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Svenska kraftnät
2020/1259

Request by Svenska kraftnät for a derogation from the minimum level of capacity to be made available for cross-zonal trade for **2022**

In accordance with Article 16(9) of Regulation (EU)
2019/943 of the European Parliament and of the Council of 5
June 2019 on the internal market for electricity

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The grounds for requesting a derogation

Regulatory background

Article 16(8) of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (hereinafter “Regulation 2019/943”), prescribes that TSOs shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside their own bidding zone, or as a means of managing flows resulting from transactions internal to bidding zones.

Article 16(8) also defines that this requirement is complied with if a minimum level of available capacity for cross-zonal trade is reached. This level, hereinafter referred to as the “CEP 70% requirement”, is set to 70% of the capacity of internal and cross-zonal critical network elements respecting operational security limits (hereinafter “CNEs”) considering contingencies (hereinafter referred to as “CNECs”).

Article 16(4) of Regulation 2019/943 prescribes that countertrading and redispatch, including cross-zonal redispatch, shall be used to reach the CEP 70% requirement. Article 16(4) stipulates that the application of cross-zonal measures is subject to the implementation of a redispatching and countertrading cost sharing methodology.

The CEP 70% requirement is applicable as of 1 January 2020. Transitory measures, i.e. action plans pursuant to Article 15 of Regulation 2019/943 or derogations pursuant to Article 16(9) of the same regulation, allow the minimum capacity to be reached in a progressive way.

Article 16(8) of Regulation 2019/943 prescribes that the CEP 70% requirement entails respecting operational security limits on CNEs as well as considering contingencies. Article 16(9) prescribes that relevant regulatory authorities may grant a derogation from paragraph 8 of article 16 where it is necessary on foreseeable grounds for maintaining operational security. The extent of such a derogation shall be strictly limited to what is necessary and to maintain operational security, avoid discrimination between internal and cross-zonal exchanges and not extend to more than one year at a time.

Svenska kraftnät has assessed the fulfilment of the requirement in article 16(8)(a) of Regulation 2019/943 based on the method presented in Recommendation no 01/2019 of the European union agency for the cooperation of energy regulators of 08 August 2019 on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943 (hereinafter referred to as ACER Recommendation 01/2019). Svenska kraftnäts’ analysis of historical (from 2021) capacity allocations and the foreseen probable flow scenarios with associated allocated capacities and available remedial actions for 2022 is used as a basis to request for a derogation from Article 16(8) according to Article 16(9) of Regulation 2019/943.

If the requested derogation is granted Svenska kraftnät shall amend the methodology to reduce the need for derogations published on March 31 2021 were relevant.

Request for derogation is compliant with the relevant rules

Svenska kraftnät submits this request for derogation, which is compliant with Regulation 2019/943, more specifically Article 16(9). In this connection, Svenska kraftnät notes the following:

- The request for a derogation is based on grounds that are foreseeable.
- The derogation is requested in order to maintain operational security.
- The extent of the requested derogation is strictly limited to what is necessary.
- The derogation avoids undue discrimination between internal and cross-zonal exchanges as Svenska kraftnät will maintain the available capacity above the CEP 70% requirement for as much of the time as possible.

Svenska kraftnät submits the following request for a derogation

Article 1. Subject matter and scope

This request for derogation on the implementation of the minimum margin available for cross-zonal trade is submitted by Svenska kraftnät in accordance with Article 16(9) of the Regulation 2019/943.

The request is based on foreseeable reasons to deviate from the CEP 70% requirement:

- The lack of remedial actions makes Svenska kraftnät unable to meet the CEP 70% requirement in 2022 without endangering operational security in a N-1 situation, see further information in Article 7.
 - Congestion in the West Coast Corridor inside bidding zone SE3, in combination with the lack of available downregulation implies a need to reduce capacity on six different interconnectors: SE3-NO1, DK1-SE3, DK2-SE4, DE-SE4, PL -SE4 and LT-SE4.
 - The historic dynamics of the Nordic AC grid has changed which have induced a higher flow of energy from east to west. This new flow increases the loading of network elements that historically were not effecting the market outcome space and has thus created congestion in new sections of the Swedish grid. This affects the capacities that can be allocated respecting operational security on the following borders; SE3-NO1, SE3-DK1, SE2-SE3, SE3-SE4 and SE3-FI.

Svenska kraftnät commits to limiting the use of the derogation as much as possible. The minimum margin available for cross-zonal trade, as defined by the CEP 70% requirement, will be achieved to the maximum possible extent as long as operational security is guaranteed.

Svenska kraftnät also commits to report all deviations from CEP 70% requirement to the Swedish NRA along with a justification why the deviation was required to guarantee operational security.

Svenska kraftnät also commits to amend the published methodology from March 2021 that provide a long-term solution to the issue for which this derogation is requested.

Article 2. Definitions and interpretations

For the purpose of this request for derogation, the terms used in this document shall have the meaning of the definitions included in Article 2 of Regulation 2019/943, Article 2 of commission regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM Regulation) and Article 2 of the ACER Recommendation 01/2019.

In this request for derogation, unless the context requires otherwise:

- The table of contents, headings and examples are inserted for convenience only and do not affect the interpretation of this derogation request.
- Any reference to legislation, regulations, directive, order, instrument, code or any other enactment shall include any modification, extension or re-enactment of it when in force.

Article 3. The West Coast Corridor

The West Coast Corridor is a cross-section in the Swedish transmission network located within bidding zone SE3 consisting of a number of CNECs that in certain flow situations in the Nordic grid affects the market outcome space. The corridor cuts through the 400 kV transmission lines in western Sweden, inside SE3.

