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# WORKSHOP ON THE DENMARK WEST-GERMANY BORDER (DK1-DE) 7 SEPTEMBER 2017

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## 1. Introduction

The Danish Ministry of Energy, Utilities and Climate and the Federal Ministry of Economic Affairs and Energy of the Federal Republic of Germany together with the Danish Energy Regulatory Authority and Bundesnetzagentur have signed a Joint Declaration that ensures a minimum amount of capacity for trade between Denmark West and Germany<sup>1</sup>.

The Joint Declaration aims to gradually increase the capacity between Denmark West and Germany available to the day-ahead market, by securing a minimum of available hourly import and export capacity in each hour on the interconnector.

The Joint Declaration was launched with a pilot project on the 3<sup>rd</sup> of July, and will until 2020 increase the minimum capacities in a stepwise approach, as the following figure shows.

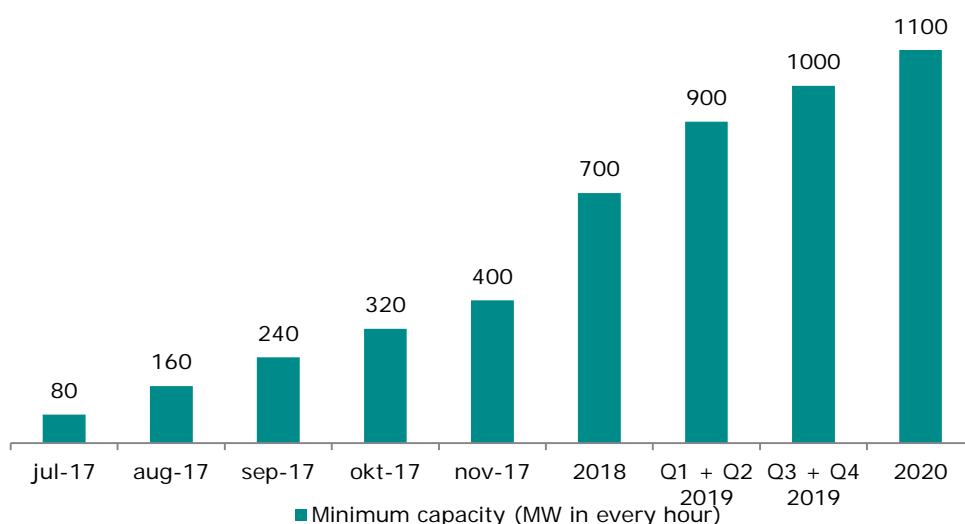


Figure 1 Required minimum of import- and export capacities on DK1-DE

Energinet and TenneT, as the relevant transmission system operators (TSOs) are jointly responsible for the implementation of this agreement, and the Joint Declaration specifies that the TSOs shall, in case of physical congestion, conduct countertrade to secure the minimum capacities. Currently this countertrade is achieved by using existing methods on both sides of the border. For Denmark, Energinet is using the special regulation regime and Germany TenneT is acquiring the necessary resources in the German intraday market.

However, with substantially increase of minimum capacities in the medium to long-term, existing methods might not be sustainable from a system security and cost-efficiency perspective. Therefore Energinet wishes to start a process with relevant stakeholder involvement to evaluate alternative models for countertrade. This workshop on the 7<sup>th</sup> September constitutes the first milestone in this process.

<sup>1</sup> <http://efkm.dk/aktuelt/nyheder/nyheder-2017/juni-2017/dansk-tysk-aftale/>  
<https://www.energinet.dk/Om-nyheder/Nyheder/2017/06/14/Faelleserklaering-sikrer-kapacitet-paa-dansk-tysk-graense-paa-1100-MW>

The scope of this document is to describe four possible countertrade models including current methodologies.

The first section describes the current capacity allocation at the border and when the Joint Declaration is effective. Section 3 defines the scope of countertrade, and lastly in section 4, Energinet has identified a list of possible countertrade models and the initial advantages and disadvantages by each countertrade model.

## 2. Capacity Allocation on Denmark West – German border

For each hour TenneT and Energinet separately calculate the available Net Transfer Capacity (NTC) in both directions for the Denmark West - German border. In case of reductions, the minimum of the two values is released to the market. In effect, the capacity offered to the market is not agreed upon by Energinet and TenneT, but is determined by whichever TSO calculates the lowest transmission capacity on its side. The TSOs have to respect a limitation set on capacity by each other, as the method is used to restrict the flow on the interconnector to a volume that does not endanger the other TSO's system security.

