

MEMO

INTERRUPTIBLE CAPACITY AT DIFFERENT POINTS

1. Background

As required in NC TAR, Art 29 (b), TSOs must publish the explanation of how the probability of interruption is calculated. Therefore, this document describes how the prices for interruptible capacity on different points are estimated in the Energinet system.

Since interruptible capacity was introduced in the Danish gas grid in 2006, Energinet have calculated a rebate for interruptible capacity, based on the probability of being interrupted, calculated by comparing the expected interruptible amount with the possible flow.

2. General principles

Energinet determines the price level for interruptible capacity, based on the following principles:

- The calculation is based on the ex-ante method described in NC TAR
- There is calculated a separate rebate percentage per relevant point and relevant direction
- The rebate level is typically calculated in 5 per cent intervals

It should be mentioned that the demand for interruptible capacity has been low, and no actual interruptions have been registered. The pricing and rebate level of interruptible capacity is therefore generally based on an estimate of *if* the interruptible capacity was booked and utilized, what level of interruption could be expected.

Also, when determining the rebate level, 3 factors are taken into consideration:

1. The expected utilization rate of firm contracts
2. Expectations of backhaul flows to support interruptible capacity in the opposite direction
3. Statistical flow scenarios in the transmission system

3. Interruptible capacity prices and probabilities for interruptions

Energinet only offers interruptible capacity on a day-ahead basis.

The formula for calculation the probability of interruption, and thereby the rebate level is listed in TAR NC Article 16 as follows:

$$\text{Pro} = \frac{N \times D_{\text{int}}}{D} \times \frac{\text{CAP}_{\text{av. int}}}{\text{CAP}}$$

In general, it is estimated that the probability for interruptions on all points is low and rebate level sat to 5 per cent. Many active shippers in competition for the capacity on the Ellund point makes the probability a little bit higher on Ellund although it is still considered low and rebate level is set to 10 per cent.

Ellund (entry and exit):

Energinet offers interruptible capacity in both directions on the Ellund points.

Hereby follows 2 examples of how Energinet estimates the probability of interruption for Ellund entry, based on the TAR NC formula. Same method is applied for Ellund exit. As no interruptible capacity has been booked nor interrupted in both directions since 2013, Energinet does not have any relevant empiric or historical data, to back up the calculation of the probability.:

Example A: all capacity is interrupted for 2 hours out of 24 hours (day-ahead capacity)

- N: number of interruptions = 1
- D_{int}: duration of interruption = 2
- D: duration of product = 24
- CAP_{av.int}: how large an amount is interrupted of the total capacity = 2,5 GWh/h
- CAP: total interruptible capacity offered = 2,5 GWh/h

Formula: $((1 \cdot 2) / 24) \cdot (2,5 / 2,5) \Rightarrow 0,0833 \cdot 1 = \underline{\text{approx. 8,3 per cent}} \Rightarrow \text{rounded up to } \underline{10 \text{ per cent}}$

Example B: a small amount of capacity is interrupted for all hours (day-ahead capacity)

- N: number of interruptions = 1
- D_{int}: duration of interruption = 24
- D: duration of product = 24
- CAP_{av.int}: how large an amount is interrupted of the total capacity = 0,2 GWh/h
- CAP: total interruptible capacity offered = 2,5 GWh/h

Formula: $((1 \cdot 24) / 24) \cdot (0,2 / 2,5) \Rightarrow 1 \cdot 0,08 = \underline{8 \text{ per cent}} \Rightarrow \text{rounded up to } \underline{10 \text{ per cent}}$

Joint Exit Zone – reverse flow

The Joint Exit Zone – revers flow point is part of the market model, supporting the possibility to virtually import gas from Sweden to Denmark in the reverse flow direction.

Physically it is not possible to deliver gas from Sweden to Denmark, but because there is always a physical delivery from Denmark to Sweden, it is possible to offer interruptible capacity

virtually in the opposite direction. The price level is set at 5 per cent, to indicate a low probability of interruption if capacity is booked and utilized.

In practice this capacity has only very rarely been booked, and no interruptions have so far been registered.

Faxe (Entry and Exit) and North Sea (Entry)

Faxe Entry and Exit as well as North Sea Entry are relatively new points (Oct. 2022) introduced with the Baltic Pipe. No interruptions have so far been registered. The price level is set at 5 per cent, indicating a probability of interruptions lower than 5 per cent over a given period of time, typically a gas year.

Faxe Entry (from Poland to Denmark)

There is a significant flow from Denmark to Poland and therefore interruptible capacity in the opposite direction can be supported by this flow. However, there is already a significant firm capacity established in this direction, where almost no bookings have yet been registered (only a few test bookings), so there is no expectation so far for a demand of interruptible capacity.

Faxe Exit (from Denmark to Poland)

Full technical capacity in direction Faxe Exit is offered as firm capacity. This means that interruptible capacity will mainly be supported by firm capacity holders not utilizing their capacity, also because there are so far no indications of market interest to flow gas in the opposite direction.

North Sea Entry (from Norway to Denmark)

Full technical capacity at this point is offered as firm capacity, meaning that interruptible capacity will mainly be supported by firm capacity holders not utilizing their capacity.

4. Overview of rebate levels per point

The following table shows an overview of the current rebate level for existing capacity points:

Point and direction	Rebate level (in percentages)
Ellund Entry	10 per cent
Ellund Exit	10 per cent
Joint Exit Zone – reverse flow	5 per cent
Faxe Exit	5 per cent
Faxe Entry	5 per cent
North Sea Entry	5 per cent

The percentage will be reviewed and possible adjusted each year, based on any empiric data obtained during the previous gas year.