Internal

NTC process on the german border & impacts on the NTC

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Principal Market Operations

online meeting, 18th September 2024

swissgrid

Overview about the NTC processes on the CH borders

NTC CH→DE

- Evolution NTC CH-DE-value
- Core points of the NTC CH-DE methodology
- NTC situation in May/June 2024
- France exchange & load flow situation
- Next steps & outlook

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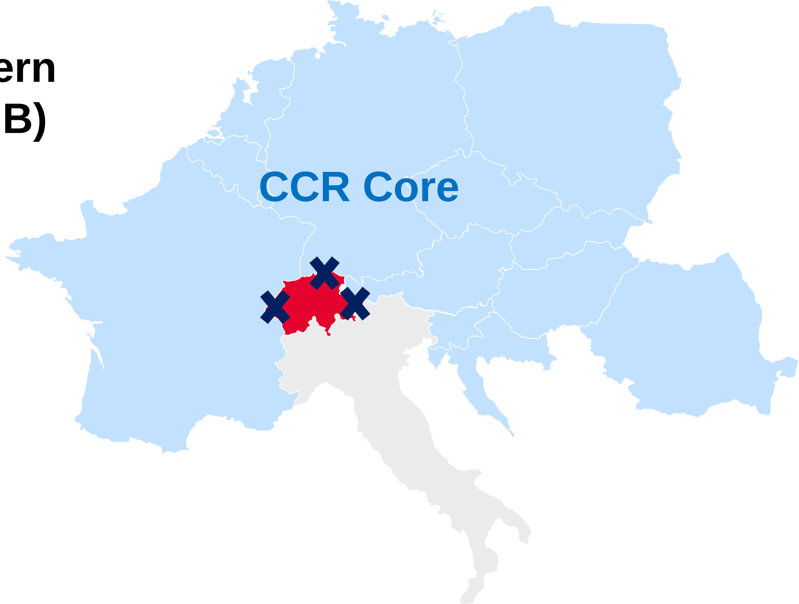
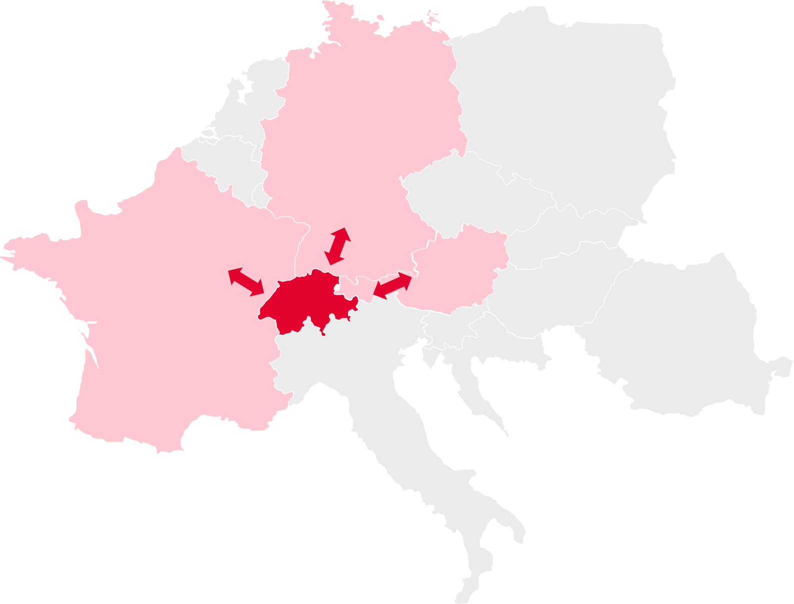
Next steps & outlook

While the NTC values on the southern border are determined in the context of CCR Italy North, still individual bilateral processes on the northern borders exist

Swiss Northern Borders (SNB)



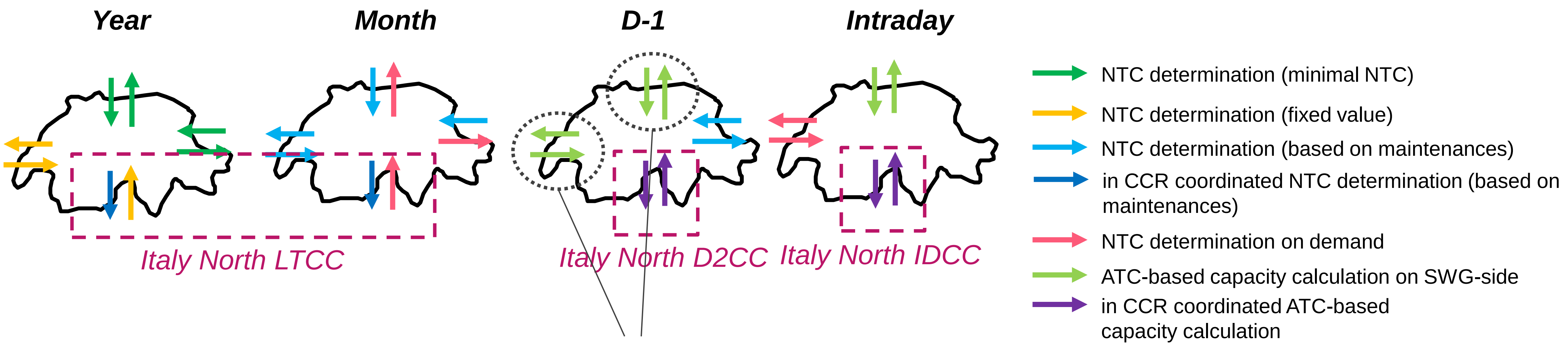


- Individual bilateral processes
- No coordination with CCR Core (Flow-Based Market Coupling)

Italian Border

- Swissgrid fully integrated in the capacity calculation processes as a *Technical Counterparty*

The NTC values on the CH-borders are determined based on different methodologies in the different timeframes



Calculation of the Swissgrid-proposal is done internally with a tool developed to serve particularly the methodology defined for export towards Germany.

- **NTC CH→DE** (in summer, based on **methodology defined with ElCom**)
- **NTC FR→CH**
- **NTC CH→FR**
- **NTC ADF→CH** (only in Winter)