With the implementation of the minimum capacity requirements, the TSOs have to secure a day-ahead NTC at the same or at a higher level than the minimum capacity in each hour for both import and export capacities as specified in the Joint Declaration. The capacity to the day-ahead market is the highest value of two values- the day-ahead NTC or the minimum capacity:

*Day-ahead capacity = MAX(day-ahead NTC; minimum capacity)*

Following this methodology, if one of the TSOs calculates an import and/or export NTC on the border for a given hour, which is lower than the level of minimum capacity specified in the Joint Declaration, the TSOs are obliged to disregard the calculated NTC value, and instead increase the capacity to the level specified in the Joint Declaration.

On the other hand, if the calculated NTC is higher than the level of minimum capacities, the Joint Declaration is disregarded, and the calculated NTC is released to the market.

The following box provides an example of the determination of capacity to the day-ahead market.

**Case 1: 16<sup>th</sup> of July 2017 hour 4-5**

On the 16<sup>th</sup> of July in the hour from 8 to 9, Energinet's and TenneT's capacity calculation methodologies resulted in an export NTC from DK1 of zero for that given hour. Following the Joint Declaration, the TSOs shall secure at least 80 MW for each hour.

$$\text{Day-ahead capacity} = \text{MAX}(\text{day-ahead NTC; minimum capacity}) = \text{Max}(0;80) = 80\text{MW}$$

Therefore, the TSOs disregarded the calculated NTC, and adjusted the day-ahead market capacity to 80MW in the export direction for DK1. A similar situation in August would release 160 MW in terms of minimum capacity to the market.

As the minimum requirements were higher than the calculated NTC, the TSOs initiated a countertrade.

**Case 2: 16<sup>th</sup> of July 2017 hour 3-4**

One hour earlier on the 16<sup>th</sup> of July, Energinet and TenneT released 1100MW in export capacity from DK1.

$$\text{Day-ahead capacity} = \text{MAX}(\text{day-ahead NTC; minimum capacity}) = \text{Max}(1100;80) = 1100\text{MW}$$

. As this level was higher than the minimum capacities required, the Joint Declaration was disregarded, and the 1100MW was forwarded to the market, and no countertrade was initiated.

*Box 1 Example on the use of minimum capacities*

### 3. Scope of countertrade

The need for countertrade is based on the results from the day-ahead market and whether the scheduled flow create physical congestions in either TenneT's or Energinet's grid. In hours with physical congestion, the TSOs respectively activate upward regulation on one side of the congestion and activate downward regulating power on the other side. The use of up- and downward regulation is depending on the direction of the scheduled flow and which TSO that cannot sustain the flow.

For example if the day-ahead market results in a flow from DK1 to DE, but if TenneT experiences internal congestions, TenneT can initiate a countertrade with Energinet. Energinet will provide the downward regulation in DK1, and TenneT will purchase sufficient upward regulation within their area to compensate for the limited flow from DK1.

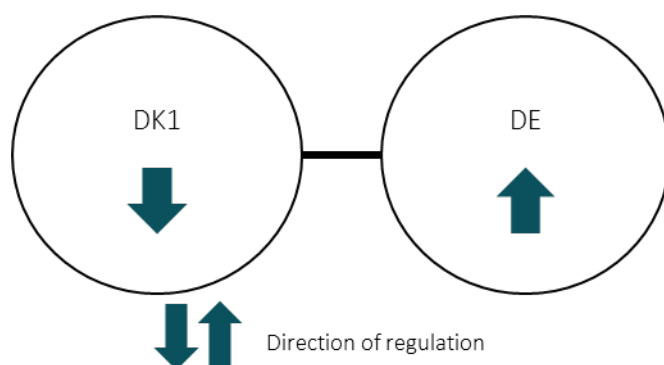


Figure 2 Countertrade between bidding zones

In the hours with physical congestions, the amount of MWh which has to be countertraded is, as written below, based on the difference between the calculated NTC, the minimum requirements and the scheduled flow resulting from the day-ahead market:

$$\text{Countertrade capacity} = \text{MAX}((\text{Nominated PTR}^2 + \text{Flow day-ahead}) - \text{day-ahead NTC}; 0)$$

The above formula is valid for all countertrade models.

#### Case 1: 16<sup>th</sup> of July 2017 hour 4-5

On the 16<sup>th</sup> of July in the hour from 8 to 9, Energinet and TenneT released 80 MW in the export direction from DK1 to DE, following the Joint Declaration.