The congestion problem at the West Coast Corridor occurs in hours with a northbound flow in the Swedish transmission system. For the problem to arise, the northbound flow from SE4, DK1, DK2, DE/LU, PL and LT, through the West Coast Corridor must exceed its general maximum capacity of about 2,300 MW.

Svenska kraftnät have analysed the available tools; remedial actions and capacity allocation, to manage the overloads and maintain operations inside security limits. When there are insufficient remedial actions available for Svenska kraftnät to operate the grid within operational security limits Svenska kraftnät has no other alternative than to allocate capacities that do not make 70% or more of one or several of these CNECs operational secure capacity available to the market.

However, it can be noted that such situations have decreased considerably in 2020; in 2021 situations with high flows in the West Coast Corridor have rarely been observed. Theoretically, flow patterns can change and persistent periods may arise when Svenska kraftnät from operational security perspective will not be able to allocate secure capacities of 70% or more on one or several of the relevant CNECs to the market without exceeding operational security limits. These hours with congestion problems in the West Coast Corridor are generally characterised by a combination of four factors described in the following subsections.

1. General reduction in demand relative to steady state, for example during nights and weekends

As the load decreases the power flows in the system changes. In the area close to the West Coast Corridor local demand and generation are at an equilibrium during the day. As local demand decreases local generation generally holds its output level and thus a new equilibrium with increased flow arises.

2. High wind in-feed, especially in Denmark, Germany and Southern Sweden

Wind in-feed located south of the West Coast Corridor pushes power through the Corridor. The normal southbound flow is replaced by northbound flow.

3. Subsequent production reduction in the hydro plants in Norway

As the flexible hydro plants decrease generation it may generate a flow from south to north to meet the load in Norway. New interconnectors from Norway may have the same effect as decreasing hydro plant generation; i.e. inducing a south to north flow as exports from Norway, not transiting Sweden, increase.

4. Nuclear generation south of the West Coast Corridor

Since two of the four generation units in the Ringhals nuclear power plant have been decommissioned (one in 2019 and one in 2020), the contribution of this inflexible generation have decreased considerably. However, the two remaining units, as well Oskarshamn nuclear power plant, still contribute to flows in the West Coast Corridor. The current level of production is expected for 2022 and at least until 2024.

Article 4. The East-West flow situation

The Nordic power system is undergoing a rapid change. In 2020 and 2021, two of the reactors at Ringhals nuclear power plant were taken out of operation and at the end of 2020 the interconnector between NO2 and DE/LU (Norway and Germany) was taken into operation. These two events have had significant impact on the historic dynamics of the Nordic AC grid by inducing a higher flow of energy from east to west as the relative load on the Swedish west coast is increased. This new flow increases the loading of network elements that historically were not affected the market outcome space.

In this new flow situation there are network elements that risks being overloaded due to the east-west flows when historical levels of capacity is allocated to the market.

Svenska kraftnät have analysed the available tools; i.e. countertrade, redispatch and capacity allocation, to manage the overloads and maintain operations inside security limits. When there are insufficient remedial actions available for Svenska kraftnät to operate the grid within operational security limits Svenska kraftnät has no alternative then to allocated capacities that do not make 70% or more of one or several of these CNECs operational secure capacity available to the market. Most of the time during the analysed period in 2021 the capacity made available to the market by Svenska kraftnät was 70% or more of the secure capacity. For approximately 20 % of the market time units between 2021-01-01 and 2021-09-26 the capacities made available to the market by Svenska kraftnät have not reached the minimum requirement of article 16(8). This is under the assumption that the CNECs put forth are also the limiting CNECs during the unplanned outages during this period and that each of the analysed CNECs are limiting for at least one bidding zone boarder every hour.

In article 5 the requirements and current situation for remedial actions as a tool the Svenska kraftnät can utilise to relive these CNECs, and thereby increase the capacity on these CNECs made available to the market, is described.

Article 5. Capacity calculation and compliance with article 16(4) of the Electricity market regulation 2019/943

The level of capacity that should be made available to the market when utilising NTC capacity calculation and allocation is not explicitly defined in the CEP 70% requirement. To evaluate its compliance Svenska kraftnät utilises the evaluation method for CNTC described in ACER Recommendation 01/2019.

According to article 16(4) remedial actions, such as countertrade and redispatch, shall be used to meet the requirement to make 70% of the transmission capacity, respecting operational security limits after deduction of contingencies, available to the market. In this article Svenska kraftnät describes the current capacity calculation process, including how available remedial actions are taken into consideration.

Svenska kraftnät determines transmission capacities between bidding zones in accordance with EU regulations. Operational security limits are managed in accordance with the Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation (SO), stating that Svenska kraftnät is obliged to comply with the operational security requirement to relieve the electricity transmission system after an N-1 event within 15 minutes. This means that Svenska kraftnät must ensure that there are sufficient remedial actions- to relieve a network element from the transitory admissible overload limit down to the permanent admissible overload limit within 15 minutes if the flow on the network element reaches this limit due to any fault in the system. This defines a boundary condition for capacity calculation; the flow on any network element in an N-1 scenario must always be lower than the transitory admissible overload limit.

Svenska kraftnät allocate capacity for cross-zonal trade based on the transitory admissible overload limits for each CNEC and thus considers the available remedial actions in the form of countertrade to be able to relieve the system to below its permanent admissible overload limits in an N-1 event. Since the capacity calculation is based on the transitory admissible overload limits countertrade is already taken into account when the capacity available for trade is calculated; thereby a higher capacity can be allocated to the market. In addition to countertrade, Svenska kraftnät also has a fast active disturbance reserve dimensioned to manage all N-1 faults; i.e. it is dimensioned according to the largest fault. While calculating the available capacity for trade, possible non-costly remedial actions are also taken into account; one such action being topology changes that achieve the most favorable distribution of the flow through the power system in N-1 situations.

