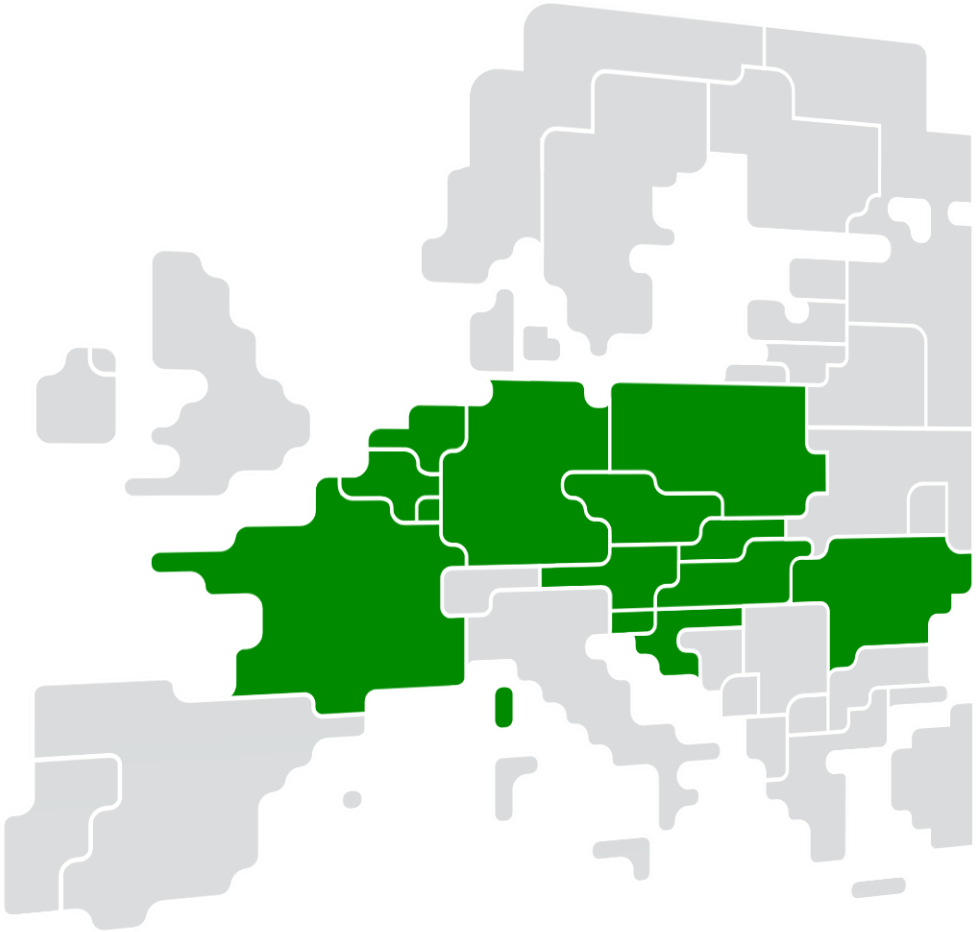
General introduction

22 November 2021



Introduction

Today's speakers

MODERATORS

Ruud OTTER
Core Consultative Group's co-Chair, TenneT BV

Gertjan MEUTGEERT
Core DA FB Project Manager, Magnus

SPEAKERS

Michael NEMY
Core FB expert, CEPS

Adele ROY
Core MC expert, EPEX-SPOT

Steve VAN CAMPENHOUT
Core FB expert, Elia

Syed RAHMAN
JAO Publication Platform

Marius SCHRADE
Core FB expert, 50Hertz

Today's participants: more than 400 registrations

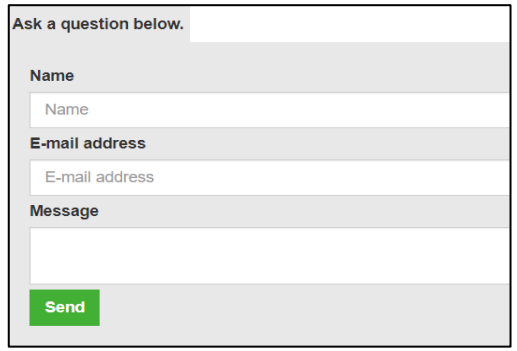
Introduction

Practicalities

- Interaction during the webinar

Q&A

- Ask questions via the portal
- Questions that cannot be answered today, as well as the full set of Q&As will be shared with participants afterwards