The market resulted in a full export flow from DK1 to DE (80MW), with no nominations of PTRs. Remembering the results from the previous case, the TSOs calculated an export NTC of zero, and TenneT and Energinet initiated a countertrade.

$$\text{Countertrade capacity} = \text{MAX}((\text{Nominated PTR} + \text{Flow day-ahead}) - \text{day-ahead NTC}; 0) = \text{MAX}((0+80)-0; 0) = 80\text{MW}$$

The TSOs initiate a countertrade of 80 MW on either side of the border, and Energinet provided the MW with special regulation.

#### Box 2 Example on the use of minimum capacities

With the signing of the Joint Declaration, Energinet and TenneT can use existing methodologies to conduct the countertrade. However, as the minimum capacities increase over time, it is necessary to consider alternatives.

The TSOs can develop and submit a proposal for a new methodology by the end of the pilot phase on the 1<sup>st</sup> of December. Energinet has therefore launched a process with close involvement of all stakeholders to give the market participants an opportunity to submit comments to all suggested countertrade models, as well as to propose additional countertrade models.

<sup>2</sup> "Nominated PTR" are physical transmission rights, sold in the long-term market and nominated by the owner.

The evaluation of and decision for a specific countertrade model will be based on the following criteria:

- Effect on system operation
- System security
- Cost-effectiveness
- Effect on day-ahead prices

Additional criteria will be discussed at the workshop.

From a TSO perspective Energinet will work to find a countertrade model, which in no way endangers system security and has a limited impact on the operation of the system.

In addition the cost-effectiveness is an important criterion to include when selecting a countertrade, as the Joint Declaration specifies a cost-cap for TenneT. The Joint Declaration specifies that if the cost-cap is reached the German and Danish NRAs will evaluate the reasons and consider the way forward.

One general concern for applying countertrade models is the risk that the day-ahead market price will not reflect the increased capacity at the border due to speculation. Market participants could for example have an incentive to bid more production/less consumption in the day-ahead timeframe in order to offer this production and/or consumption for downward regulation later. One example are production facilities, which sell excess production in the day-ahead market at a low price, and thereby decrease the day-ahead price, for later on to provide the excess production as downward regulation. The same goes for consumption, where market participants bid too little consumption into the day-ahead market, thereby decreasing the day-ahead price, for later to offer increased consumption for downward regulation in DK1. Energinet will work to find a countertrade model which secures, as much as possible, correct price effect in the day-ahead market.

Beside these considerations, Energinet will of course always have to adhere to the requirements and guidelines from EU Regulation 714/2009 and the Danish law on energy supply (Energiforsyningsloven).

#### **4. Possible markets and models to provide countertrade.**

The countertrade models identified in this section are based on currently existing markets, such as the Nordic regulating power market and the intraday market.

The content and opinion in this document shall be viewed as Energinet's initial input to the workshop arranged on the 7<sup>th</sup> of September. Energinet have attempted to include comments from previous presentations in these descriptions. The aim of the workshop is to supplement these descriptions with additional input from all market participants in order to have the full picture of potential advantages and disadvantages for a thorough impact analysis.

As the capacity is released to the day-ahead market, the countertrade can be conducted by either the intraday or regulating power market. Therefore, the next sections divide the different countertrade models into these two markets.

## 4.1 Countertrade using the intraday market

The countertrade can be conducted by either:

- Energinet as an active participant in the intraday market, or
- The CoCA Model, or
- An Implicit regional intraday auction

### 4.1.1 Energinet as an active participant in the intraday market

Energinet can either on its own or through a service provider buy the necessary down- or upward regulation on the intraday market. This countertrade model is currently applied by TenneT on the German side in order to secure upward regulation in case of countertrade.

If the countertrade is initiated, for example to limit the flow from DK1 to Germany, Energinet or the service provider could sell the electricity in DK1 - either to DK1 market participants or to any other market area as long as cross-border capacity is available. The TSO or the service provider can have access to the Nordic intraday market ELBAS, and the entire Europe when XBID goes live in 2018.

If Energinet were to go through a service provider to conduct the countertrade, Energinet would specify rules for transparency, so this service provider does not receive any information prior to the market. One solution could be to announce the MWh needed for countertrade via UMM messages.

Capacity released to the intraday market will always be based on the calculated day-ahead NTC. That is, even in the case where minimum capacity values have been applied for the day-ahead market, it is the day-ahead NTC value that will be used to calculate available intraday capacity.