At the time of capacity allocation, the CNECs that are most limiting to the trade between all bidding zones areas are determined. It is for these limiting CNECs that the requirement for minimum capacity according to 16 (8) in the Electricity Market Regulation (EU) 2019/943 applies and for which Svenska kraftnät has an obligation according to 16 (4) to use re-dispatch and/or countertrading to achieve the minimum levels of available capacity for cross-zonal trade.

In situations where Svenska kraftnät cannot allocate at least 70% of secure capacity for the limiting CNEC, the possibility of taking a calculated risk of continuous countertrading in the coming day is considered. In calculating the risk, the following is taken into account:

- 1) The possibility of countertrading before fault to relieve each CNEC and thereby secure the operational limits of the electricity transmission system, and
 - 2) If, after this countertrade, enough volumes to relieve all CNECs from their transitory admissible overload limit to their permanent admissible overload limit after an N-1 fault are expected to be available.

In Annex A and Annex B an assessment of the calculated risk for the CNECs relevant for the West Coast Corridor and East-West flows are presented. Based on these kind of analyses and operational experience additional continuous countertrading can be included in the capacity allocation and increase the trading capacity assessed for each limiting network element after contingency, CNEC. The compiled risk can however not be so large so that it endangers operational security.

Article 6. Coordinated capacity calculation implementation and compliance with article 16(8) of the Electricity market regulation 2019/943

Svenska kraftnät will continue to utilize the NTC approach for capacity calculation until the capacity calculation methodology according to article 20 of CACM entailing a flow-based approach for the Nordic Capacity Calculation Region is implemented. The implementation is planned to be finalized at the end of 2022.

Until the methodology for capacity calculation utilising the flow-based approach is implemented, regulatory authorities and ACER should recognize that, in some cases, the high uncertainties related to forecasting cross-zonal exchanges outside coordination areas may impede Svenska kraftnät's ability to reach the CEP 70% requirement. In such cases, the temporary relaxation of the CEP 70% requirement through a derogation is an appropriate instrument. In addition, the tools Svenska kraftnät has access to for evaluating its compliance with the 70 % rule before implementation of the new capacity calculation methodology according to article 20 of CACM entailing a flow-based approach are based on some simplifications bringing uncertainties to both calculation, allocation and the follow-up. The calculations Svenska kraftnät is performing to evaluate its 70 % compliance is performed ex-post, i.e. using a snapshot for the grid based on measured values for the relevant market time unit. This brings uncertainty to the follow-up, which to be done correctly should have been based on the same grid model as the capacity calculation was based on, i.e. an historical snapshot selected based on the expected flows in the grid.

The presence of structural congestions, which are the reason for this derogation request, have been identified by analysing calculated historical capacities. These capacities were compiled utilising the net transmission capacity method. To efficiently and precisely determine the capacity in relation to the requirement in Article 16(8) of Regulation 2019/943

the network needs to be analysed in with the flow-based representation of the whole coordination area as described in the ACER recommendation 01/2019.

During the period of the derogation Svenska kraftnät will gather data compiled in the external parallel run of the flow-based approach capacity calculation presiding its implementation. From this data Svenska kraftnät will determine which network elements that do not fulfil CEP 70% requirement for all MTUs. This data will additionally be utilised to improve and fine-tune the envisioned measures described in brief in Article 9. and potentially to define the starting point in an action plan according to article 15 of Regulation 2019/943.

Article 7. Lack of remedial actions

The foreseeable ground to request a derogation is a lack of sufficient remedial actions that would enable Svenska kraftnät to meet the CEP 70% requirement from 2022 without endangering operational security in an N-1 situation.

The situations where Svenska kraftnät faces challenges to meet the CEP 70% requirement occur due to the structural congestion described in Article 3 and Article 4. Svenska kraftnät would implement extensive use of remedial actions to solve the congestion, in accordance with Article 16(4) of Regulation 2019/943, if this was possible. However, lack of sufficient remedial actions has constrained Svenska kraftnät to define cross border capacity, NTC, available to the day-ahead market to ensure operational security; i.e. prevent overloads on the relevant CNECs as described in Article 3 and Article 4. This means that Svenska kraftnät during 2022 can not exclude situations where capacity allocation not meeting the 70% requirement will be necessary to ensure that the operational security is maintained.

Svenska kraftnät has made the assessment that there is lack of countertrading resources to enable an increased degree of planned continuous countertrading. The available resources are already considered for relieving each CNEC to or below its permanent admissible overload limit after an N-1 fault; see Article 5 for more information. In the case of these CNECs there is also the need to activate countertrading resources in neighbouring countries. In the Nordic market there is good cooperation between the TSOs to manage commercial flows that breach operational security limits. On these occasions, regulation bids are used in Finland, Denmark and Norway to maintain the system inside operational security limits. Both in practice and in the ongoing follow-ups that Svenska kraftnät has carried out, it is clear that the regulation power market has insufficient volumes to relieve the CNECs so that 70% or more of their secure capacity can be made available to the market for all market time units. If sufficient countertrade would have been available, countertrade could be utilised in line with Article 16(4) of Regulation 2019/943.