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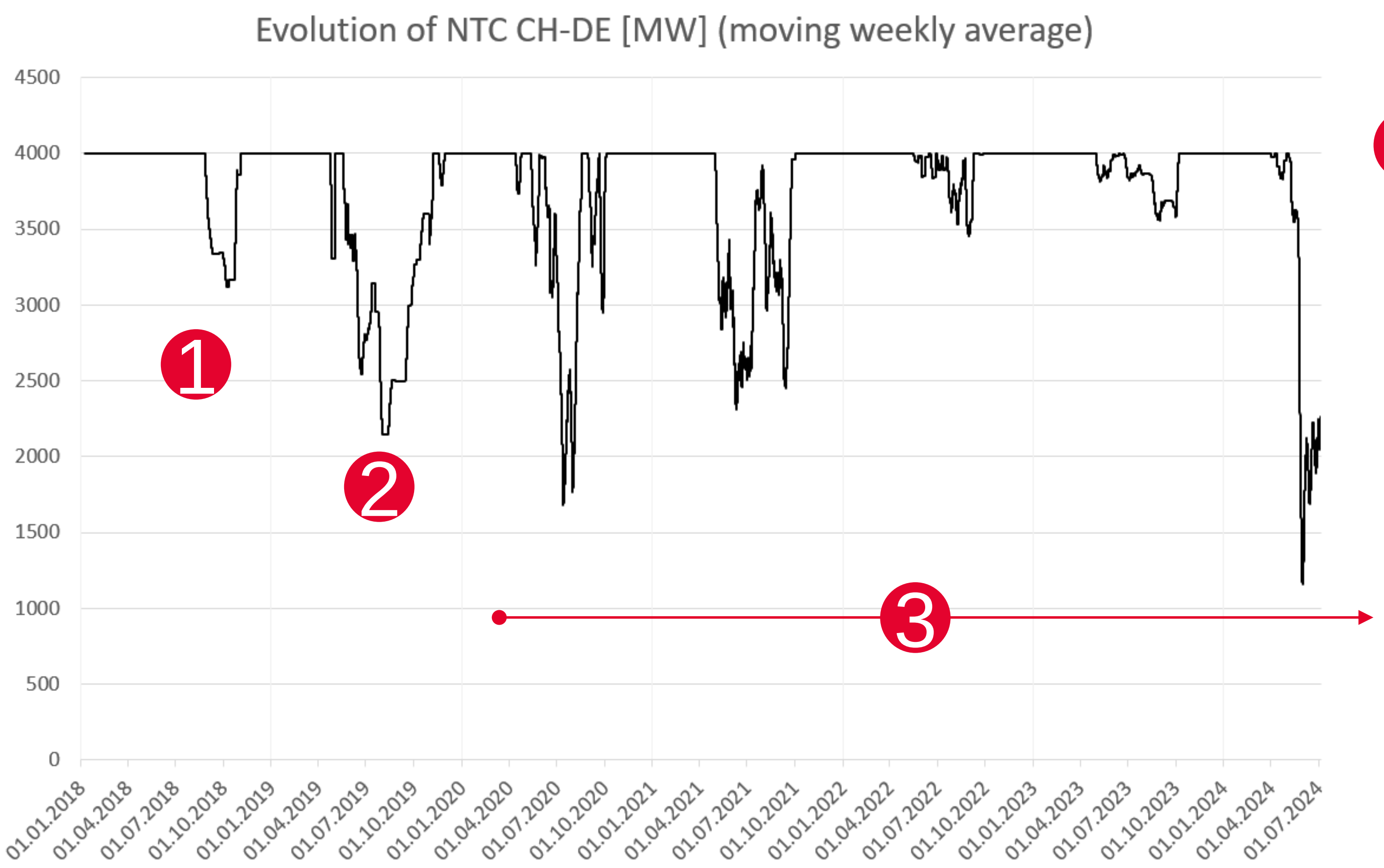
RECAP: The NTC CH-DE methodology was developed in order to increase the transparency of the NTC determinaton



1 • In the past, the **NTC CH-DE was set to 4000 MW**. Only in rare cases, manual adhoc reductions were done, e.g. like in summer 2018

2 • In summer 2019, these reductions were so big and happened so often, that **a lot of market participants requested** more transparency

• During winter 2019/20, **Swissgrid developed in collaboration with ElCom a methodology** to determine the NTC CH-DE. This methodology was **consulted with the branche** and published on the Swissgrid website. Detailed insights were given to the market participants in a **technical workshop held in February 2022**

3 • **Since Summer 2020**, Swissgrid determines the NTC CH-DE during the summer period based on that methodology

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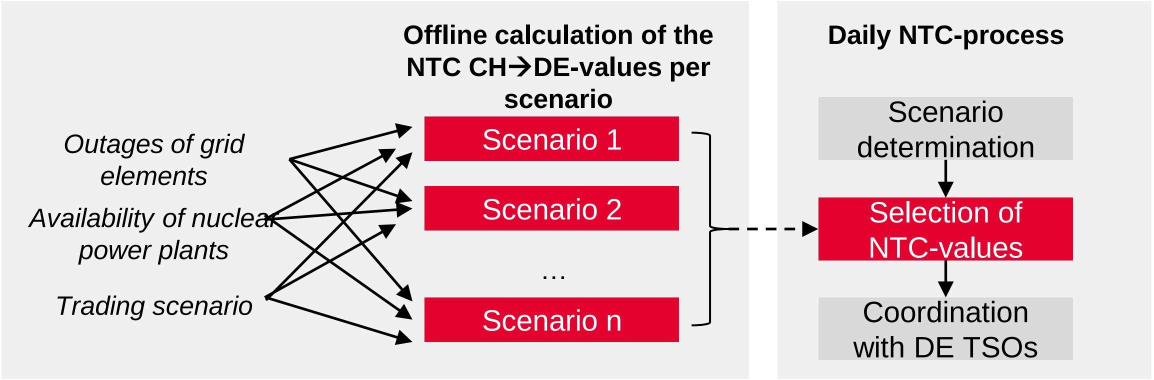
The Swissgrid-proposal of the Day-Ahead NTC CH-DE during the summer period is based on a methodology commonly designed with ElCom and consulted with the branche

- **Key points:**
  - Based on a **loadflow-based calculation** of different scenarios (see picture on the right)
  - Only considering **elements sensitive to an exchange CH→DE** (elements overloaded by local powerplants are discarded)
  - A **seasonal european grid model, that is repesentative* for the summer period** is used.
    (*Usually it is selected based on the median net positions of the same previous period (e.g. summer 2024 model was selected based on summer 2023))
  - **Two trading scenarios** per scenario are calculated: «Full CH Export» and «Transit» (FR→CH→DE) → Final scenario is selected in D-2 **based on a price forecast**



In May and June, the huge french net position caused an overestimation of the NTC CH-DE, leading to a stressed grid situation

- In general, **any differences between realtime and the NTC scenario** have an impact on the final NTC-value (over- or underestimation)
- The very low NTC-values in May and June were especially caused by
  - **Big deviation of the french net position compared to the scenario considered during the NTC calculation** ← Not covered by the Methodology
  - **Maintenances of KKG** and/or **KKL**
  - **Maintenances of 220kV south-north-transit-elements**

← Covered by the Methodology

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The higher the transit FR→DE, the lower the NTC CH→DE