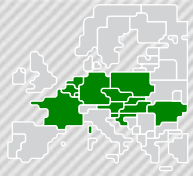
Mentimeter

- Have your phone ready for an interactive quiz with Mentimeter

Mentimeter

- Session will be recorded and published via ENTSO-E Core CCR page afterwards

Agenda



MONDAY NOVEMBER 22nd 2021 – morning session 09.00-12.00

09.00	INTRODUCTION Ruud Otter & Gertjan Meutgeert
	• General background (Ruud Otter)
	• Capacity calculation (Michael Němý)
	• Capacity allocation (Adèle Roy)
10.15	Q&A SESSION
10.30	CORE DA CAPACITY CALCULATION METHODOLOGY Michael Němý
	• Core DA high-level business process
	• Detailed explanation Core DA FB capacity calculation methodology
11.45	Q&A SESSION
12.00	*Closure*

MONDAY NOVEMBER 22nd 2021 – afternoon session 13.00-16.00

13.00	INTRODUCTION Ruud Otter & Gertjan Meutgeert
13.10	CORE TRANSPARANCY FRAMEWORK Steve Van Campenhout
13.30	CORE PUBLICATION OF DATA Steve Van Campenhout / Syed Rahman / Marius Schrade
	• Explanation Core Publication tool
	• Explanation Monthly KPI reports
15.30	Q&A SESSION
16.00	*Closure*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Mentimeter
Or
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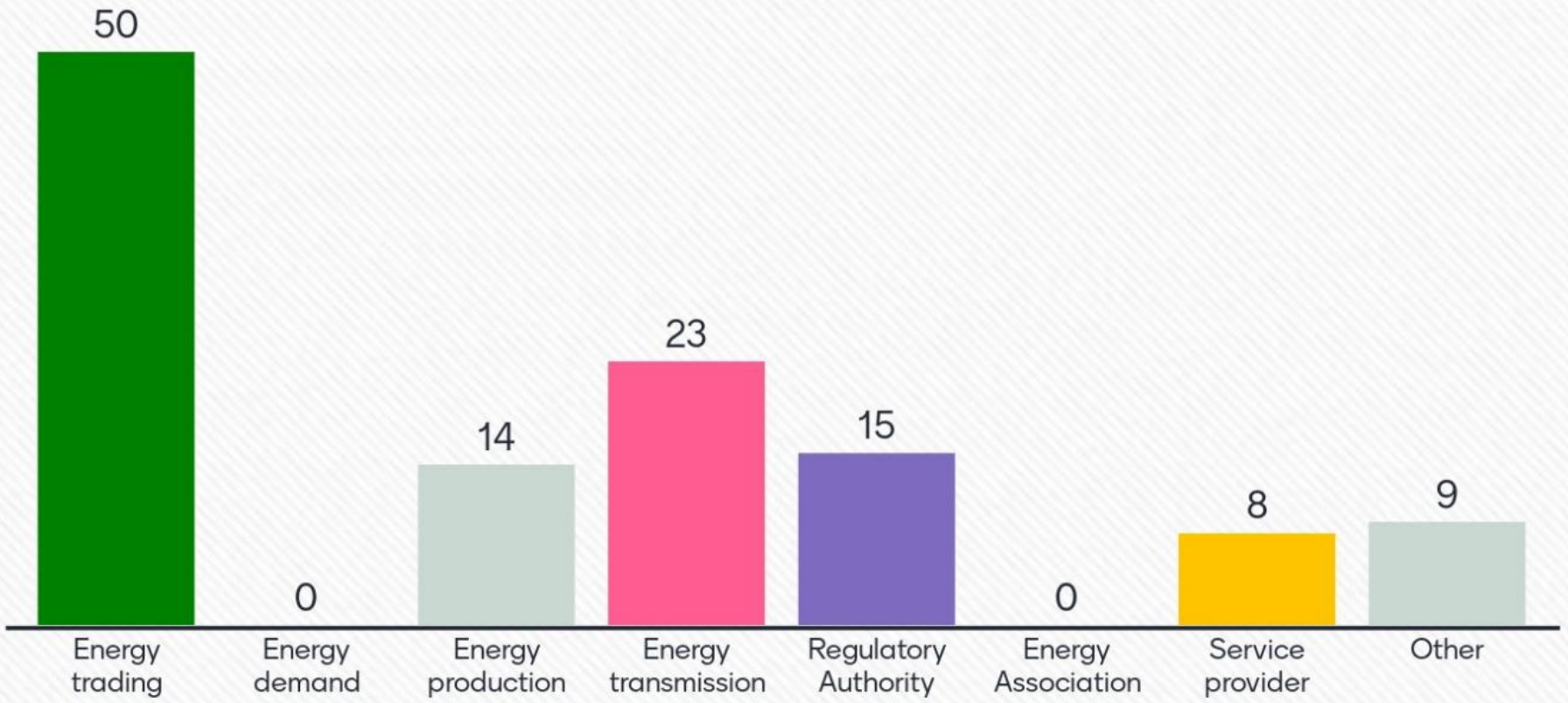
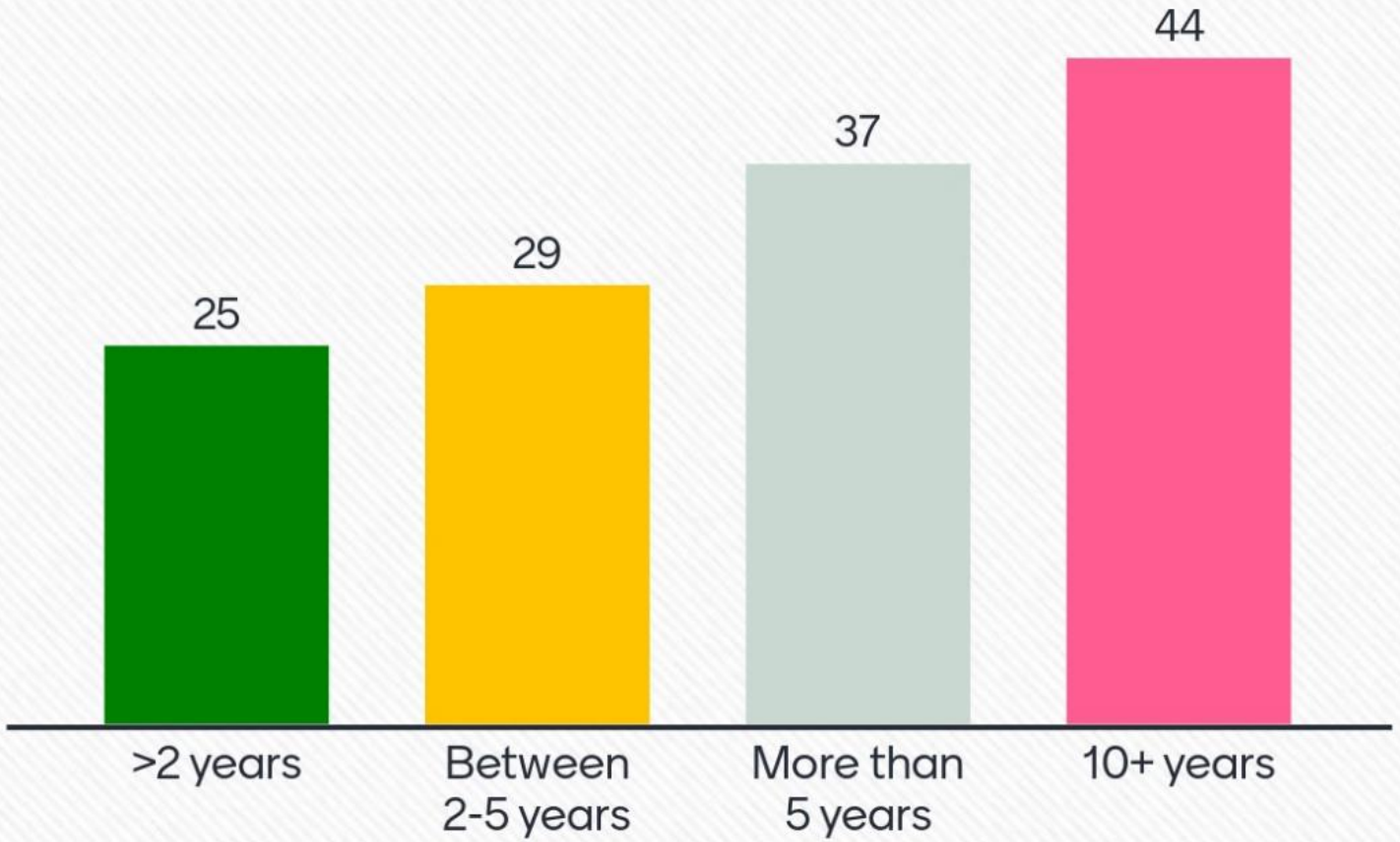
About you - What type of organisation do you work for?



