Nordic Capacity Calculation Methodology Project (Nordic CCM) and Nordic RCC

External Parallel Run Handbook

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About this handbook

The Nordic Capacity Calculation Methodology (CCM) project is responsible for the methodology development and implementation of the Nordic Capacity Calculation Methodologies for the Long-Term (LT), Day-Ahead (DA), and Intraday (ID) timeframes. The methodologies are to be developed in line with the requirements from the Forward Capacity Allocation Guideline (FCA GL) and Capacity Allocation and Congestion Management Guideline (CACM GL), and to be approved by the National Regulatory Authorities (NRAs).

The Nordic CCM External Parallel Run relates to implementation of flow-based methodology for the day-ahead and intraday market time frame.

With this handbook, the CCM project and Nordic RCC hope to provide additional support to all stakeholders in utilising the data from the external parallel run (EPR) to prepare for go-live of flow-based in the Nordics.

Please note that this handbook will be updated and extended during the EPR.

User guide Content

Common abbreviations

Abbreviation	Description
AAC	Already Allocated Capacity
AAF	Already Allocated Flow
AC	Allocation Constraint
Ac	Alternating current
AMR	Adjustment for minimum RAM
ATC	Available Transfer Capacity
ATCE	Available Transfer Capacity Extraction
BZ	Bidding Zone
CACM	EU Regulation 2015/1222: Guideline on Capacity Allocation and Congestion Management
CC	Capacity Calculation
CCC	Coordinated Capacity Calculator
CCM	Capacity Calculation Methodology
CCR	Capacity Calculation Region
CGM	Common Grid Model
CNE	Critical Network Element
CNEC	Critical Network Element with Contingency
D-1	1 Day before delivery day
D-2	2 Days before delivery day
DA	Day-Ahead market timeframe
Dc	Direct current
EDD	Energy Delivery Day
EIC	Energy information code
ENTSO-E	European association for the cooperation of transmission system operators (TSOs) for electricity
EPR	External parallel run
F_0	Flow on CNE in case all bidding zones operate at zero net-position
F_RA	Impact of remedial actions
F_ref	Reference flow on the network element
FAV	Final Adjustment Value (the same as IVA in the Nordic CCM)
FB	Flow-based
Fmax	Maximum allowed flow for the CNEC/maximum power flow on a CNE/Operational security limits of the CNE
(F)RM	(Flow) Reliability Margin
GSK	Generation Shift Key
ID	Intraday market timeframe
IGM	Individual Grid Model

Imax	Maximum operational current limit
IVA	Individual Validation Adjustment
JAO	Joint Allocation Office
LHF	Last Hour Flow
MAS	Modelling Authority Set
MC	Market Coupling
MTU	Market Time Unit
NEMO	Nominated Electricity Market Operator (i.e. power exchanges)
NP	Net Position (supply minus demand)
NRA	National Regulatory Agency
NRCC/RCC	The Nordic Regional Coordination Centre (replaced the earlier Nordic Regional Security Coordinator, RSC)
NTC	Net Transfer Capacity
OSL	Operational Security Limit
PTC	Power Transfer Corridor (the same as combined dynamic constraint in the Nordic CCM)
PTDF	Power Transfer Distribution Factor
PX	Power Exchange
RA	Remedial Action
RAM	Remaining Available Margin (margin of a CNEC available for cross-zonal trade within a CCR)
RM	Reliability Margin
SDAC	Single Day-Ahead Coupling
SEW	Socio-economic Welfare
SF	Simulation Facility
TP	ENTSO-E Transparency Platform
TSO	Transmission System Operator
VBZ	Virtual Bidding Zone
XBID	Intra-Day continuous trading platform
z2z	Zone-to-zone
z2s	Zone-to-slack

High-level description of common terminology

Socio-economic welfare (SEW)

Socio-economic welfare (SEW) is calculated as the sum of consumer surplus, producer surplus and congestion income for each hour. SEW is used as the main optimization parameter and the Euphemia coupling algorithm tries to maximize the overall SEW gain among all bidding zones participating in Single Day-Ahead Coupling (SDAC).

Consumer and producer surplus are calculated by Euphemia and used as is without any further calculations.

Congestion incomes are calculated per border, based on the flows and price differences. Flows are calculated based on border PTDF's and the net positions and prices are calculated by Euphemia. Congestion incomes are distributed among all borders based on the Congestion Income Distribution methodology[1].

Bidding zone prices

Prices for each bidding zone are calculated by Euphemia.

Net positions

Net positions of actual bidding zones are calculated by Euphemia and used as is. Euphemia does not calculate net positions for virtual bidding zones (which are used for modelling HVDC links) but it calculates the flows on these links. Net positions of virtual bidding zones are calculated based on these flows.

Allocated flow – expected physical flow

Allocated flows (F_AAC) are calculated by summing the products of each bidding zone PTDFs and corresponding bidding zone net positions to the F_0-flow.

The F_AAC can be calculated both on CNE(C) level, but also on border level by using a border CNE.

[1] MoAvailabl for download att the ACER website: https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2007-2017%20on%20CIDM.pdf

Flow for FB is calculated using the CNEC PTDF's and net positions from FB market coupling. Flow for NTC is calculated using the same CNEC PTDF's but taking the net positions from NTC market coupling instead. This flow corresponds to the expected physical flow on the element with the given net position.

The results from these calculations are not the same as scheduled exchanges which are currently used as commercial border flows.