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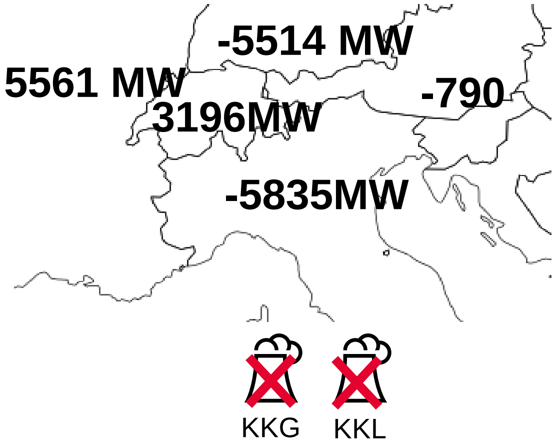
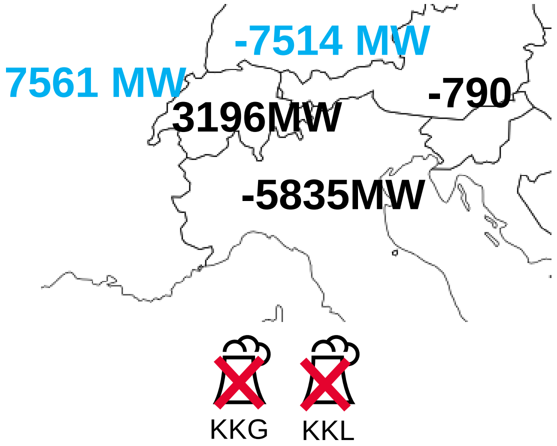
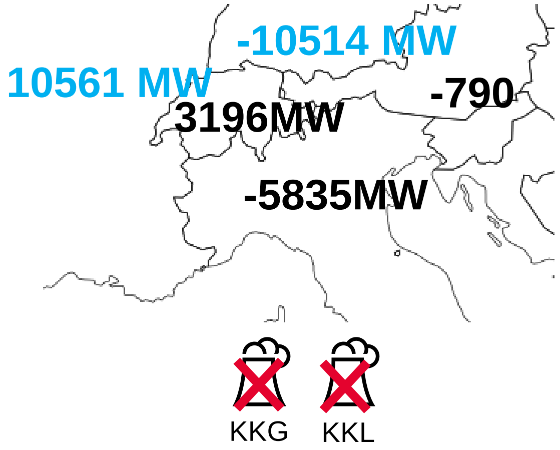
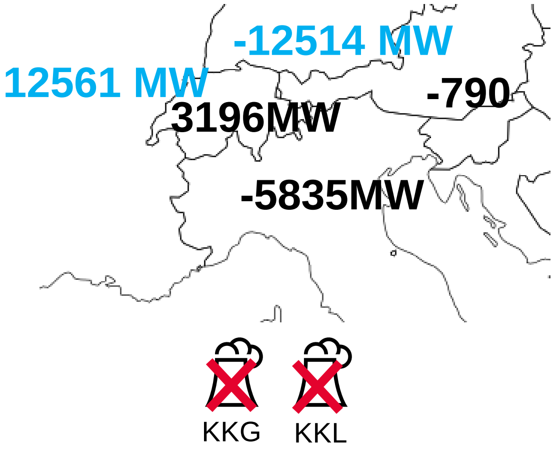
	Initial reference scenario	Var1: Transit FR→DE +2 GW	Var2: Transit FR→DE +5 GW	Var3: Transit FR→DE +7 GW
				
NTC CH→DE	**4150 MW**	**3650 MW**	**2600 MW**	**1000 MW**
Limiting elements	380/220kV Transformation	380/220kV Transformation	380/220kV Transformation Axis between Romandie & «Rest of Switzerland»	Axis between Romandie & «Rest of Switzerland»

!

Swissgrid currently has no accurate forecast of the Net Positions of France and Germany in the NTC determination process.

State-of-the-Art forecasts are only available at a too late time of the process (see: slides for next steps / improvements).

As a short term solution, the **reference scenario has been changed** from the initial to a one located between Var1 and Var2

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The more nuclear power plant production is available, the higher the NTC CH-DE

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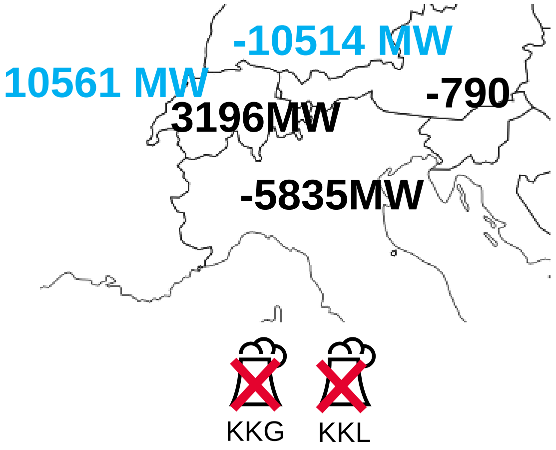

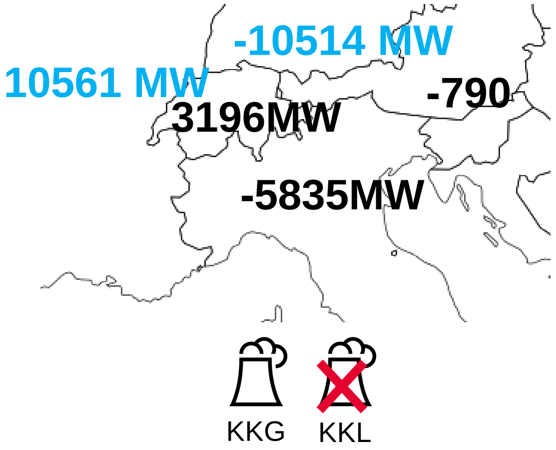

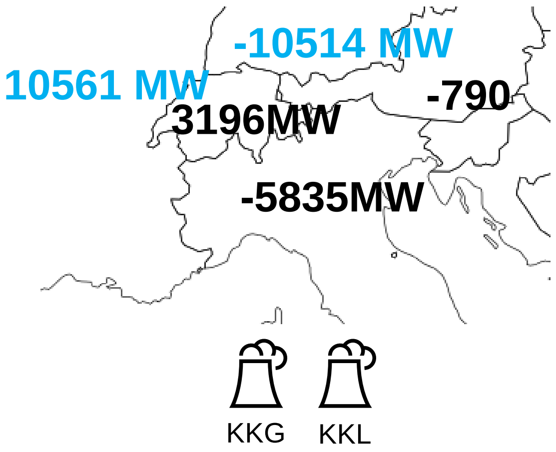

NTC CH→DE	**2600 MW**	**3800 MW**	**4700 MW**
Limiting elements	380/220kV Transformation Axis between Romandie & «Rest of Switzerland»	380/220kV Transformation Axis between Romandie & «Rest of Switzerland»	380/220kV Transformation Axis between Romandie & «Rest of Switzerland»

NTC reductions because of maintenances of nuclear power plants are considered by the Methodology