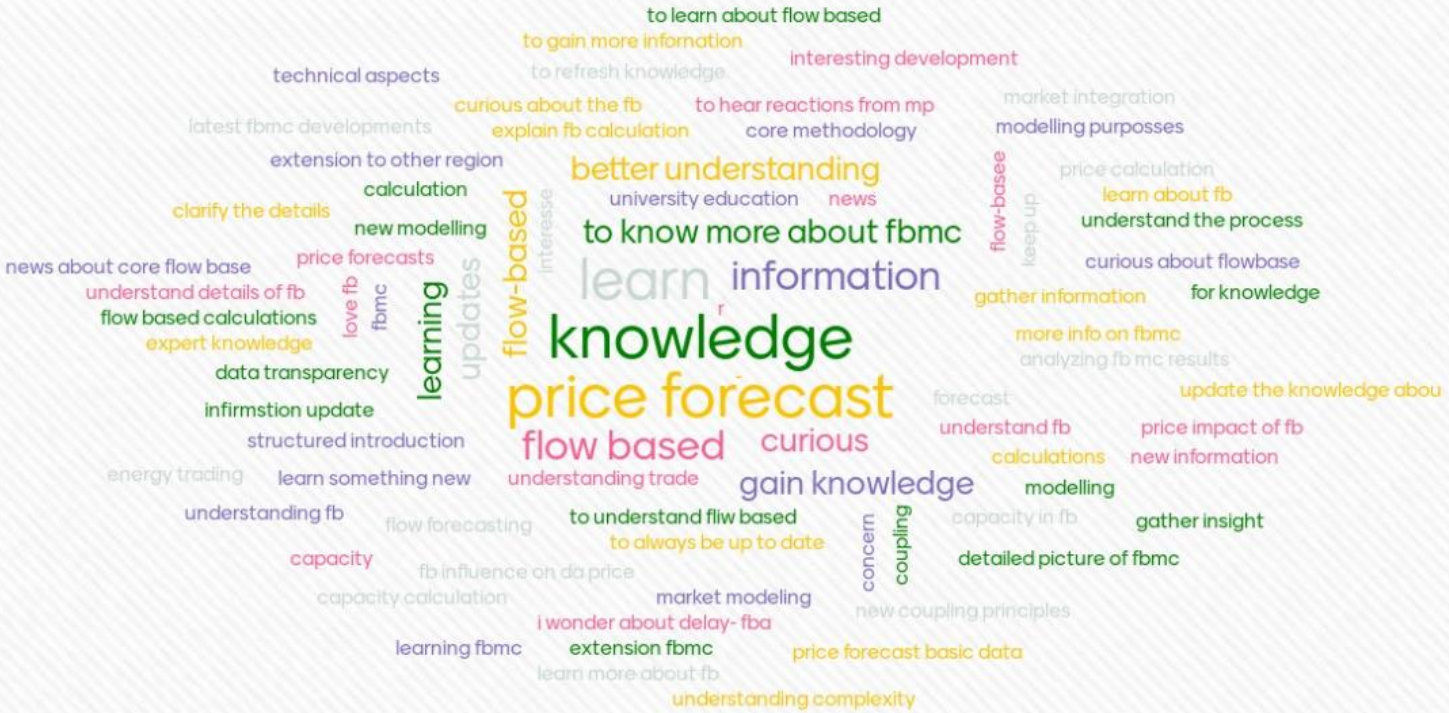
About you - How many years of experience do you have in the energy business?