The allocated flow F_AAC are calculated by:

$$F_{AAC} = \sum PTDF_k \times NP$$

While the expected physical flow is calculated by:

$$Physical\ flow_k = F_{0,k} + \sum PTDF_k \times NP$$

Where $F_{0,k}$ and $PTDF_k$ are the F_0 and PTDF parameters corresponding to the CNEC k.

Scheduled exchange

Scheduled Exchange (SE), i.e. the electricity transfer between neighbouring bidding zones derived using a SDAC algorithm "volume indeterminacy" feature based on DA Scheduled Exchanges Calculation Methodology).

The Nordic CCM project recommends the use of F_AAC, as this is not equal to the flow allocated by FB.

Nordic Flow-based Capacity Calculation Methodology

Nordic Day-ahead Capacity Calculation Methodology (Nordic CCM), consists of methodology relating to

- Day-Ahead (DA) and Intraday (ID) timeframes
- Long-Term (LT) timeframe.

The Nordic Capacity Calculation Methodology (CCM) project is responsible for the methodology development and implementation. The methodologies are to be developed in line with the requirements from the Forward Capacity Allocation Guideline (FCA GL) and Capacity Allocation and Congestion Management Guideline (CACM GL), and to be approved by the National Regulatory Authorities (NRAs).

The National Regulatory Authorities (NRAs) in Denmark, Finland and Sweden have each approved the amended Methodology for Day Ahead and Intraday Capacity Calculation. The NRAs have made their decision in their own national language.[2] The Nordic Long-term CCM was approved by ACER on 30 October, 2019.[3]

Additional information on the Nordic FB methodology approved by the Nordic NRAs is available at the Nordic RCC website: https://nordic-rcc.net/flow-based/methodology/.

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[2] The decision of the Danish NRA (decision 20/05093) is available for download in Danish at the website of the Danish Utility Regulator (Forsyningstilsynet): https://forsyningstilsynet.dk/el/afgoerelser/afgoerelse-om-aendret-metode-for-kapacitetsberegning-i-ccr-nordic-1

The decision of the Swedish NRA (decision 2020-102099) is availale for download in Swedish at the website of the Swedish Energy Markets Inspectorate (Energimarknadsinspektionen): https://ei.se/om-oss/nyheter/2020/2020-10-26-ei-har-fattat-beslut-om-ny-metod-for-kapacitetsberakning-i-norden

[3] The ACER decision is available for download at the ACER website: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2016-2019%20on%20the%20Nordic%20CCR%20TSOs%20proposal%20for%20LT%20CCM.pdf

The annexes to the ACER decision is available for download at the ACER website: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Pages/Annexes-to-the-DECISION-OF-THE-AGENCY-FOR-THE-COOPERATION-OF-ENERGY-REGULATORS-No-16-2019.aspx

Capacity calculation methodology and day-ahead market coupling

A capacity calculation methodology is a description of the rules of the capacity calculation region (CCR) on how to calculate the amount of capacity available for trading between bidding zones in a market timeframe. The purpose is to maximize the socio-economic welfare, in terms of capacity allocation.

The basic principle is that the network capacities are sent to the NEMOs. The NEMOs utilize the market coupling algorithm Euphemia to maximize the socio-economic benefits of the European day-ahead market, while respecting the network constraints of the TSOs, which results in traded volumes and prices.

Please note that the Nordic CCM External Parallel Run relates to implementation of flow-based methodology for the day ahead and intraday market time frame.

Capacity calculation today (NTC)

Today, with NTC, network capacities are set by the TSOs.

The TSOs calculate NTC capacities individually by (mostly) looking at their own grid constraints and critical network elements, and by translating these into a capacity on the bidding zone borders, subject to the day ahead market allocation.

When the TSOs give capacity in the form of NTC values, all border capacities are available at the same time to the day-ahead market for allocation.

For additional information on the NTC concept in general, we refer to the basic explanation provided by ENTSO-E in the document NTC User's information.[4]

[4] The ENTSO-E document NTC User's information is available for download at the ENTSO-E website: NTC User's information.PDF (entsoe.eu)

Capacity calculation with flow-based methodology

With FB, network capacities are derived from a coordinated, formalised and automated process where the Nordic RCC acts as a coordinated capacity calculator (CCC).

The TSOs provide the critical network elements (today's day ahead market allocation) instead of pre-calculating resulting capacities on the border in the form of a MW-value.

The individual TSOs does not have to make a distribution of the capacity between different bidding zone borders before the capacity is sent to the NEMOs. Instead, the maximum available capacity is given to the NEMOs and the market coupling algorithm. The capacity is then allocated to the energy transactions that provide the most socio-economic welfare, when prices and flows are calculated by the NEMOs.

The process of sending network capacities in Nordic FB

1. The TSOs provide the NRCC with data for each market time unit (MTU). Input datasets include critical network elements with associated contingencies (CNECs), combined dynamic constraints, and the operational limits for these elements (Fmax).
2. The Nordic RCC uses the data to calculate the FB parameters. These are based on an hourly common grid model (CGM) - the Remaining Available Margin (RAM) and Power Transfer Distribution Factors (PTDFs).
3. The TSOs validate the FB-parameters
4. The Nordic RCC sent the FB-parameters to the NEMOs

For detailed descriptions of the Nordic FB methodology approved by the Nordic NRAs, please visit the Nordic RCC website: https://nordic-rcc.net/flow-based/methodology/.

Day-Ahead Market coupling and Euphemia

NTC and the new capacity calculation methodology (i.e. FB) differ in many ways but they both aim to represent the grid in the best way to the marked coupling.