In situations where the West Coast Corridor is fully utilized, a volume of between 1 200 MW and 1 500 MW of downregulation resources would be required after a contingency to maintain operational security in line with the targets for operational security. Downregulations volumes need to be present south of the West Coast Corridor, in DK1, DK2

or SE4. It would also require corresponding upregulation volumes north of the West Coast Corridor, generally in Norway.

In Annex B an analysis of historical volumes for countertrade is presented for the West Coast Corridor. The analysis show that there is a lack of sufficient remedial actions for a large share of the analysed period. This means that Svenska kraftnät in certain situations will be constrained to maintain the operational security in the system by the capacity made available to the market on the six interconnectors in Southern Sweden (SE3 and SE4): SE3-NO1, DK1-SE3, DK2-SE4, DE-SE4, PL -SE4 and LT-SE4. A lower import capacity reduces the flow of power from interconnected countries into southern Sweden. A lower export capacity, on SE3→NO1, reduces the transit of the imported power going via the West Coast Corridor to Norway.

For the East-West flow situation, downregulation would be required in SE2 and/or FI and corresponding upregulation is required in DK1, NO1 and SE4. The amount of regulation volumes differs since the three CNECs that need to be alleviated are located further apart from each other in the network than the CNECs that constitute the West Coast Corridor. An analysis of historical volumes for countertrade for relevant CNECs for East-West flows is presented in Annex A.

The analysis of the East-West flows also show that there is lack of sufficient remedial actions. Svenska kraftnät is therefore constrained to maintain the operational security by the capacity allocated to the market on all connections to and from SE3: SE3-NO1, SE3-FI, SE3-DK1, SE2-SE3 and SE3-SE4.

Article 8. Ongoing bidding zone review

According to European legislation the bidding zone configurations in EU shall be reviewed on a regularly basis to make sure they are defined in an optimal way. Svenska kraftnät is currently involved in a pan-European study where alternative bidding zone configurations will be defined based on the expected presence of structural grid congestion in 2025. Currently the Nordic TSOs are performing detailed analyses requested by ACER to identify structural congestion. The results will be used by ACER to decide on the alternative configurations to be studied further.

The ongoing change in the Nordic power system has, as mentioned before, resulted in new flows situations, which has caused structural congestion at new locations compared to when the current Swedish bidding zones were defined. To ensure efficient allocation of transmission capacity in order to support secure operation of the power system and the maximization of social welfare correct bidding zone configurations are important. This means that new bidding zone configurations that better reflect the location of structural congestion in the East-west flow situations, may be beneficial.

However, for the West Coast Corridor, described previously in article 3, its properties has historically not been seen as ideal for creating a specific bidding zone where these lines constitutes a bidding zone border. A small bidding zone dedicated for just the West Coast Corridor would encompass small loads and virtually no generation. The resulting small

bidding zone would often only be an extension of the adjacent bidding zones, not being able to function on its own. To reconfigure the Swedish bidding zones in a way that the West Coast Corridor would constitute a border is also not feasible. A transmission line between Ingelkärr to Stenkullen that alleviates the congestion is planned to be taken into operation in 2025. The bidding zone would only be relevant until this time.

The bidding zone review will start after ACER has decided on the alternative configurations to be reviewed. The decision is expected during the first quarter of 2022. After that, the alternative configurations will be compared to the present ones based on many different perspectives such as economic efficiency, operational security and cross-zonal trade opportunities. The results from the analysis will be presented as a recommendation to the EU member states to either amend or maintain the current bidding zones.

Article 9. Methodology and projects to reach CEP 70%

On March 31 2021 Svenska kraftnät published a methodology for reducing the need for derogations in accordance with Article 16 (9) of the Electricity Market Regulation 2019/943¹. The methodology describes several measures that Svenska kraftnät is analysing and developing which will reduce Svenska kraftnät's need for a derogation. The methodology is first and foremost aimed at mitigating the issue of the West Coast Corridor, for which Svenska kraftnät was granted derogations for 2020 and 2021. However, most measures described are of general nature and applicable to facilitate making at least 70% of operational secure capacity available to the market for other limiting CNECs than those relevant for the West Coast Corridor.

Should the derogation be granted, Svenska kraftnät will further develop and publish an amended methodology regarding the management of the issue together with a description of additional measures.

Article 10. Extent and duration of derogation

This request for derogation is applicable for the duration of 2022 and to these interconnectors: DK1-SE3, DK2-SE4, FI-SE3, DE/LU-SE4, PL-SE4, LT-SE4, SE3-SE4 and SE2-SE3.

However, since the foreseeable ground that the request for a derogation is based on are reoccurring events, Svenska kraftnät may resubmit a request for derogation at the end of the 12 month period for the next period of maximal duration allowed by Regulation 2019/943.

Article 11. Language

The reference language for this derogation request shall be English.

¹ Svenska kraftnäts metod för att minska behovet av undantag enligt artikel 16(9) i Elmarknadsförordningen (EU) 2019/943.

Article 12. Confidentiality

The information provided by Svenska kraftnät for this derogation request does not have to be treated as confidential unless stated or agreed otherwise.

Annex A Analysis of the of day ahead, capacity allocation and special regulation market in the Nordics with regards to East-West flows

In Annex A an in-depth analysis of the possibilities to use downregulation and upregulation bids on the Nordic Regulation Power Market (RKM) to alleviate overloads on the critical network elements (CNEC) described in Article 4 of the main body is presented. The analyses are based on historical market behaviour during 2020 and 2021. The bidding history for the Nordic special regulation market is attained from NordPool's website. Bids are submitted to the Nordic TSO's per each bidding zone. The Nordic TSO's publish the bids on NordPool's website.