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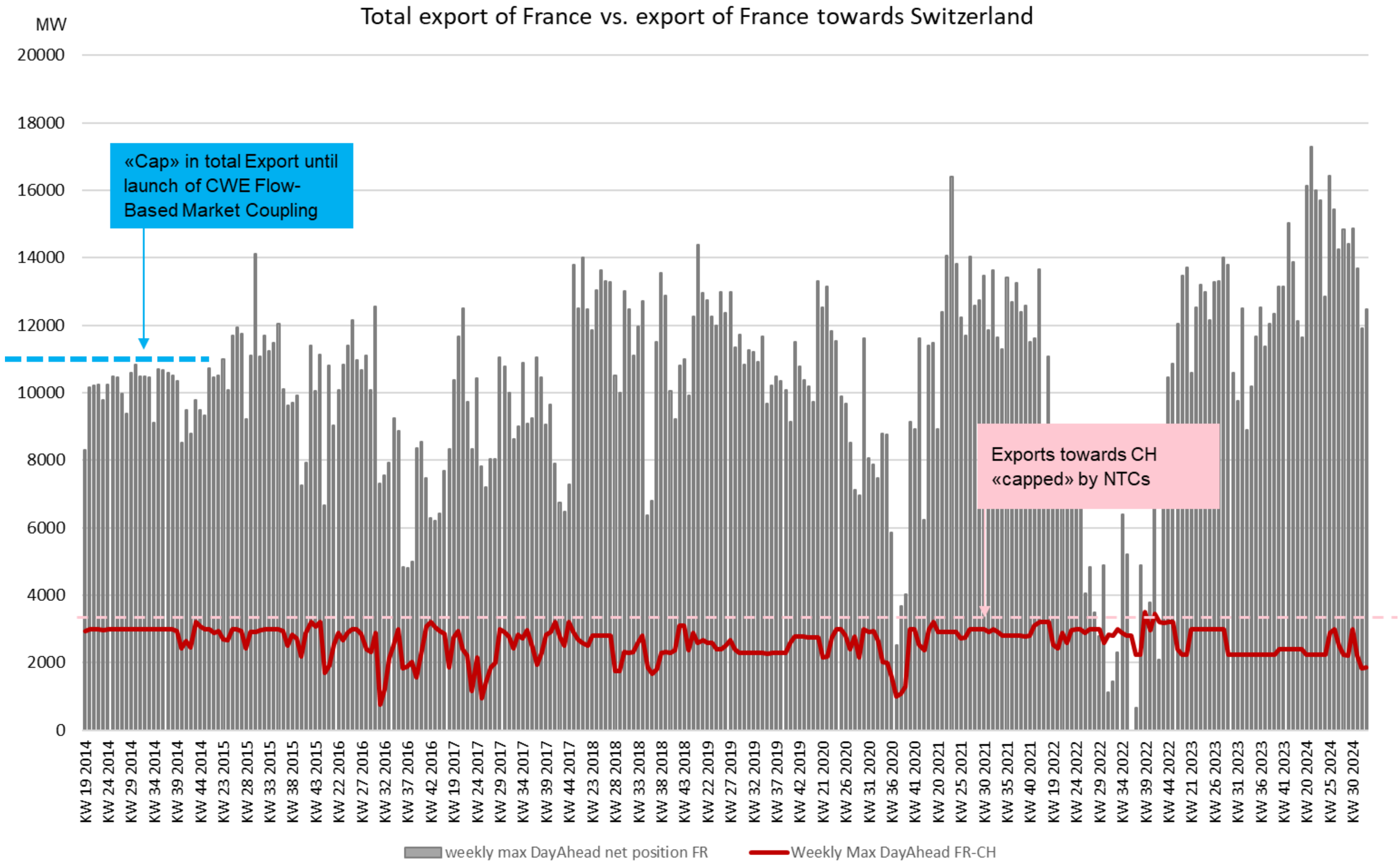
NTC situation in May/ June 2024

France exchange & load flow situation

Next steps & outlook

The maximum scheduled exchange of France has increased year over year in the past 10 years – a reason are the new EU regulations (Flow-Based, 70%minRAM) …



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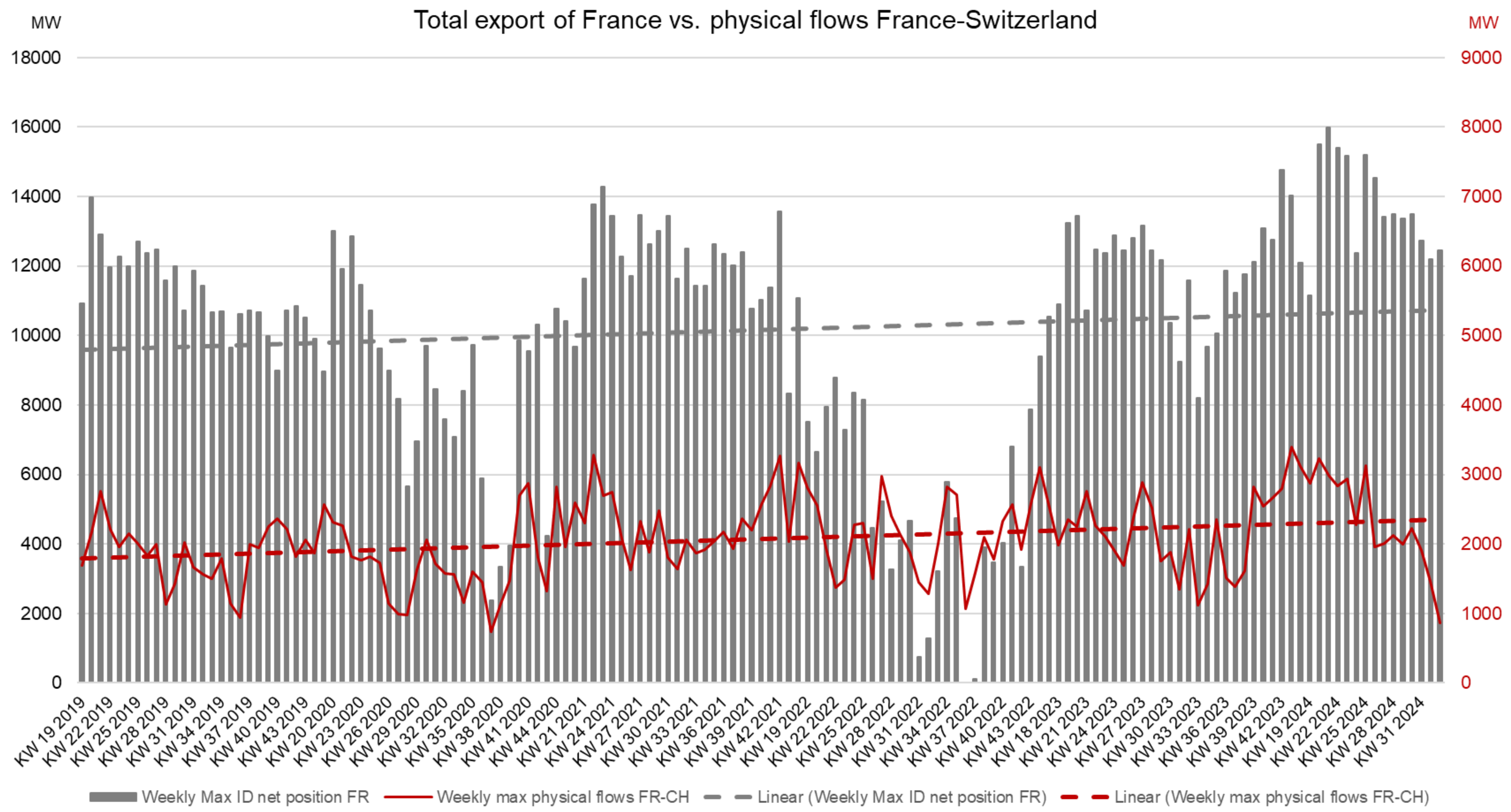
… which leads to increased flows through Switzerland, creating additional bottlenecks within our grid.



