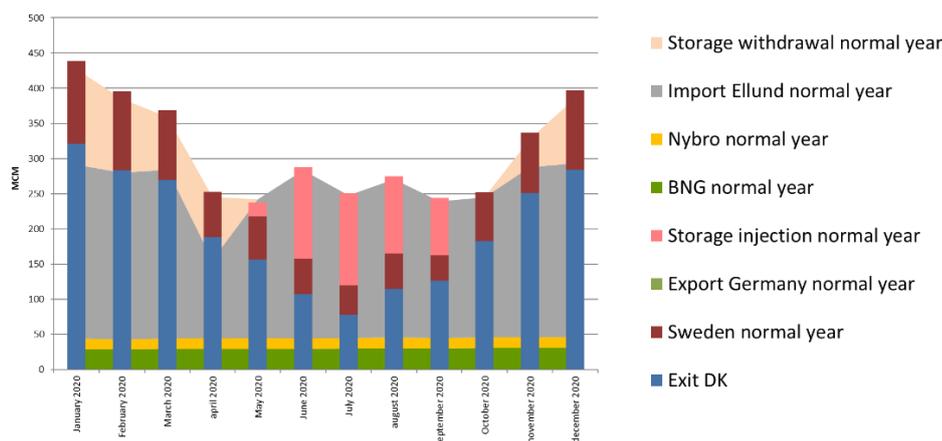


Figure 6. Supply and demand 2020

If the demand is higher than assumed full capacity of storage volume capacity and higher utilization than 80% of the capacity in Ellund is needed in a normal year. In a cold year full capacity of storage and Ellund might be needed to cover the market demand in Denmark and Sweden.

5. What happens in Emergency

If crisis level Emergency is declared, it might lead to different consequences depending on the actual incident. An incident might lead to two best and worse extremes:

- Emergency for less than one day and use of Energinet emergency storage. No interruption of customers at all
- Emergency for 30 days or more with interruption of all non-protected customers in Denmark (25% of the market) and Sweden (98% of the market)

Energinet will not escalate the actions beyond what is required by the actual incident. Energinet storage volume reservation is based on EU requirements and is only intended as backup to stored commercial gas. According to the regulation it must be secured that the protected customers can be supplied with gas for a period of at least 30 days in long term incidents.

In 2019/2020 Energinet has reserved approximately 165 MCM in Emergency storage from Gas Storage Denmark (and some extra from storage customers in spring) based on the assumption that most of the gas to protected customers can be supplied from other infrastructure sources in case of a 30 days failure of the largest infrastructure (Ellund).

The reserved storage volumes will also secure sufficient storage withdrawal capacity to handle short term technical incidents (“hydraulic incidents”).

If Energinet, following a declaration of Emergency, has to escalate the actions, because the incident is expected to take more than a day, it might lead to:

- Interruption of commercial interruptible customers
- Partly interruption (25-75%) of Danish and Swedish non-protected customers
- 100% interruption of Danish and Swedish non-protected customers

It should be avoided to declare Emergency and use non-market based instruments, and this is the responsibility of the commercial players. Emergency storage reservations should only cover

the need for protected customers in case of critical infrastructure failures or international political crisis.

6. Next steps

Based on the now known prerequisites it is up to the commercial players to prepare themselves by sufficient transport and storage reservations taking into account uncertainties and not jeopardize the security of supply especially in February to April where severe imbalances in the transmission system might lead to crisis level Emergency and interruption of non-protected customers.

The development should be closely followed by all players

Energinet has introduced the SSL curve (Safe Storage Level <https://en.energinet.dk/Gas/Gas-news/2019/08/21/Launch-of-SSL>) indicating the security of supply level. The SSL is information to shippers about the actual filling of gas compared to the safe filling of gas in the storage facilities in Denmark. This data is a tool to enable further calculations of the security of supply covering the Danish and Swedish gas consumption for the rest of the storage season.