To mitigate the overload volumes must be available according to the impact that these have on the relevant CNECs. The impact of a regulation on the flow on a specific CNEC is described by the PTDF² value between the relevant bidding zones. These calculations are performed ex-post, i.e. using a snapshot for the grid based on measured values for the relevant market time unit. This brings uncertainty to the analysis, but provides a good approximation of the general situation.

In the graphs below, Figure 1, 15Figure 2 and Figure 3 the total amount of downregulation and upregulation resources available during from July 2020 to July 2021 are presented. Since available resources are not known until 45 minutes prior to the operational hour Svenska kraftnät has to base the capacity calculation and allocation on experience of available regulation resources. As the zone-to-zone PTDF values as well as the limiting CNECs varies over time a firm constant value of regulation volume that needs to be available for each hour and area cannot be defined. During each capacity calculation, a prediction of the amount of regulation resource in each relevant bidding zone therefore is needed and this amount must be able to relieve over loads on each specific CNEC.

The historical data in the figures show that it often is the case that less than the required amount of regulation resources are available.

² Power transfer distribution factor

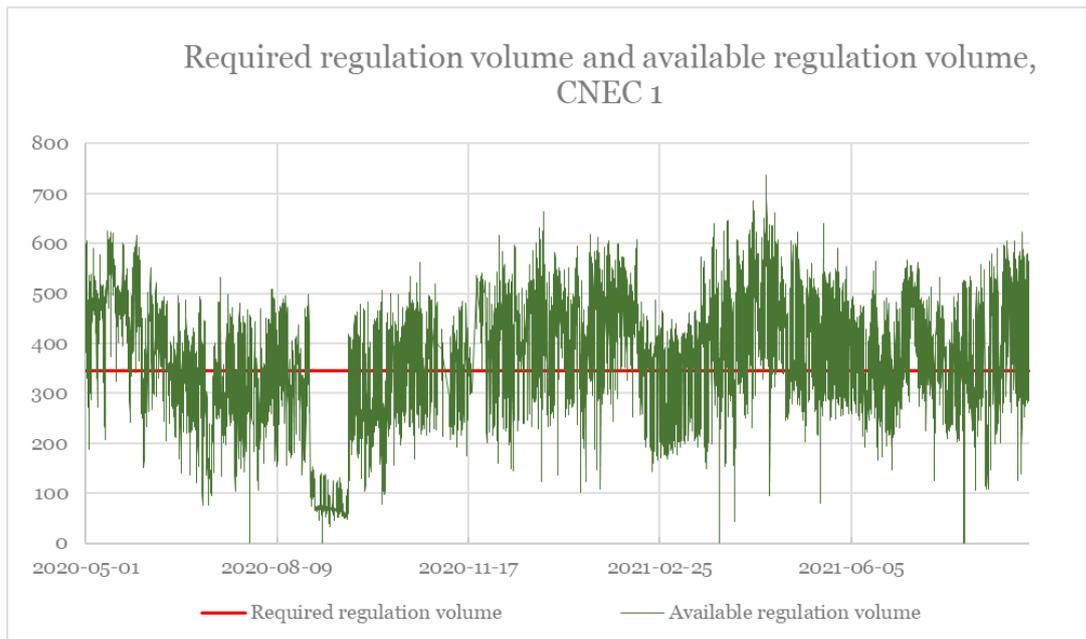


Figure 1: The green line indicates how much the bids on the regulation power market at each specific hour could have relieved CNEC 1. The red line indicates the relief that CNEC 1 required. The red line, indicating required regulation volume, changes over time as the thermal capacity of the transmission line changes with temperature. The red line is constant when another component, such as for example a bus bar, is defining the admissible overload limit.

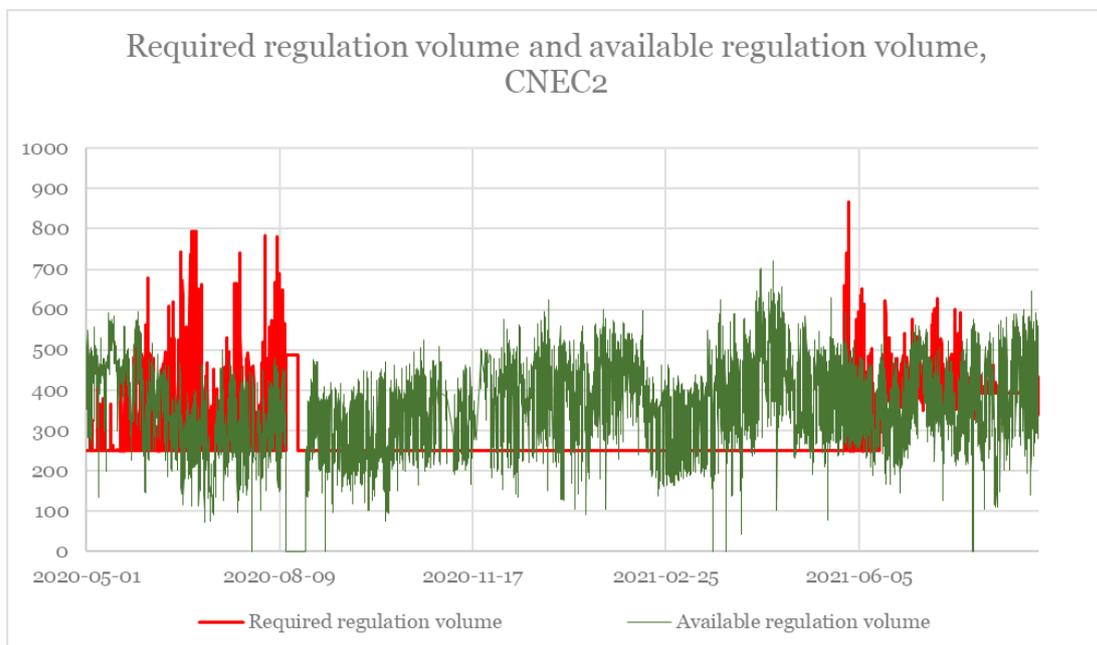


Figure 2: The green line indicates how much the bids on the regulation power market at each specific hour could have relieved CNEC 2. The red line indicates the relief that CNEC 2 required. The red line indicates the relief that CNEC 1 required. The red line, indicating required regulation volume, changes over time as the thermal capacity of the transmission line changes with temperature. The red line is constant when another component, such as for example a bus bar, is defining the admissible overload limit.