Market coupling is handled by the NEMOs. They take the network capacities they receive from the TSO and deliver them to the market coupling algorithm Euphemia that maximize the socio-economic benefits of the market, while respecting the network constraints of the TSOs (being NTC or FB), which results in traded volumes and prices.

Market coupling is handled by the NEMOs utilising the market coupling algorithm Euphemia. Euphemia has been developed by the NEMOs to solve the Day-Ahead European Market Coupling problem.

Euphemia matches energy demand and supply for all the periods of a single day at once while taking into account the market and network constraints. The main objective of Euphemia is to maximize the social welfare, i.e. the total market value of the Day-Ahead auction expressed as a function of the consumer surplus, the supplier surplus, and the congestion rent including tariff rates on interconnectors if they are present. Euphemia returns the market clearing prices, the matched volumes, and the net position of each bidding zone as well as the flow through the interconnectors. It also returns the selection of block, complex, merit, and PUN orders that will be executed. For curtailable blocks the selection status will indicate the accepted percentage for each block.

Information on how SDAC delivers fulfilment of economic surplus maximisation via the Euphemia algorithm is available in the NEMO presentation Economic Surplus Maximization in SDAC.[5]

For more information on Euphemia we refer to the NEMOs public description of Euphemia.[6]

[5] The presentation is available for download at the Nordic RCC website: https://nordic-rcc.net/wp-content/uploads/2021/11/Economic-Surplus-Maximization-in-SDAC.pdf

[6] The Euphemia public description is available for download at the NEMO Committee website: https://www.nemo-committee.eu/assets/files/190410_Euphemia%20Public%20Description%20version%20NEMO%20Committee.pdf

Capacities for Intraday market: ATC Extraction

The Nordic Day-ahead Capacity Calculation Methodology describes a transitional solution for the calculation and allocation of intraday cross-zonal capacities for continuous trading in the intraday timeframe. The Nordic TSOs are to transform the FB domain into ATC-like values until the single intraday coupling is able to support FB parameters.

The ATC extraction data (ATCE) from the CCM EPR is published at the Nordic RCC website: https://nordic-rcc.net/flow-based/simulation-results/.

For more information on ATC extraction for Nordic CCM, we refer to the ATC Extraction Description.[7]

[7] The ATC Extraction Description is available for download at the Nordic RCC website: https://nordic-rcc.net/wp-content/uploads/2022/05/ATC_Extraction_Description_20220413.pdf

Implementation of FB in the Nordic CCR

The Nordic TSOs and Nordic RCC is currently working to implement Nordic Flow-based Capacity Calculation Methodology for the Day-Ahead and Intraday timeframes. The process is subject to NRA approval and adheres to their decided process.

Implementation process timeline

The implementation timeline for a flow-based method for capacity calculation is dependent on successful parallel runs and confirmation from the Nordic NRAs. The parallel operations have been divided into phases (parallel runs). Each phase has TSO-defined entry criteria, based on the guidance from NRAs. Entry criteria for each phase is the same as the exit criteria for the previous phase.

Figure 1. Process timeline for the implementation of Nordic Capacity Calculation for the DA and ID timeframes.

External parallel run

According to stipulated timeline, the external parallel operation must last for at least 12 months. The NRA reporting consists of three month of data.

The Nordic TSOs and the Nordic RSC jointly decided to start the external parallel run (EPR) of the Nordic flow-based methodology on 7 March 2022 for the Energy Delivery Day of 8 March 2022.

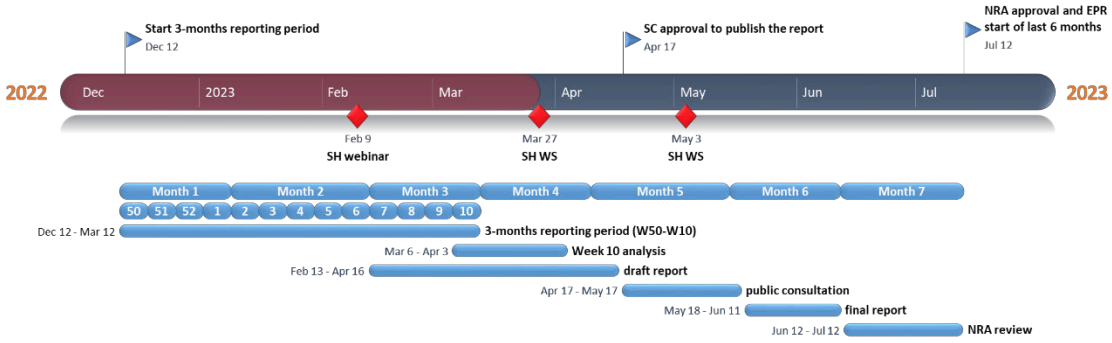

Figure 2. EPR timeline.

During the EPR, market simulations are performed by the NRCC together with the NEMOs. The daily process for EPR follow the same process as after go-live except for when it come to the process of simulating the market results.

Please note that the parallel run will generate data that can used as a basis to facilitate the adaptation of planning tools and/or business processes of all stakeholders concerned.

Market result simulation during external parallel run

A day-ahead market coupling simulation with the FB domain (RAM and PTDF) in the Nordic CCR are done by the NEMOs. The FB domains are accumulated for a one-week period before running the simulations. However, there is a grace period of 2 weeks after the EDD before the order books can be used. Market report elaborating on the market results will therefore be publish 4 weeks after the last delivery day, where 2 week is the grace period.