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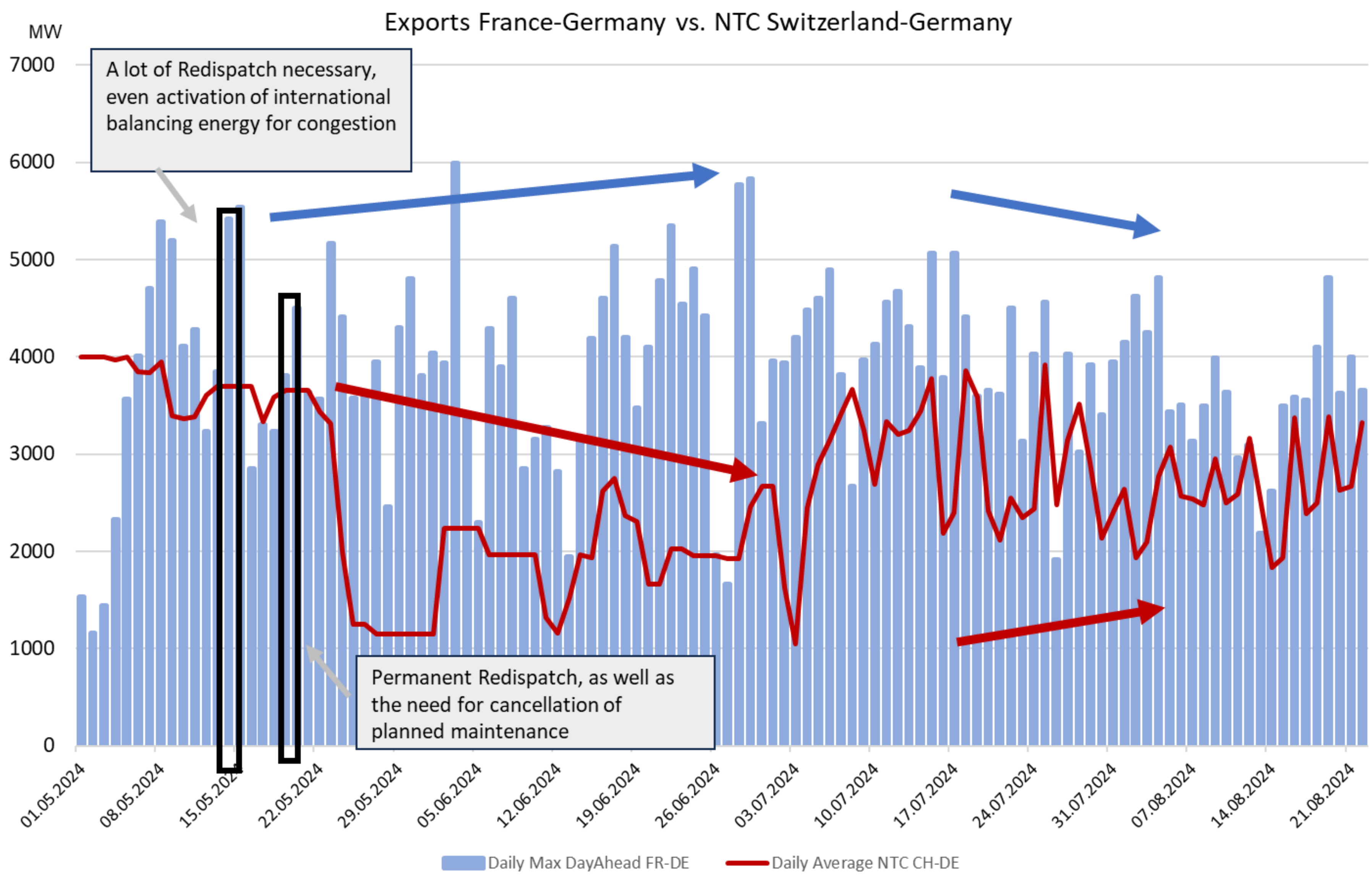
In May, Swissgrid was confronted with almost uncontrollable grid violations, due to the unprecedented export situation of France, combined with outage of nuclears etc.



- In particular, the export towards the “Core region” (Core Flow-Based Market Coupling) peaked during the summer
- Exchanges between France and Germany lead to the most severe flows through Switzerland
- Swissgrid was partly left without any redispatch potential
- After these extremely critical situations, Swissgrid had to reduce the export NTCs by adjusting to the new situation of France
- As maintenances and Nuclears came back, Swissgrid could step-wise increase the NTC again

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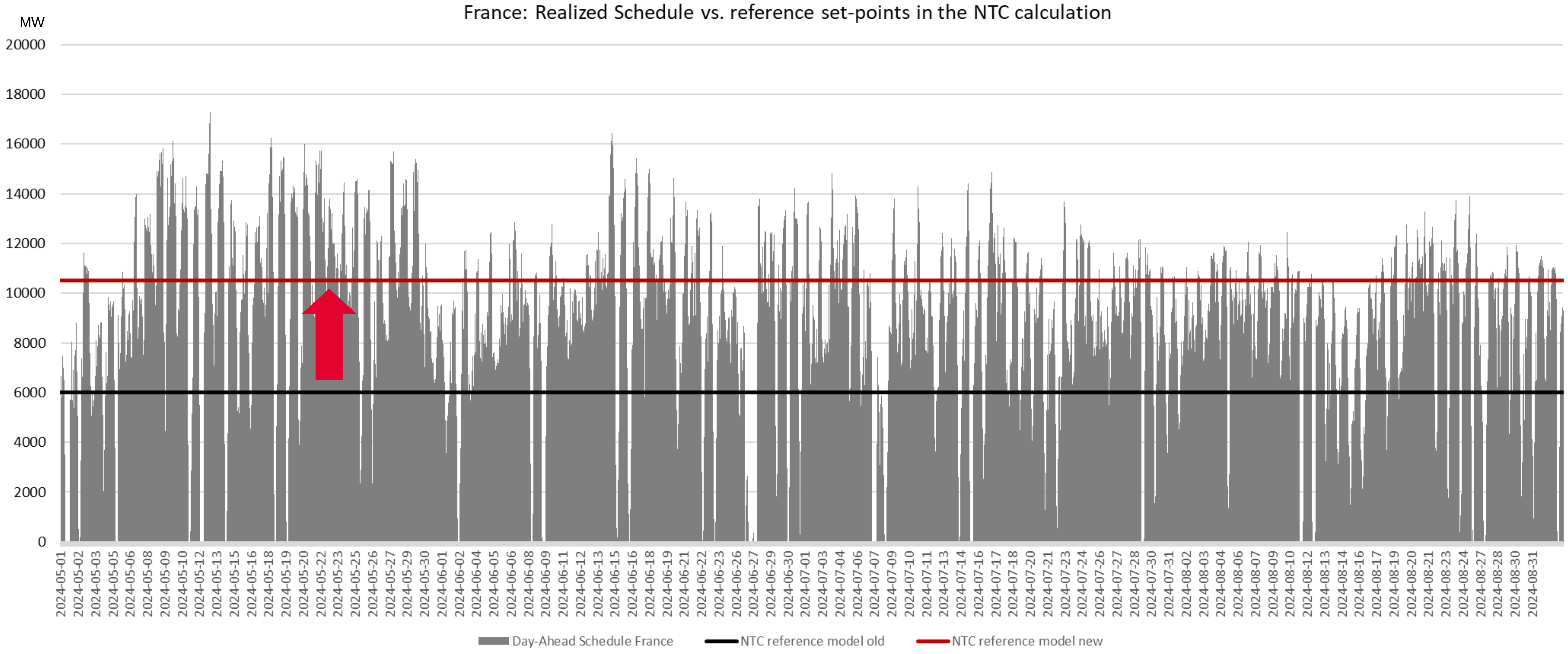
A key point was the adjustment of the net position of France in the reference scenario used for the NTC calculation.

