Swissgrid Ltd
Bleichemattstrasse 31
P.O. Box
5001 Aarau
Switzerland

T +41 58 580 21 11
info@swissgrid.ch
www.swissgrid.ch

Methodology for determining the NTC CH-DE for the DayAhead - auction

Effective May 2025

Date 26th May 2025

Author Swissgrid AG

Content

1 Introduction and context

This document describes the methodology, that Swissgrid uses to determine the NTC CH-DE for the DayAhead-auction starting in May 2025. The final NTC CH-DE results from the minimum of the Swiss proposal and the counter-proposal coming from the German transmission system operators.

2 Abbreviations

ATSO	Adjacent or neighbouring TSO
L	Loading of a network element
E	Exchange
CNEC	Critical Network Element and Contingency
NTC	Net Transfer Capacity
S	Sensitivity

3 Capacity determination process

1. Swissgrid determines the NTC CH-DE for the DayAhead-auction based on scenarios on a daily basis. A scenario is a situation in the grid that consists of several parameters, that are used as a basis in the calculation process. The whole process can be found in Annex 12.1.
2. The parameters that characterize a scenario are the following:
    a. Outages of nuclear power plants
    b. Outages of grid elements
    c. Anticipated trading scenario
3. The anticipated trading scenario consists of assumptions about the expected trading directions over the borders FR-CH, DE-CH, AT-CH and CH-IT and the net positions of the adjacent countries. In this context, a full Swiss export and a transit scenario (FR→CH→DE) are considered.
4. The reference for the expected trading scenario is provided by the medians of the schedules and net positions from the previous period, e.g. the past summer.
5. The NTC values for each scenario are calculated on demand offline by performing a loadflow-analysis based on the capacity calculation methodology that is described in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**. The calculation is carried out in any case for the trading scenario that was created based on the reference described in chapter 3(4). The NTC is also calculated for selected deviations from this reference by varying for example the net positions of the selected neighbouring control blocks (e.g. France and Germany).
6. The selection of the relevant scenario for the target day is determined and consequently, the relevant NTC values are chosen based on the outage planning of network elements, the outage schedules of the nuclear power plants that are reported to Swissgrid and a forecast about the expected trading scenario performed by Swissgrid. If the NTC was calculated for various deviations from the reference (see chapter 3(5)), the final NTC values are selected based on a forecast of the net positions for the target day. For this forecast, Swissgrid relies on a daily forecast coordinated among European TSOs.

7. Swissgrid coordinates the NTC CH->DE with the German TSOs. The final NTC results from the minimum of the Swiss and German proposal.

4 Capacity calculation methodology

1. The capacity calculation is performed offline by performing a loadflow analysis based on an European merged common grid model, which represents the selected scenario.

2. The Swiss generation available in this common grid model is distributed equally to all Swiss generation in relation to their maximal generation limits. Nuclear power plants are excluded from these adjustments as their maximal production is considered based on the selected scenario. This pretreatment of the common grid model is necessary in order to avoid violations on CNECs in the base case caused by a non uniform production distribution.

3. During the capacity calculation, the Swiss export in the direction towards Germany is increased under consideration of remedial actions described in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**. In this context, only the operational security limits of the critical network elements according to chapter 5 are considered.

4. The increase of the Swiss export and the German import are done based on the Generation Shift Key methodologies described in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**.

5 Critical Network Elements, Operational Security Limits, Contingencies

1. Swissgrid ensures, that only Critical Network Element and Contingencies (CNEC) are taken into account in the capacity calculation described in chapter 5, that fulfill the following conditions:

    a. Sensitivity of a trade of 1000 MW from Switzerland towards Germany is higher than 7%. That means that the loading of the related Critical Network Element is after the trade between CH and DE at least 7%[1] higher than before the shift.

    b. The loading of the Critical Network Element is not caused by a single power plant (or a power plant group in case of radial lines). In such a case the problem is considered as local and structural and therefore, the NTC should not be limited by such elements.

2. The list of CNECs considered in the capacity calculation are determined for each scenario.

3. The maximum Base Case limit for CNECs, whose violation is caused by a single power plant (or a power plant group in case of radial lines) (refer to criteria 5(1)b)) is set to 85% as long as they are sensitive towards a trade activity from Switzerland to Germany (refer to criteria 5(1)a)).

4. The values defined in 5(1) and 5(3) can be adjusted if required as a result of an analysis of the particular grid situation. ElCom will be informed accordingly. The market participants will receive the information on the Swissgrid website: Market-relevant information.