The advantages of the countertrade model are the following:

- Firstly, the use of the intraday market will have less effect on the daily operations of the TSOs and thereby have a minor or no effect on the system operation. This will as well have a positive effect on the system security, as the congestions will be handled well in advance of the operational hour.
- Secondly, the countertrade model opens up for the use of up- and downward regulation bids in the whole Nordic area and later on in all of Europe with the implementation of XBID which will, all other things being equal, result in higher liquidity for providing the regulation, and therefore secure a cost efficient countertrade.
- Thirdly, the increased market for providing up- and downward regulation diminish the risk of speculating behaviour in the day-ahead market, specified in section 3.

Currently, Energinet is not allowed to trade directly in the intraday market. This countertrade model would therefore require permission for Energinet to trade. Alternatively Energinet would need to contract a service provider, probably through a tender process.

The countertrade model might have an effect on the prices in the Nordic regulating power market, as the bids have been used to conduct the countertrade, and would not be available as regulating power.

#### 4.1.2 Counter Capacity Allocation (CoCA) Model

This countertrade model has been developed in cooperation with TenneT, and the principle behind the countertrade model is to allow market participants to execute countertrade on behalf of the TSOs.

The CoCA model is an additional daily auction with explicit capacity between Germany and Denmark West, which is arranged after the closure of the day-ahead market and before the intraday gate opening at the border.

The capacity to be used in the countertrade is auctioned as a physical transmission obligation, which is an explicit transmission obligation from Germany to Denmark West. The bids from market players are aggregated in a single bid curve, and all accepted bids are settled at the marginal price in the auction.

The PTO commits the market operator to transport power from Germany to Denmark West, and the PTO is not covered by Use-It-Or-Sell-It (UIOSI) and cannot be used to transfer system capabilities, i.e. balance products. The transmission obligation will be nominated automatically before the intraday market opens. Danish (DK1) and German market participants can offer PTOs, and it is expected that the price of a PTO is negative, i.e. the TSOs pay the market participants.

The preliminary suggested process for CoCA is shown in the following figure:

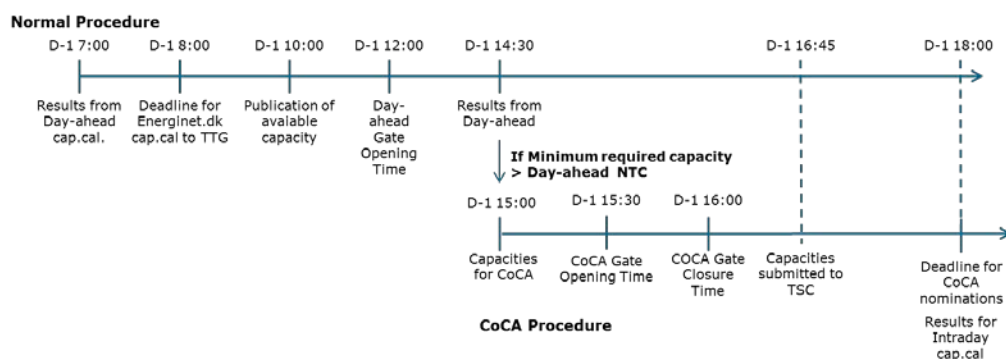


Figure 3: Suggested process for the CoCA model

The disadvantages are related to the implementation of a system and procedure, which might have a limited life span, as it only runs until the termination of the Joint Declaration. The implementation period is also considered to be lengthy, as it requires new processes and new investments in IT for the TSO.

Another disadvantage is that only BRPs in DK1 and DE can bid for the PTOs. However the BRPs have the opportunity to use bilateral trade or the intraday market (both national and European wide) to purchase the required up- and downward regulation, which also benefits other market participants not holding the PTO.

The benefits are the same as considered in the other intraday model: It has limited effect on the system operation and system security, and does also provide for a model with access to more liquidity in the intraday market.



### 4.1.3 An Implicit Intraday Auction

This countertrade model is a new suggestion; however, it has not been discussed with TenneT at the time of writing this document.

The countertrade model suggests to relieve the congested direction from DK1 to DE by an implicit intraday auction with a negative capacity corresponding to the needed countertrade at this border. This methodology is currently in use between the bidding zones NO1-NO3 in the day-ahead algorithm.

The system to be used for the intraday auction is the day-ahead algorithm Euphemia. After the day-ahead market results are known, the TSOs specify the needed amount for countertrade for each hour, and add these as negative capacities in the algorithm. The negative capacities are implicitly indicating that the flow from the intraday auction is forced to only go in the other direction, and decrease the flow by the needed amount of countertrade. One example is if the flow from DK1 to DE for a particular hour has to be decreased by 160MW, the capacity for export will be set to -160 MW, and a positive number for capacity import.