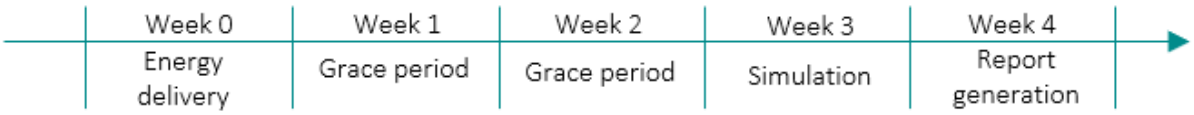

Figure 3. The timeline from Energy Delivery to Market Report publication.

The NRCC provides the Nordic CCM project with the FB market results from simulations. The market algorithm Euphemia provides prices, net positions, consumer and producer surplus for all bidding zones, amongst others. The Social-Economic Welfare (SEW) is calculated by summing up consumer surplus, producer surplus and congestion income. The calculated FB SEW is then compared to the NTC SEW, hour-by-hour, to evaluate the impact of the new capacity calculation and allocation.

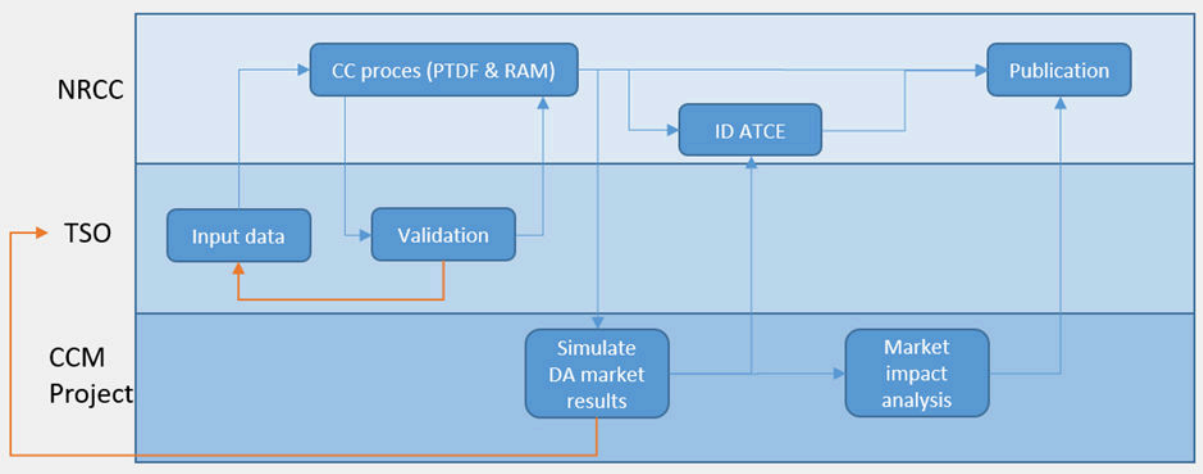

Figure 4. The high-level business process illustrating the roles, responsibilities and interactions among the Nordic RCC, TSO operators and the Nordic CCM project during the parallel run.

The simulation of market results

Before the summer of 2022, the simulations were calculated by Simulation Facility (SF). Both NTC and FB market results were simulated in this period. However, SF was unavailable from June 2022 to February 2023 due to failed updates in the system. Consequently, since this period, it has not been possible to produce simulations and, therefore market reports. SF is now back in operation but still not available in a version that can be used for EPR.

From December 2022, the Euphemia test environment at the NEMOs has been used to simulate the FB simulations. The NTC market results are taken directly from the production system of Euphemia.

Both the test environments at the NEMOs and SF use the same market coupling algorithm that is used for day-ahead market coupling.

Handling of the external borders

External borders are interconnectors within the Hansa CCR or interconnectors within the Baltic CCR and capacity calculation for these interconnectors fall under the capacity calculation method of the Hansa CCR and Baltic CCR. The capacity calculation process for the Nordic CCR includes calculation of the internal Nordic constraints which may impose limits on external border. This is done by calculating cross zonal capacity towards the virtual bidding zone, e.g. NO2_ND where NordNed are connected to the Nordic CCR.

For more information on the capacity calculation in Hansa CCR, we refer to the Common Coordinated Capacity Calculation Methodology Proposal for HANSA CCR.[8]

In the EPR the capacity on external borders is set to the minimum value of either the physical constraint of the interconnector and the capacity provided by the neighbouring TSO. If the border in NTC was limited by an internal Nordic limitation this shall not limit the interconnector in FB as this will be handled by FB.

[8] The Hansa CCR Common Coordinated Capacity Calculation Methodology Proposal is available for download on the Consultation page at the ENTSO-E website: https://consultations.entsoe.eu/markets/commonccm_hansa-ccr/

Publication of data from the EPR

During the EPR, the flow-based parameters is calculated and published daily on the JAO publication tool website: https://test-publicationtool.jao.eu/nordic

EPR data and reports related to market simulations is published on the Nordic RCC website: https://nordic-rcc.net/flow-based/simulation-results/

FB parameters available on the JAO website

Here we publish the following FB-parameters.

- Flow-based Domain
- Min and Max Net Positions (Max and Min Net Pos)
- Max Exchanges (MaxBex)
- Max Border Flow (MaxBflow)
- Validation Reductions
- Reference Net Position and Reference HVDC Exchange (Ref Net Pos. and HVDC exch.)
- FB Domain Backup
- CGM Vertical Load and Generation Forecast (CGM Forecast)

You can also use the JAO publication tool to get a Nordic market view, view market graphs and market maps.