Mentimeter results

As run during workshop

About you - Why do you participate in today's webinar?



Introduction

Why market integration/market coupling

EU transition towards a carbon free energy system needs market integration

- Take advantage non-simultaneous weather occurrences
- Allow RES development in the best suited locations

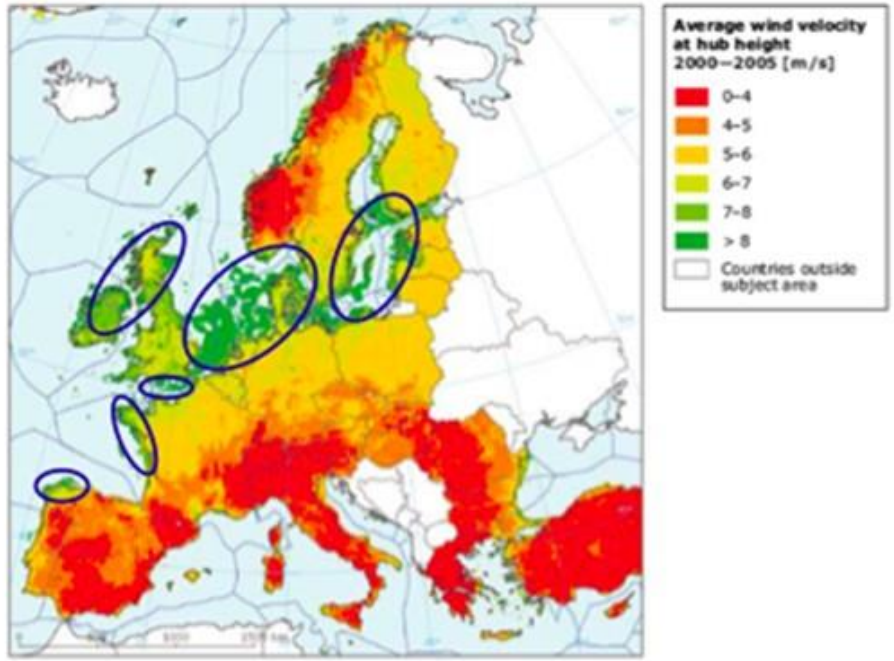
System reasons

- More robust
- Enhances security and adequacy

Market reasons

- A large market increases competition
- A large market is more efficient
- A large market reduces risks
- Increase of overall social welfare

Wind generation will concentrate mainly in locations far from the load centres



Source: EEA, 2008.

Introduction

A zonal market

Each bidding zone is a separate part of the European electricity market.