(note: all hours are displayed, also off-peak hours where exports are not necessarily relevant)



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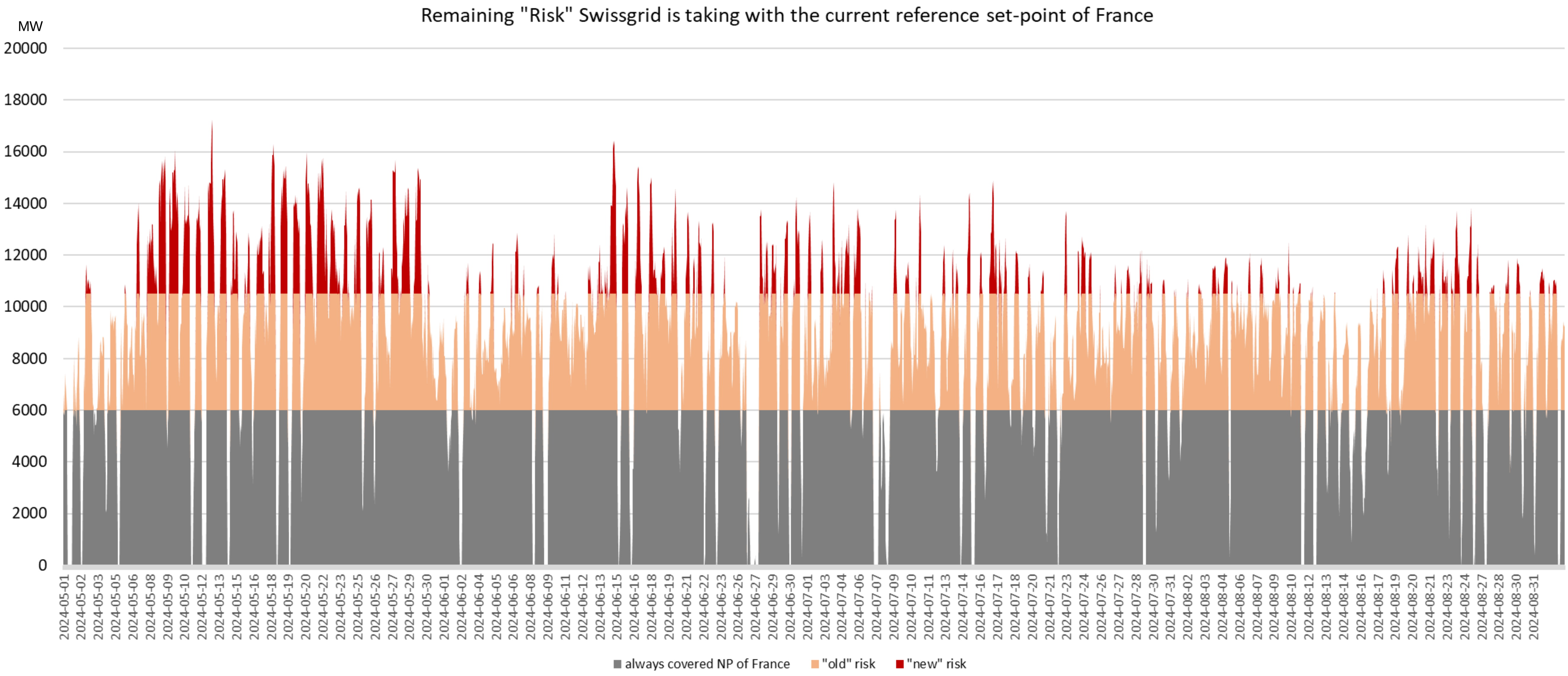
Even with the updated reference scenario, Swissgrid still takes certain risks which in reality materialized (red part of the diagram)



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The only true and optimal solution is a inclusion into all regional Capacity Calculation processes – preferably with the help of an Electricity Agreement

- Swiss cross-boder capacity would be treated equally to EU cross-border capacities
- Full coordination would be in place according to agreed (fair) rules
- Violations in Switzerland would therefore impact all capacities, and not only the ones on the CH borders
- Hence, increasing grid security and strengthening security of supply
- Swissgrid would not have to act «reflexive» and «after-the-fact»
- Full transparency for market participants
- Swiss electricity system can support the energy transition in Europe
- Legal certainty for Swissgrid and Switzerland

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Appendix: Detailed explanation of the NTC CH-DE methodology

The NTC CH-DE is calculated on a weekly basis for the whole next week and only updated in case of relevant grid changes

weekly process
(NTC calculation based on methodology)
every tuesday/ wednesday for the whole next week (Mo - Sun)

NTC calculation «Export» Scenario

NTC calculation «Transit» Scenario

Daily process
(NTC selection or recalculation on demand)

Scenario selection

D-1 price forcast FR & CH

NTC Selection («Export» or «Transit»)

NTC to the market

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The NTC calculation is performed in several subprocesses for 8 hours a day.

- The calculated hours are: 00:30, 03:30, 07:30, 10:30, 13:30, 16.30, 19:30 and 22:30.
- The remaining hours are extrapolated

Grid model selection

Grid model pretreatment

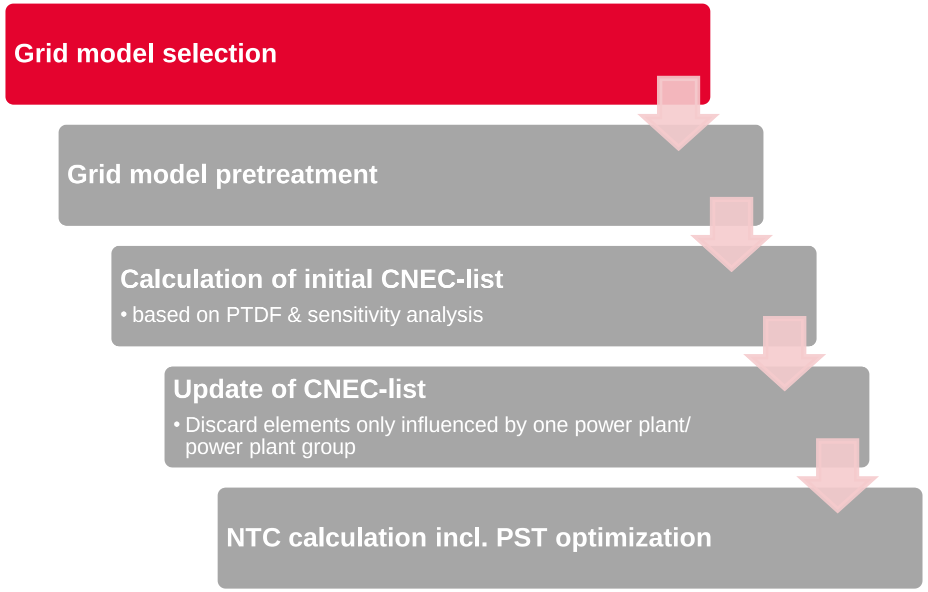
Calculation of initial CNEC-list
- based on PTDF & sensitivity analysis

Update of CNEC-list
- Discard elements only influenced by one power plant/ power plant group

NTC calculation incl. PST optimization

The calculation is based on reference grid models (standard models)