To assist users, there is also a JAO publication handbook: https://test-publicationtool.jao.eu/PublicationHandbook/Nordic_PublicationTool_Handbook.pdf

EPR results published on the Nordic RCC website

The weekly results published on the Nordic RCC website contain (from week 50, 2022 onwards)

- CCM EPR Market report
- CCM EPR Market report Appendix
- Market Simulation Results
- ATCE results
- ATCE Graphical report
- Grid Constraint Matrix

Please note that the content of the files may be revised and more information added in response to the needs of stakeholders.

CCM EPR market report

The market report presents the comparison of the market results between the current Net Transfer Capacity (NTC) calculation method and the simulated flow-based (FB) capacity calculation method of the day-ahead market timeframe. NEMO Simulations has produced the simulated FB market results by using Euphemia test environment. The market report is published weekly.

CCM EPR market report Appendix

The weekly-published appendix provides in-depth tables and graphs related to the market report. Its content includes an overview of the TSO domain validation outcome, detailed SEW, prices, net positions and border flows graphs, complementary to the weekly market report.

Market Simulation Results

The market simulation results are shared in the Excel workbook format that contains the simulated market results of the FB market coupling in the Nordic region.

The file contains all data since week 50 2022 and will be updated with the latest data every week.

The workbook contains the following sheets.

- BuyVol
- SellVol
- NetPositions
- F_AAC
- Prices
- PriceSpread
- Scheduled Exchange

BuyVol

Contains the simulated volumes bought in each bidding zone in the Nordic and in connected neighbouring countries for both FB and NTC.

SellVol

Contains the simulated volumes sold in each bidding zone in the Nordics and in connected neighbouring countries for both FB and NTC.

NetPositions

Contains the simulated market net position for each bidding zone and virtual bidding zone in the Nordic for both FB and NTC. The virtual bidding zones are without a value for NTC as the virtual bidding zones are not part of the NTC topology.

F_AAC

Contains the flow allocated by the FB domain.
For FB this is calculated as the simulated NP times the PTDF. The TSO recommend to the use the F_AAC value instead of the SEC value for FB.
For NTC this is calculated as the actual dayahead NP times the PTDF.

Prices

Contains the simulated market price in each bidding zone in the Nordic and in connected neighbouring countries for both FB and NTC.

PriceSpread

Contains the simulated market price spread between the neighbouring bidding zones in the Nordic region for both FB and NTC. In each column, two bidding zones are specified and the price spread is the difference between the prices in the first and second bidding zones.

Scheduled Exchange

Contains the electricity transfer scheduled between neighboring bidding zones on the cross borders for both FB and NTC. Scheduled exchange calculation (SEC) uses a SDAC algorithm 'volume indeterminacy' feature based on DA Scheduled Exchanges Calculation Methodology. The SEC differ from the flow actual allocated by flow based (F_AAC). The TSO recommend to the use the F_AAC value for FB.

Pivot tables

In addition to the sheets mentioned above, there is a pivot table for each sheet. These pivot tables have been created in Excel by choosing "PivotTable" in the "Insert"-tab in the top menu. For all these pivot tables the "EDD" (date) is chosen as the row, and the "DOMAIN" is chosen as the column. In addition, "WEEK" and "YEAR" have been added as filters so it is possible to choose a certain week or year in the top left corner in the sheet. In the "Values" section of the pivot table, there are already some default

values that are presented in both the table itself and the graph. Here, the user can easily add more bidding areas / CNECs by dragging the desired bidding areas / CNECs from the list at the top right to the "values" field in the pivot table set-up field to the bottom right. Here, it might be necessary to change the calculation done by the pivot table. To do so, one can simply left-click on the

Descriptions of two-pager weekly reporting:

Data quality

- Data quality is described for the week of analysis.
- IVA provision. Is used if operator sees a need for adjustments to the FB domain, this indicates if adjustments is given for specific day.
- Substituted IGM. If there is an error to IGMs, backup IGM will be used.
- Final domain acceptance means that the Nordic TSOs accepted flow-based domain to be used in the Flow-based market coupling.

Prices – weekly average

- Weekly average prices (€/MWh) are shown for flow-based and current method.
- Price FB-NTC means the price difference between flow-based and current method
- Price %diff means the percentage price difference between flow-based and current method

Socio-economic welfare results

- Represents socio-economic welfare change when comparing Flow-based and current method
- Congestion income = change of congestion incomes between Flow-based and current method
- Producer surplus = change of producer surplus between Flow-based and current method
- Consumer surplus = change of producer surplus between Flow-based and current method

Socio-economic welfare change in the Nordics

- Describes Nordic socio-economic welfare change for consumers, producers and congestion incomes. Total SEW is a sum of these three elements.

Socio-economic welfare change per BZ

- Describes the total socio-economic welfare change per Nordic bidding zones from reported week

Price duration curve

- Price duration curve is calculated by a difference of maximum and minimum price from Nordic BZs per hour. For example, if highest price is found from FI area and lowest price is found from NO4 area in a certain hour, the difference is calculated from these areas.
- If duration curve has values of 0, it means that prices have been uniform in the Nordics.

Nordic net position

- Nordic net position is the sum of the NO, SE, DK and FI net positions. Positive net position means export from the Nordics

FB and NTC prices

- Flow-based and NTC hourly price. Blue = Flow-based price, Orange=NTC price

FB and NTC net positions

- Flow-based and NTC hourly net position. Blue = Flow-based net position, Orange=NTC net position

ATCE graphical report

The Nordic TSOs and Nordic RCC plan to publish a weekly graphical report to facilitate the understanding of comparison between the ATCE ID results and the ID offered capacity in the current NTC method.