In the intraday auction, all market participants in the bidding zones participating in the auction can provide up- and downward regulation. The intraday auction will match the bids on either side of the border and relieve the congestion, i.e. the negative capacities. Following the previous example if 160 MW from DK1 to DE has to be countertraded, the intraday auction can be used to find the available upward regulation in DE and the necessary downward regulation in either DK1 or the adjacent bidding zones.

As the solution is bound to move production from a low price zone to a high price zone it will result in a negative transmission income for the involved TSOs. As this negative transmission income is the result of the need for countertrade, it will be covered by the respective TSO, requesting the countertrade.

The market participants will be remunerated by pay-as-cleared.

The details for when the auction should be arranged are to be discussed. The countertrade model should, if possible, not interfere with continuous cross-border intraday trading.

The disadvantage, as with the CoCA model, is the lengthy development and implementation period. Given that competition between NEMOs soon also becomes a reality in the Danish bidding zones, the auction also need to enable the submission of bids from all relevant NEMOs in the participating bidding zones.

The benefits are again as with all intraday market based models, that effects on system operation and system security are eliminated and that the intraday market will ensure liquidity.

## 4.2 Countertrade using regulating power

Another possible countertrade model is the use of up- and downward regulating power in Denmark, which could be conducted by either:

- Special regulation
- New regulating power product

#### 4.2.1 Special regulation

With this model, the minimum capacities will be released in the day-ahead market and the trade in the intraday market will continue unaffected, as the TSOs will conduct the countertrade by using the regulating power market.

Energinet is currently providing up- and downward regulation through “special regulation”. With this model, Energinet can only use bids from DK1, as the other Nordic TSOs do not participate in the exchange of regulating power toward TenneT, and as there is often no free capacity available on Great Belt.

Energinet selects bids from the Nordic regulation power market’s NOIS-list according to pay-as-bid. The bids selected for countertrade from the NOIS-list are all bids not used in the balancing in the Nordics.

Energinet has the opportunity to purchase downward regulation capacity each morning, and the market participants who win the capacity in the auction are obliged to submit downward regulation bids in specific hours; however this option is usually not applied as enough bids are expected to be available in the NOIS list on a voluntary basis.

The process for special regulation follows the general Nordic model for submitting mFRR bids:

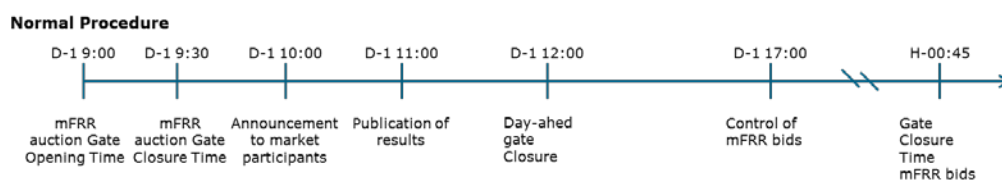


Figure 4: Process for mFRR bids in the Nordic regulating power market

The main disadvantage of this countertrade model is that it is only possible to use bids from DK1, which might not provide sufficient MWh of downward and upward regulation to conduct the countertrade without jeopardizing the system security when the minimum capacities increase. The use of bids in DK1 will also be less cost efficient compared to the intraday models, as the market is smaller and market power of individual market participants could lead to higher prices. The scarcity of the MWh will also increase costs, compared to more liquid markets. It is not expected that a purchase of up- or downward regulation capacity each morning will increase the number of bids in DK1, and thereby only make the MWh for up- and downward regulation more expensive.

Another disadvantage is that the smaller market for up- and downward regulation might give incentives for speculative behaviour in the day-ahead market.

An advantage of this countertrade model is that it is currently in use, and can be used going forward without major implementation projects and approval by regulators.

The countertrade model is considered to have less an effect on the Nordic regulating power price, as the bids selected are outside the ranges used for balancing purposes, which is also an advantage.

#### 4.2.2 New regulating power product

This option is similar to the above use of special regulation, as it will only be based on bids from DK1. However with this countertrade model, Danish market participants can split their up- and downward regulation bids into the Nordic regulating power market as usual, or submit their bids as an up- and downward regulation only to be used to conduct the countertrade towards TenneT.

This option works in the same way as special regulation, and is just a measure to trade and differentiate the products from the common Nordic Market.

The disadvantages are the same as before, and this splitting of regulation bids into several products decreases the liquidity in the market even more.

In addition, the countertrade model will most likely have an effect on the Nordic balancing price, as these bids can no longer be used in the Nordic regulating power market for balancing purposes.