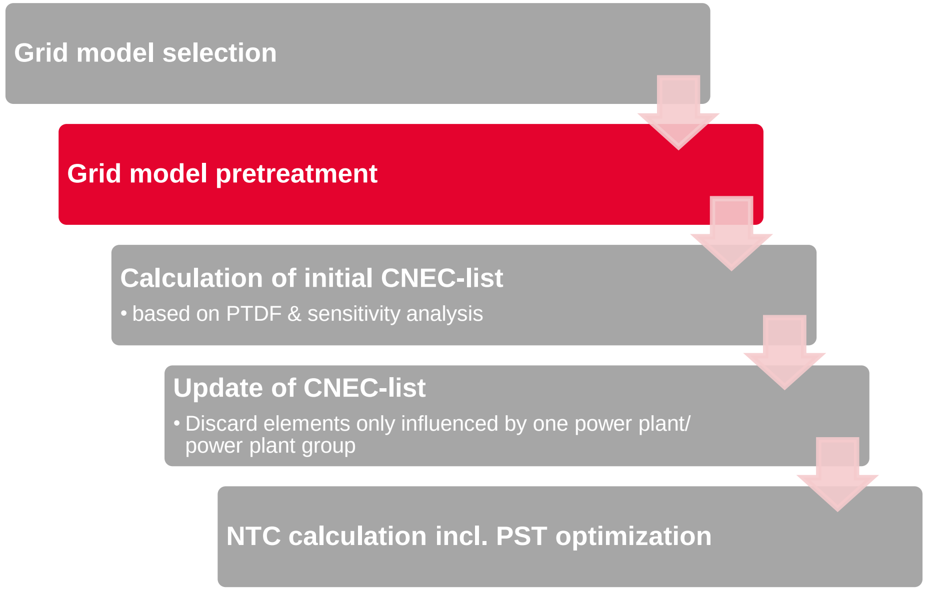
- The **weekly planning grid models** are created every Monday evening for the whole next week. (Monday - Sunday)
- These grid models are based on **snapshots of the past week**, which include also schedules of the past week
- **As the European net positions can change significantly from hour to hour i**n these models, high changes in the NTC values were the consequences
- In order to avoid this, it was decided to introduce «standard CGMs», which are representative for the total season
- The standard CGM is selected **once per season**. The selection criteria is, that the included **schedules are in the range of the median of the previous season** (e.g. the standard-models for summer 2024 where choosen based on the median of schedules of summer 2023)



The grid model is pretreated by shifting the schedules to the starting schedules.

- The grid model is shifted to the starting schedules **by adjusting the net positions** of Switzerland and the adjacent countries
- The **starting schedules** were defined as follows :

	Full Export	**Transit**
CH-DE	3000	4000
CH-FR	1000	-2500
CH-IT	$NTC_{CH \rightarrow IT}$	$NTC_{CH \rightarrow IT}$



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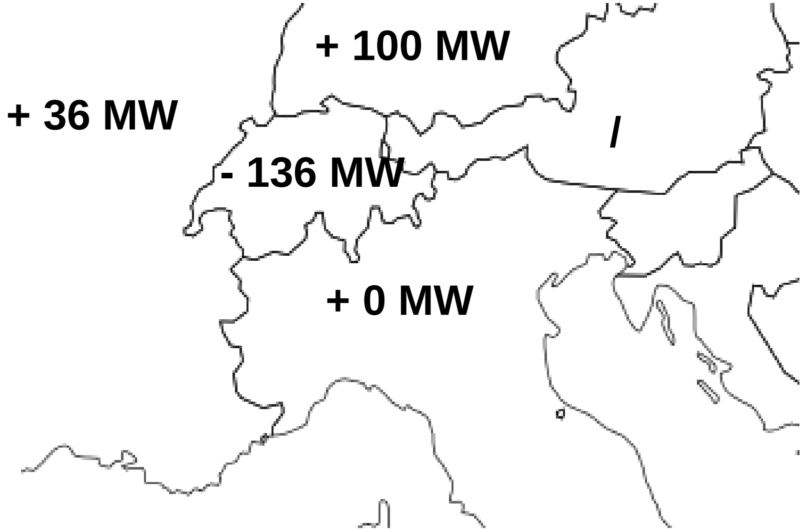
Grid model pretreatment - example

Example: «Transit»-scenario calculation 15.08.2021 16:30

Initial schedules (Standard-Model)	Starting schedules for CC	Adjustment of net position
$S_{CH\rightarrow DE}$ = 3900 MW $S_{CH\rightarrow FR}$ = -2536 MW $S_{CH\rightarrow IT}$ = 2400 MW	$S_{CH\rightarrow DE}$ = 4000 MW $S_{CH\rightarrow FR}$ = -2500 MW $S_{CH\rightarrow IT}$ = 2400 MW	**ΔNP_{DE} =** 4000 MW – 3900 MW = **100 MW** **ΔNP_{FR} =** -2500 MW – (-2536) MW = **36 MW** **ΔNP_{IT}** = 2400 MW – 2400MW = **0 MW** **ΔNP_{CH}** = -100 MW– 36MW + 0 MW = **-136 MW**



- **Grid model selection**
- **Grid model pretreatment**
- **Calculation of initial CNEC-list**
  - based on PTDF & sensitivity analysis
- **Update of CNEC-list**
  - Discard elements only influenced by one power plant/ power plant group
- **NTC calculation incl. PST optimization**

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All CNECs(*) that are influenced by > 10% by a trade CH→DE of 1000 MW are considered in the initial CNEC-list

Grid model selection

Grid model pretreatment

Calculation of initial CNEC-list based on PTDF & sensitivity analysis

Update of CNEC-list
- Discard elements only influenced by one power plant/ power plant group

NTC calculation incl. PST optimization

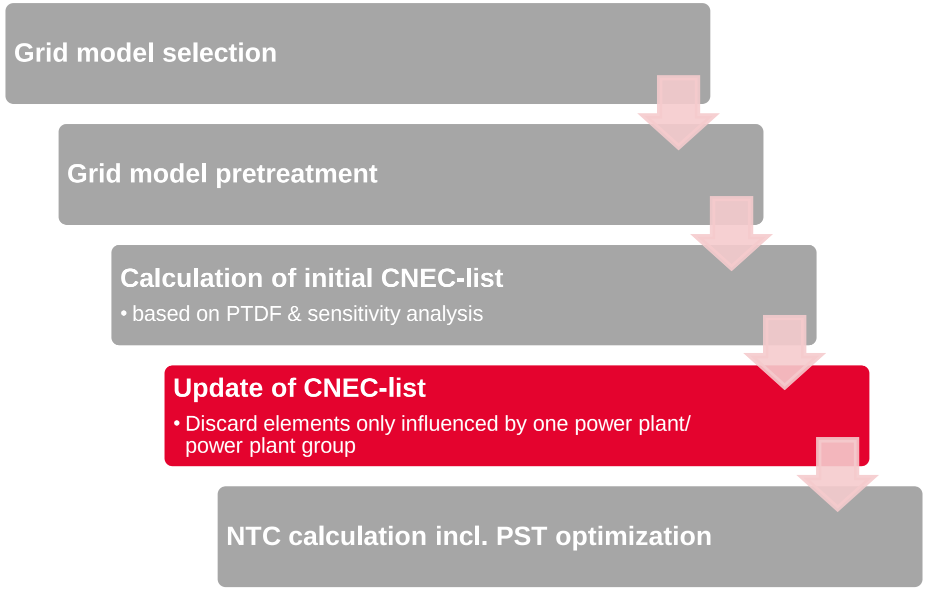
whole swiss grid	1st step: Initial CNEC-list	Sensitivity on a trade CH→DE of 1000 MW is > 10%
CNEC1		~~CNEC1~~
CNEC2		CNEC2
CNEC3		CNEC3
CNEC4		CNEC4
CNEC5		~~CNEC5~~
CNEC6		CNEC6
CNEC7		~~CNEC7~~
CNEC8		CNEC8
CNEC9		CNEC9
.		.
.		.
.		.
CNECn		~~CNECn~~
n = ca. 110 000		**n = 246**

(*) CNEC = **C**ritical **N**etwork **E**lement and **C**ontingency

Example: «Transit»-scenario calculation 15.08.2021 16:30

All CNEC(*) that are influenced by only one power plant (group) are discarded.