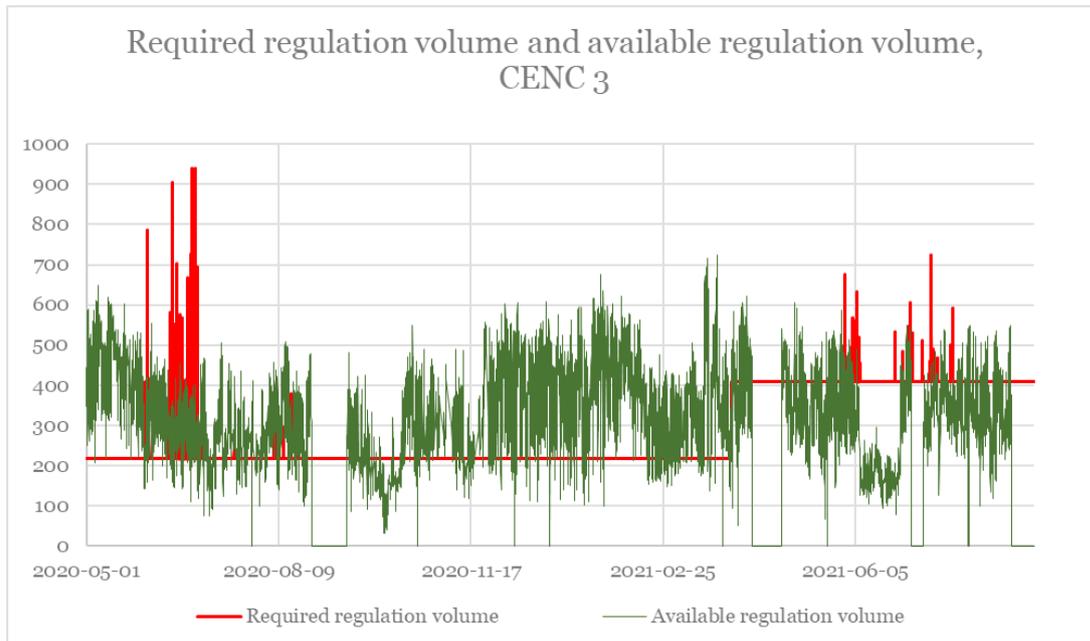


Figure 3: The green line indicates how much the bids on the regulation power market at each specific hour could have relieved CNEC 3. The red line indicates the relief that CNEC 3 required. The red line indicates the relief that CNEC 1 required. The red line, indicating required regulation volume, changes over time as the thermal capacity of the transmission line changes with temperature. The red line is constant when another component, such as for example a bus bar, is defining the admissible overload limit.

Annex B Analysis of the of day ahead, capacity allocation and special regulation market in the Nordics with regards to the West Coast Corridor

In this Annex an in-depth analysis of the situation of downregulation and upregulation bids in regards to the West Coast Corridor is presented. The analyses are based on historical market behaviour during 2020 and until the end of June 2021. The bidding history for the Nordic special regulation market is attained from NordPool's website. Bids are submitted to the Nordic TSO's per each bidding zone. The Nordic TSO's publish the bids on NordPool's website.

In situations where the West Coast Corridor is fully utilized, in general a volume of between 1 200 MW and 1 500 MW of regulation resources would be required after a contingency to maintain operational security in line with the targets for operational security. These downregulation volumes need to be present south of the West Coast Corridor, in DK1, DK2 or SE4. The corresponding upregulation is required in the bidding zones north of the West Coast Corridor; in NO1 to 5, SE2, SE1 and FI.

In the graph below, Figure 4 and Figure 5, the total amount of downregulation and upregulation resources available during 2020 and until the end of June 2021 are presented. Since available resources are not known until 45 minutes before the operation hour Svenska kraftnät has to base the capacity allocation on experience of available downregulation resources. Looking at the historical data in the figures, it is clear that it is often the case that less than the required amount of downregulation resources is available.