5. CNECs that do not meet the criteria defined in chapter 5(1)are considered in the capacity calculation only in N-case and consequently, not in contingency case. N-1-violations that occur on these elements in Real-Time are then solved with the help of redispatching if required.

---

[1] With this sensitivity threshold of 7% Swissgrig provides a quite high amount of capacity to the market. Other European Capacity Calculation Regions only consider a threshold of 5%.

6. Swissgrid ensures that the operational security limits per Critical Network Element stay within the Operational Security Limits during the Capacity Calculation. In this context the permanent admissible current is considered. This refers in general to 100% * I_{max} and is season-dependent for lines and 100% S_{max} permanently for transformers.

7. Swissgrid considers all Swiss Network elements as contingency cases during the capacity calculation and relevant contingencies in the grid of the ATSOs.

6 Remedial Actions

1. During the capacity calculation, which is described in Chapter 5, Swissgrid implements non-costly Remedial Actions for increasing the NTC.

2. The remedial actions used during the capacity calculation are the following:

   a. Change of topology in substations

   b. Change of taps of Phase Shifting Transformers

3. The consideration of costly Remedial Actions like Redispatch is not necessary as all elements, whose violations require in Real-Time redispatching measures are not considered in the capacity calculation. (refer to Chapter 6(3)).[2]

7 Generation Shift Key Methodology

1. The Swiss Export is changed proportional to the available generators margins according to the formulas written in Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**. All Swiss generators are adapted except nuclear power plants. The production of the nuclear power plants is considered as constant as long as they are available.

2. When adapting the Swiss export, the technical limits (the maximal and minimal generator limits) are considered.

3. The German import is adjusted proportionally to the generator injection that is available in the grid model.

8 Reliability Margin Methodology

1. Swissgrid reduces the NTC values calculated according to Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** by 200 MW in order to cope with the risk that is linked with the scenario forecast.

2. Swissgrid reserves the right to adjust this value in dependence of the forecast quality.

9 Validation of results

1. In calculating the NTCs according to the steps described above, Swissgrid uses only a limited set of scenarios and considers only part of the grid in terms of grid security. These limitations may lead to redispatch measures in real-time operations.

---

[2]Swissgrid could as well consider these elements in the Capacity Calculation. In case these elements would require a capacity reduction, Swissgrid would consider costly redispatch measures during the calculation to reduce the loading on these elements. Finally, this would result in the same NTC result.

2. Swissgrid therefore validates the calculation assumptions defined by the process against the actual operating conditions.

3. If necessary - particularly in cases of significant redispatch that could endanger grid security - the NTC is adjusted.

10 BackUp-Procedure

1. In case it turns out during the NTC determination process described in Chapter 3 that no calculated NTC-values are available for the expected scenario (e.g. caused by a short-term change of the outage planning), Swissgrid considers a scenario that is close to the expected scenario.

11 Transparency

1. Swissgrid publishes on a daily basis the final NTC values on the ENTSO-E Transparency Portal and on www.swissgrid.ch

12 Annex

12.1 Overview NTC CH-DE determination process

The main NTC CH-DE determination process is depicted in the following picture:

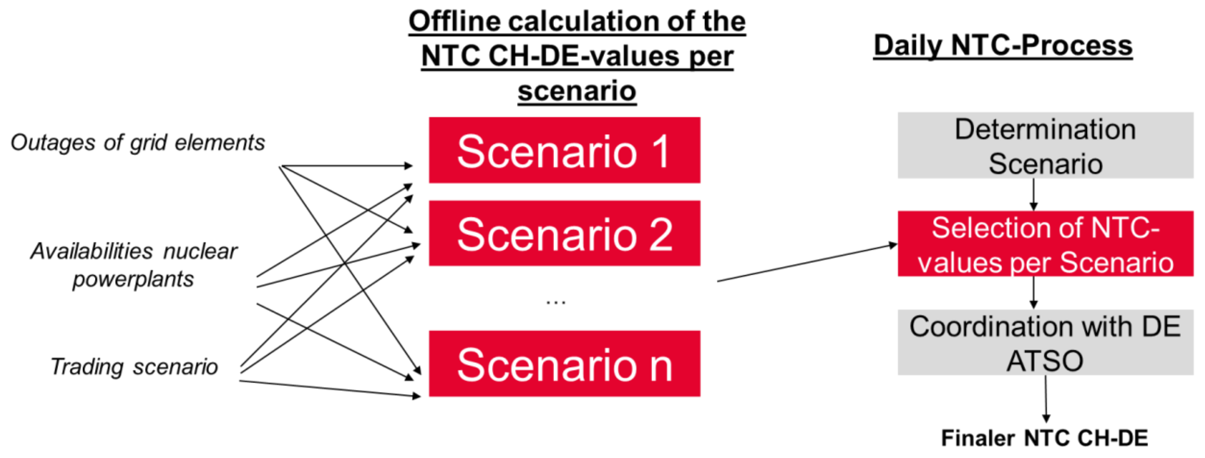

Figure 1: Description of the process

12.2 Generator Shift Key Methodologies

Switzerland:

The Swiss production is adjusted with the help of the Reserve-Methodology. In this case, the production is adjusted proportional to the available margin per generator.