- A CNEC is considered as influenced by only one power plant, if this **power plant contributes > 45% to the loading** of this CNEC
- If a CNEC is discarded, the related CNE is added in N-situation automatically



CNEC1
CNEC2
CNEC3
CNEC4
CNEC5
CNEC6
CNEC7
CNEC8
CNEC9
.
.
.
CNECn

whole swiss grid

n = ca. 110 000

1st step:
Initial CNEC-list

~~CNEC1~~
CNEC2
CNEC3
CNEC4
~~CNEC5~~
CNEC6
~~CNEC7~~
CNEC8
CNEC9
.
.
.
~~CNECn~~

Sensitivity on a trade CH →DE of 1000 MW is > 10%

n = 246

2nd step:
CNEC-list update

~~CNEC1~~
CNEC2
~~CNEC3~~
CNEC4
~~CNEC5~~
~~CNEC6~~
~~CNEC7~~
CNEC8
~~CNEC9~~
.
.
.
~~CNECn~~

Remaining CNECs are not influenced by one single power plant (group)

n = 92

Example: «Transit»-scenario calculation 15.08.2021 16:30

(*) CNEC = **C**ritical **N**etwork **E**lement and **C**ontingency

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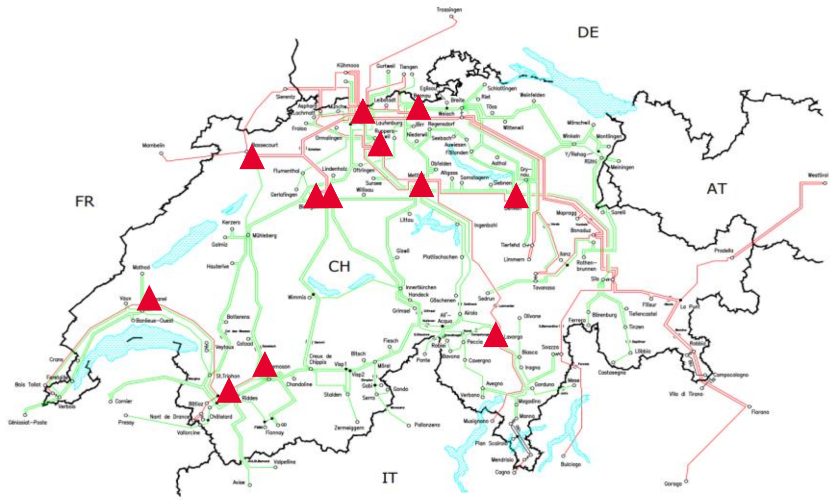
The NTC is increased by taking into account available PST taps.

- Execution of an **optimization function**, that maximizes ΔNTC while respecting the margin of the monitored CNECs and considering available PST taps
- The final NTC is then calculated as follows:

$$NTC_{CH \rightarrow DE} = Schedule_{Starting,CH \rightarrow DE} + \Delta NTC - TRM$$

- The TRM is 200 MW and the result is then rounded to the next 50 MW-step.

considered PSTs



Grid model selection

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Calculation of initial CNEC-list
- based on PTDF & sensitivity analysis

Update of CNEC-list
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NTC calculation incl. PST optimization

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NTC calculation example

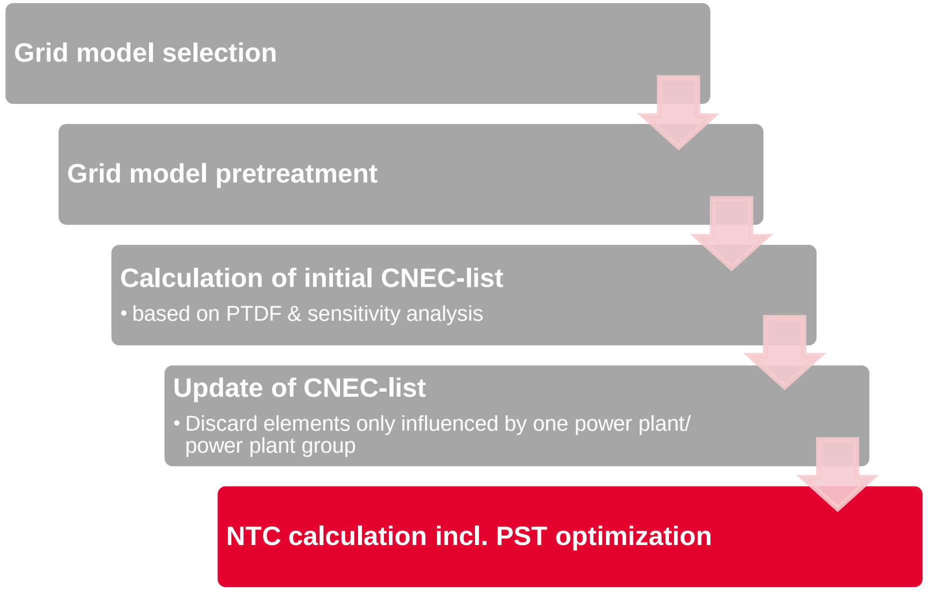
Example: «Transit»-scenario calculation 15.08.2021 16:30

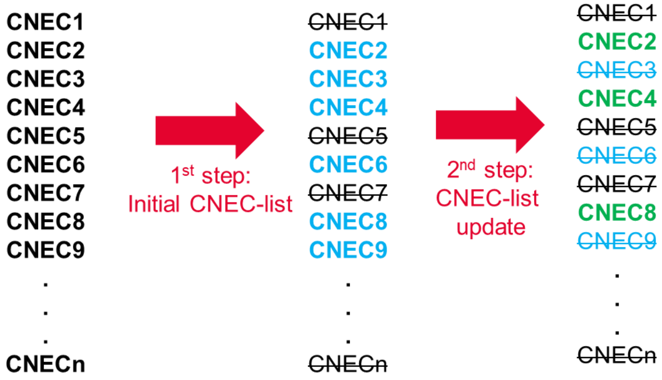
- ΔNTC = -345 MW
- $NTC_{CH \rightarrow DE}$ = 4000 MW -345 MW – 200 MW = 3455 MW → **3450 MW**

- If the same calculation was performed with the initial CNEC-list, the result would have been as follows

Example: «Transit»-scenario calculation 15.08.2021 16:30

- ΔNTC = -964 MW
- $NTC_{CH \rightarrow DE}$ = 4000 MW -964 MW – 200 MW = 2836 MW → **2800 MW**





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