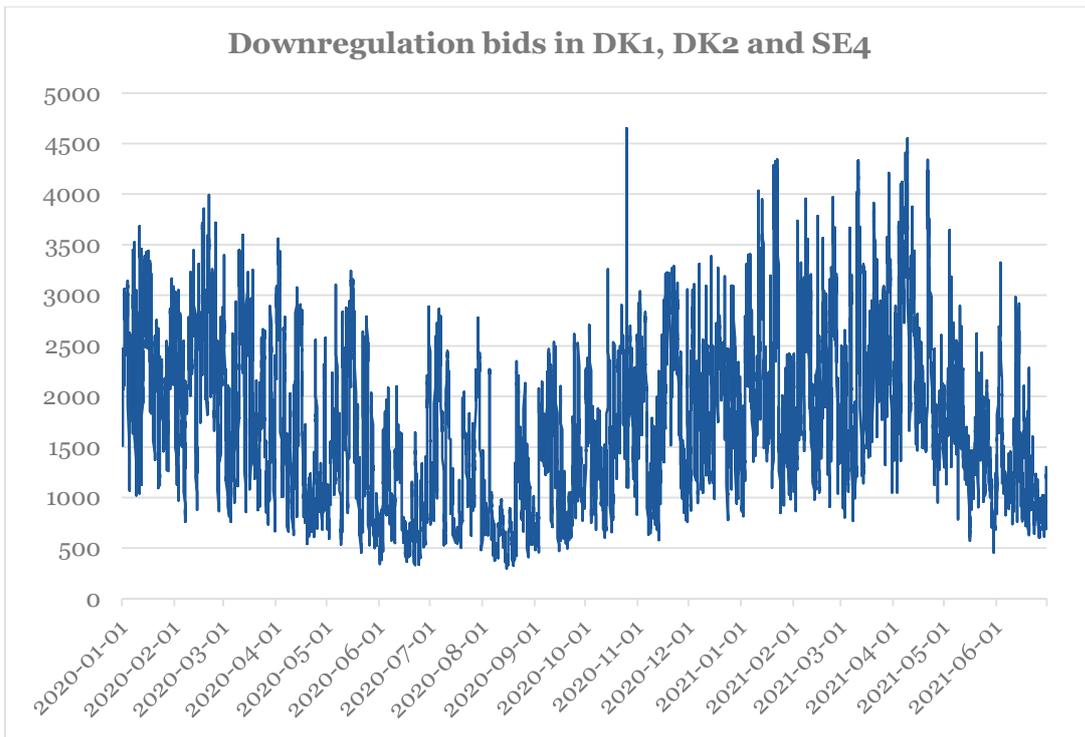


Figure 4: Available volume of downregulation in bidding zones south of the West Coast Corridor during 2020 and until the end of June 2021.

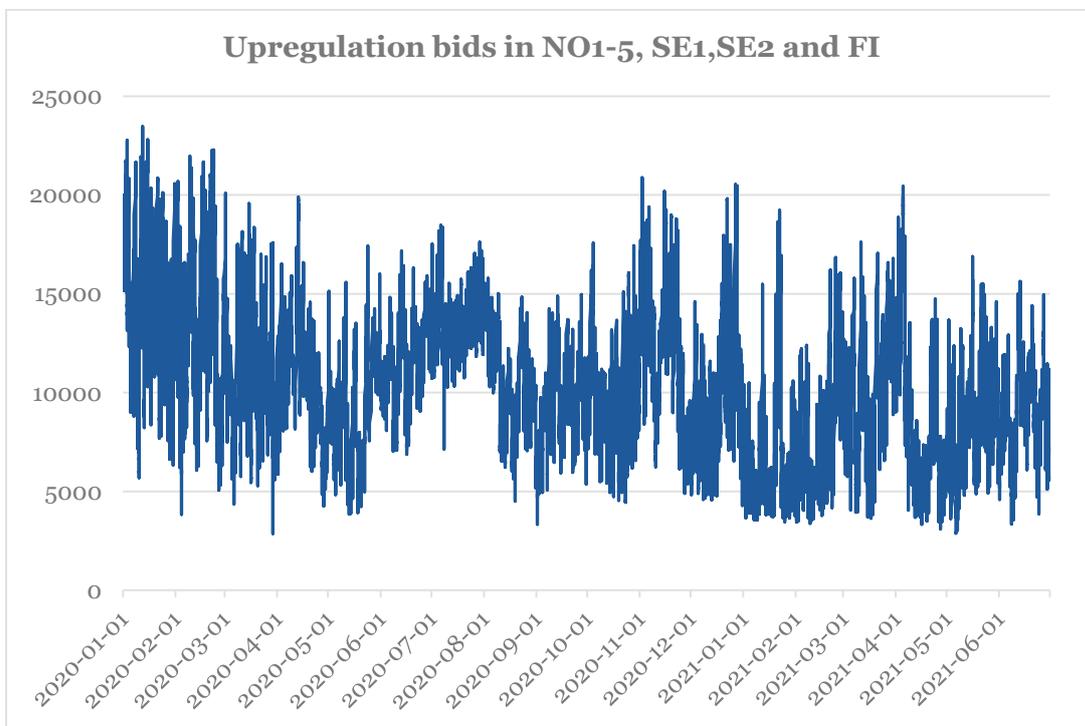


Figure 5: Available volume of upregulation in bidding zones north of the West Coast Corridor during 2020 and until the end of June 2021.

The level of available regulation volumes is different for up- and downregulation in the relevant bidding zones. On average 10 183 MW and a minimum of 2 855 MW of upregulation is available. For downregulation the average is 1 786 but the minimum available volume is 299 MW. The risk associated with assuming the available amount of regulations volumes therefore differs between up- and downregulation.

This analysis will focus on the downregulations volume as these levels are close to the required volumes; these are therefore the potential limiting factor.

1. Downregulation volumes

In Figure 6 the available downregulation resources in each bidding zone (DK1, DK2 and SE4) for each hour of 2020 and until the end of June 2021 are presented. Most of the downregulation resources are available in DK1.