ATCE results

The weekly-published ATCE results are published in a zip file. It contains 7 csv files, 1 csv per energy delivery day (EDD). Figure 2 shows an ATCE result sample of the first 3 MTUs of the EDD 2022-12-23. For the demonstration purposes, only a few borders are shown.

MTU	Backup	FI-FI_EL	FI-FI_EL	FI-FI_EL	FI-FI_EL	NO2-NO2_	NO2-NO2_	NO2-NO2_	NO2-NO2_
MTU	Backup	NTC_initial	NTC_final	AAC	ATC	NTC_initial	NTC_final	AAC	ATC
2022-12-23T23:00Z	FALSE	1016.091	1016.091	886	130.091	723.094	723.094	-640	1363.094
2022-12-24T00:00Z	FALSE	1016.096	1016.096	886	130.096	723.097	723.097	-640	1363.097
2022-12-24T01:00Z	FALSE	1016.096	1016.096	886	130.096	723.097	723.097	-640	1363.097

Figure 5. ATCE result sample.

Descriptions and disclaimers

- MTUs are in Greenwich Mean Time (UTC +0). The first MTU of the EDD labelled as 23:00 of the day before.
- Flag for 'Backup': TRUE means that the ATCE tool cannot find an optimal solution, triggering the backup process. FALSE means otherwise.
- 'NTC_initial': the extracted NTC results from the ATCE industrial tool based on the DA FB domain
- 'NTC_final': the NTC values provided to the ID platform, which may be different from the NTC initial due to validation. Currently at this stage of the EPR, there is no validation being performed, resulting the same value of NTC_initial and NTC_final.
- 'AAC': in the ATCE ID context, it is the flow allocated by flow based (NP*PTDF)., NOT scheduled exchanges.
- 'ATC': refers to the ID ATC, to be computed by the ID platform for the ID gate-opening, computed by NTC_final minus AAC.

Bidding zone naming matching between FB and current NTC in the ID timeframe

Flow-based market topology and NTC market topology are different. In flow-based market topology virtual bidding zones are used to represent HVDC connections and ac interconnectors to external regions. In NTC market topology, certain virtual bidding zones (e.g. DK1A and NO1A) are used to represent sum limitations and sum ramping constraints.

ATCE is performed using the flow-based market topology. Results are afterwards mapped to the NTC market topology. This is done by summing AAC and NTC_final for specific borders in the flow-based topology to form the corresponding allocations and capacities in the NTC topology. The mapping of borders is given by table 1.

NTC market border	Mapping from FB topology
NO1-NO1A	Sum of NO1-NO5 and NO1-NO2
NO1A-NO1	Sum of NO5-NO1 and NO2-NO1
SE3-SE4	Sum of SE3-SE4 AC interconnector and SE4_SWL-SE4
SE4-SE3	Sum of SE4-SE3 AC interconnector and SE3-SE3_SWL
DK1-DK1A	Sum of NO2_SK-NO2 and SE3_KS-SE3
DK1A-DK1	Sum of DK1_SK-DK1 and DK1_KS-DK1

Table 1. Mapping of borders NTC-FB.

ATCE graphical report

The Nordic TSOs and Nordic RCC publish a weekly graphical report to facilitate the understanding of comparison between the ATCE ID results and the ID offered capacity in the current NTC method.

Grid Constraint Matrix

This file contains the flow-based parameters combined with the simulated results for FB and the actual NTC day ahead results of the selected business week. The grid constraint file is published weekly.

Please note that the headers are not fully harmonised with the CCM terminology. This is to be amended in the next Handbook release.

Description of table columns.

DatetimeCET
The energy delivery date and MTU.

Week_NR
The energy delivery week

Date
The energy delivery date ‘yyyymmdd’.

MTU
The energy delivery MTU. Going from 1-24, e.g. Hour 0-1 is period 1.

JAO_CNEC_Name
Name of CNEC. The anonymization on the Swedish CNECs are not equal to the naming provided at JAO, this is something that is being worked on.

JAO_CNE_Name

Name of CNE. The anonymization on the Swedish CNECs are not equal to the naming provided at JAO, this is something that is being worked on.

JAO_Contin_Name

Name of the contingentcy. The anonymization on the Swedish CNECs are not equal to the naming provided at JAO, this is something that is being worked on.

Border

"TRUE": The CNEC is a border CNE going between bidding zones. A border CNE has a Fmax= 9999 and will never constrain the domain

"FALSE": A regular CNEC in the FB domain.

Redundant

"FALSE": The CNEC is constraining the flow-based domain.

"TRUE": the CNEC represents a redundant constraint.

Significant

"FALSE": The CNEC is not significant and will therefore not constrain the domain.

"TRUE": the CNEC is significant and is therefore considered in the domain.

Bidding Zone From

Bidding zone associated with sending end (according to positive flow direction) of the CNE.

Bidding Zone To

Bidding zone associated with sending end (according to positive flow direction) of

TSO Origin

The TSO where the CNE originate from..Fmax

Maximum allowed flow for the CNEC. Value is stated in MW.

IVA

Individual validation adjustment provided by TSOs during domain validation in case of unplanned outages of incorrect input data is detected.

FRM

Flow reliability margin accounts for uncertainties in flows (e.g. due to forecast uncertainties).