An increase of the Swiss net position by ΔE, causes an adjustment of the injection per generator *k* as follows:

$$P_{k,new} = P_{k,old} + \Delta E \cdot \frac{P_{k,max} - P_{k,old}}{\sum_{i=1}^{n_{PP}} (P_{k,max} - P_{k,old})}$$

An decrease of the Swiss net position by ΔE, causes an adjustment of the injection per generator *k* as follows

$$P_{k,new} = P_{k,old} + \Delta E \cdot \frac{P_{k,min} - P_{k,old}}{\sum_{i=1}^{n_{PP}} (P_{k,min} - P_{k,old})}$$

Where:

$P_{k,new}$	Injection of the generator *k* after the implementation of ΔE
$P_{k,old}$	Injection of the generator *k* before the implementation of ΔE
ΔE	Change of the Swiss exchange
$P_{k,max}$	maximal generator limit of the generator *k* in MW
$P_{k,min}$	minimal generator limit or maximal pumping limit of the generator *k* in MW
n_{PP}	number of all Swiss power plants that are available for the shift

<u>Germany</u>

The German production is adjusted with the help of the proportional method. A change of the German net position by ΔE causes a change of the injection per generator *k* as follows:

$$P_{k,new} = P_{k,old} + \Delta E \cdot \frac{P_{k,old}}{\sum_{i=1}^{n_{PP}} (P_{k,old})}$$

Where:

$P_{k,new}$	Injection of the generator *k* after the implementation of ΔE
$P_{k,old}$	Injection of the generator *k* before the implementation of ΔE
ΔE	Change of the Swiss exchange
n_{PP}	number of all German power plants that are available for the shift

12.3 Determination of the Critical Network Elements relevant for the Capacity Calculation

The determination of the relevant Critical Network Elements that are considered in the Capacity Calculation takes place in two steps:

1. Identification of all network elements that are sensitive to a trade between Switzerland and Germany

2. Filtering of all Critical Network Elements whose violation is caused solely by one power plant or a group of power plants in case of radial lines

Step 1

In the first step, a sensitivity matrix is calculated by increasing the production in Switzerland and decreasing it in Germany.

All CNEC *i* are considered as sensitive on a trade of 1000 MW between CH→DE, which fulfill the following condition:

$$S_{CH \to DE,i} \geq 7\%$$

$$S_{CH \to DE,i} = L_{CH \to DE,i} - L_{Base\ Case,i}$$

Where:

$L_{CH \to DE,i}$	loading of the CNEC *i* after the redispatch between Switzerland and Germany in %
$L_{Base\ Case,\ i}$	loading of the CNEC *i* in Base Case in %

Step 2

From the list obtained from step 1, all CNECs are filtered, whose violation is solely caused by one power plant or by a power plant group in case of radial lines. This is checked with the help of the following calculation steps:

1. Calculation of the sensitivity per power plant *j* and CNEC *i* by implementing a redispatch of 100 MW between the power plant independent of its maximal generation limit due to the linearisation and Germany (Adjustment in Germany is based on the Generator Shifting Key). The sensitivity is then calculated as follows:

$$S_{PPj,CNECi} = \left(L_{PPj \to DE,i} - L_{Base\ Case,i}\right) \cdot \frac{P_{max,j}}{100\ MW}$$

Where:

$S_{PPj,CNECi}$	sensitivity of the power plant *j* on the CNEC *i* in %
$L_{ppj \to DE,i}$	loading of the CNEC *i* after the redispatch between the power plant *j* and Germany in %
$L_{Base\ Case,\ i}$	loading of the CNEC *i* in Base Case in %
$P_{max,j}$	maximal generator limits of the power plant *j* in MW

2. Finally, all CNECs coming from step 1 are deleted from the monitoring list, which fulfill the following condition. In this context, only $S_{PP\ j,CNEC\ i}$ >0 is considered:

    a. $\frac{max(S_{PP\ j,CNEC\ i})}{\sum_{j=1}^{n_{PP}}(S_{PP\ j,CNEC\ i})} > 45\%$