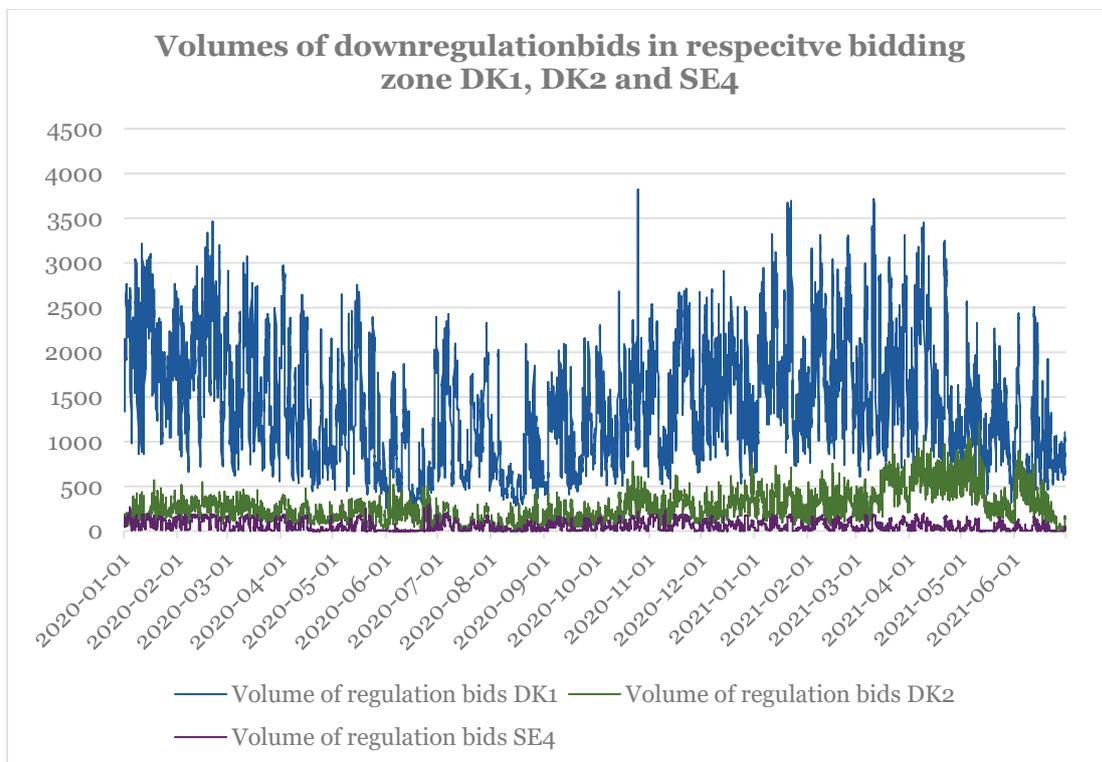


Figure 6: Volume of regulation bids during 2020 and until the end of June 2021 in DK1, DK2 and SE4, the vertical axis represents power in MW and the horizontal time and date which the specific volume is offered.

In Figure 7 remaining volumes that could be used for handling congestion problems in the West Coast Corridor are presented. During 2020 and until the end of June 2021 a total of 5325 hours there were less than 1 500 MW of available downregulation. Considering more favourable conditions there were 3 711 hours where less than 1 200 MW were available.

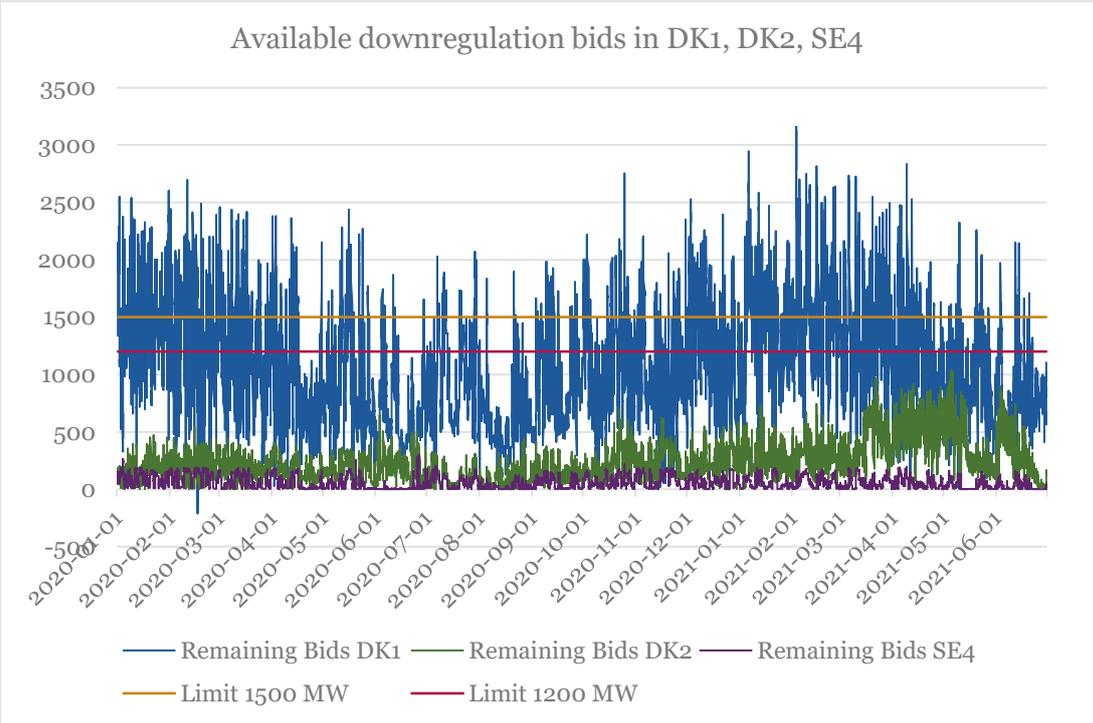


Figure 7: Available downregulation bids to solve congestion problems in the West Coast Corridor, taking into account volumes already used for balancing and special regulation (countertrade).