FRef

Reference flow on the network element, i.e. the flow stated in the common grid model which was used as basis for the flow-based domain parameters calculation.

F0

Flow on the CNE in case all bidding zones operate at zero net-position.

FRA

Impact of remedial actions on flow on the CNE.

AMR

Adjustment for minimum RAM is used to ensure that RAM is always greater than or equal to 0.

FAAC

Already allocated capacity to reservations to reserves.

RAM_External

The capacity provided by the neighbouring TSO on the external borders. See RAM for the capacity used in simulation.

RAM

Remaining available margin, i.e. spare transmission capacity available for trade:

$$\mathrm{RAM} = \mathrm{F_{max}} - \mathrm{F_{RM}} - \mathrm{F_0} + \mathrm{F_{RA}} + \mathrm{AMR} - \mathrm{F_{AAC}} - \mathrm{IVA}$$

The allocation constraints on external borders are the capacity provided by the Nordic TSOs. The capacity used for simulation on external borders are the most constraining value of RAM_External and RAM:

$$RAM_{Simulation} = \min(RAM_{External}, RAM)$$

Type
The type of a CNEC:

”Allocation constraints”: The Allocation constraint representing the capacity on the HVDC-line.

“BRANCH”: All other CNECs

FAAC_FB
Flow allocated on the CNE with the simulated FB NP. (PTDF*NP_FB).

FAAC_NTC
Flow allocated on the CNE with the day-ahead market NTC NP. (PTDF*NP_NTC).

SHADOWPRICE
Shadow price on the CNE from the FB market simulations.

FLOW_FB
Excepted flow on the CNE including the internal flow with the simulated FB NP. (PTDF*NP_FB+F0).

FLOW_NTC
Excepted flow on the CNE including the internal flow with the simulated NTC NP. (PTDF*NP_NTC+F0).

FB_Loading
Share of the allocated flow in FB related to the RAM. (FAAC_FB/RAM).

NTC_Loading

Share of the allocated flow in NTC related to the RAM. (FAAC_NTC/RAM).PTDFs
Power transfer distribution factors:

- Zone to slack PTDFs – Values describe how much the flow on the CNE would increase in response to a 1MW increase of the net-position of a given bidding zone. A list of bidding zones is provided in section **Error! Reference source not found.**.
- Zone to zone PTDFs – Values describe how much the flow on the CNE would increase in response to a 1MW increase with a flow between the bidding zones. A list of bidding zones is provided in section **Error! Reference source not found.**.

Please note that names of certain network elements are anonymized in accordance with Article 2(d) of Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection. This means that the network element or contingency, in question, has been assigned a new unique and dynamic identifier, which cannot be used to identify the physical location of the asset.

Additional information published from the EPR

Phenomena report

The phenomena report explains recurrent phenomena that have been observed during the parallel run phase of the Nordic CCM project. It shall support the market reports with detailed explanations of those recurring phenomena, and it is continuously updated with new phenomena.

EPR Issue log

An EPR issue log contains the monitoring outcome of substituted individual grid models, substituted common grid models, number of backup FB domains and the reasons that trigger the substitutions. The issue log is updated weekly.

Additional information

Topology: FB vs. NTC

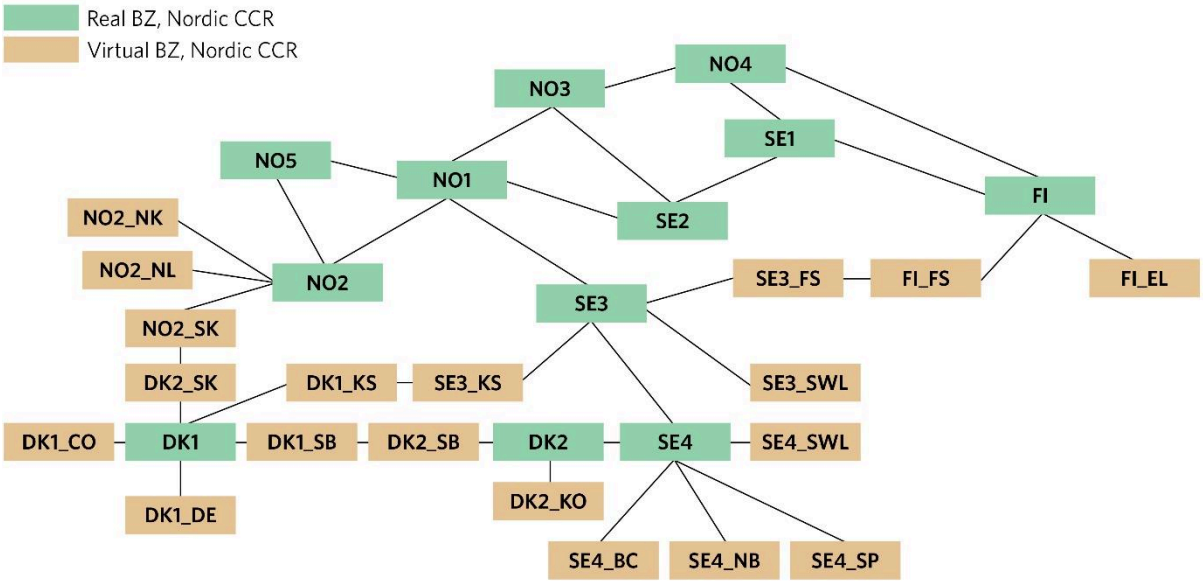

Figure 6. Flow-based Topology.

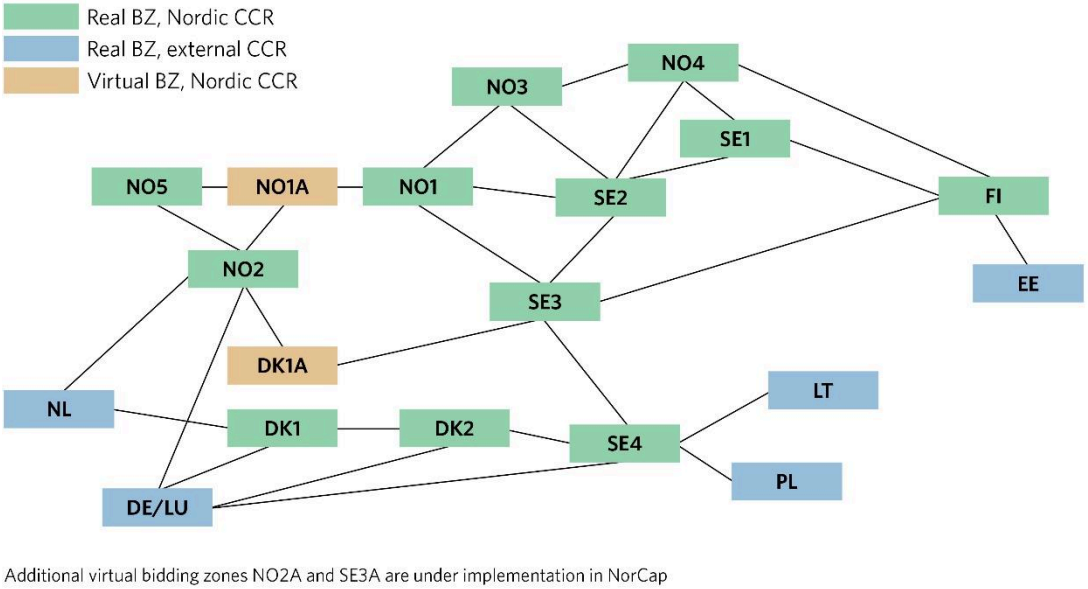

Figure 7. NTC topology.

HVDC losses

Implicit net loss can be applied on the borders. In the Nordic area this is applied on the following borders.

3,1%	Nordlink
2,9%	Skagerak
2,4%	Baltic
3,2%	Norned

Table 2. Implicit net losses applied on borders in the Nordic area.

Naming and anonymisation of CNECs

All CNECs that Svenska kraftnät utilise to determine the capacity for FB will be anonymised in accordance with Swedish national legislation. The anonymisation is randomised on an hourly basis.

CNEC naming convention

Energinet

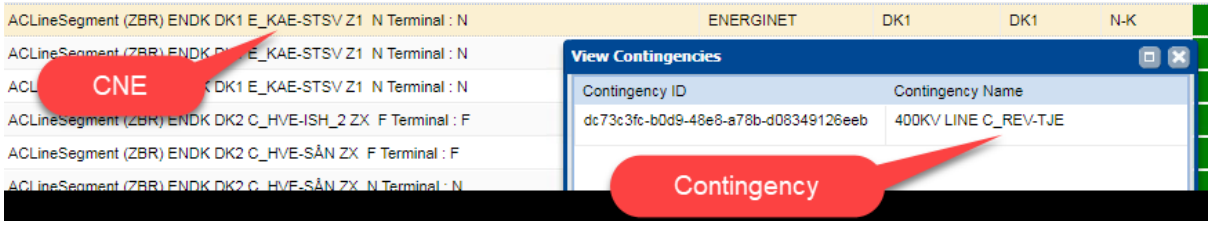

Figure 8. Energinet CNEC naming convention.

Fingrid

Area_Cut_CNE(from-to)_Contingency

Example:

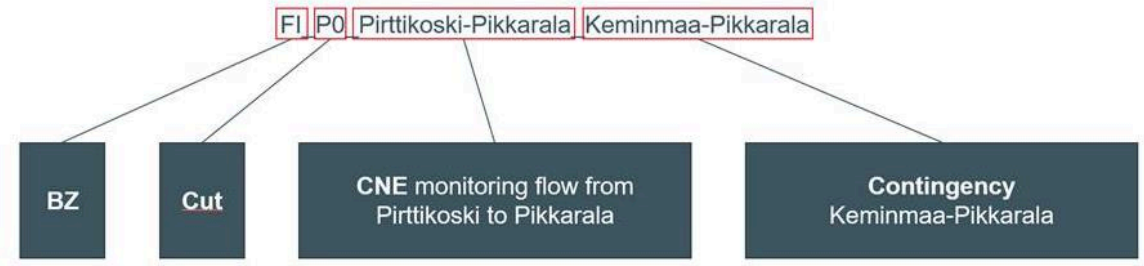

Figure 9. Fingrid CNEC naming convention.

Statnett

12832_11 15% 420 Hasle-Rød + 300 Mauranger-Blåfalli

Figure 10. Example of Statnett naming convention.

Elaboration: Hasle-Rød the contingency, and Mauranger-Blåfalli is the monitored element

General format: %x + y : X is contingency, Y is monitored element

The percentage at the beginning of the NO CNECs refer to the loading of the CNE based on the 'Statnett backoffice pre-computation'. It is not the actual loading of the CNEC in FB, which should come from the NRCC. In short, the percentage at the beginning of the Norwegian CNECs has no practical meaning for the SHs.