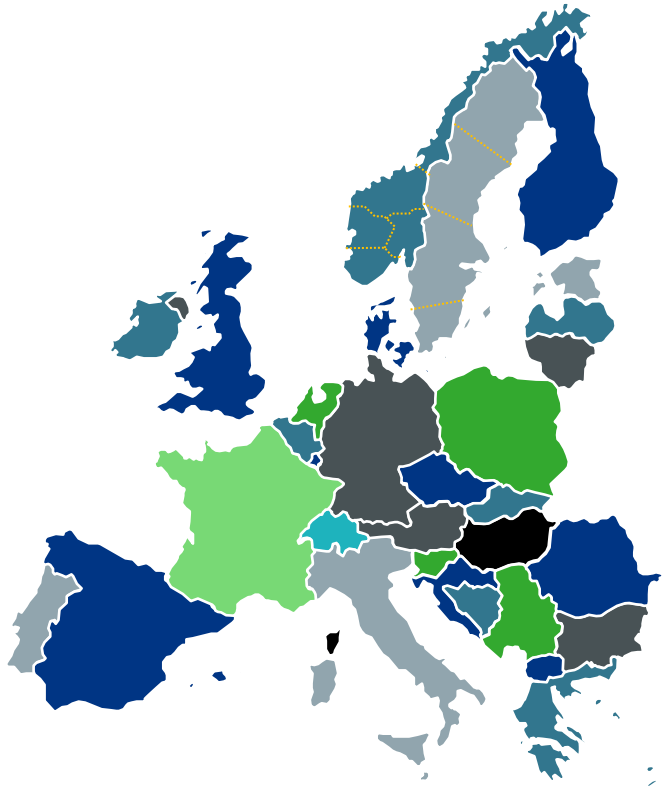
EU is a zonal market. Individual market areas (Bidding Zones) should be defined by structural congestions:

- Unlimited exchange allowed inside a Bidding Zone
- Congestion management between Bidding Zones

In each bidding zone, a separate forward, day-ahead market, intraday market etc. exist.

The Bidding Zones are mostly coextensive with the EU Member States (formerly national networks).

Bidding zones are physically coupled by interconnectors, and the electricity markets are coupled via market coupling.



Occasional overload → Redispatch (curative and preventive)

- Costs socialize via grid tariffs

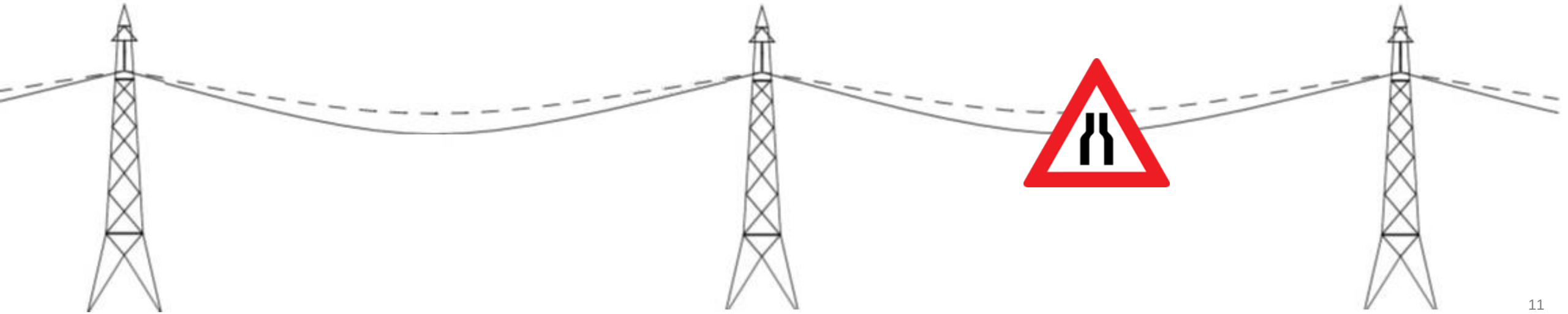
Regular overload / Structural congestion → Market-based congestion management

- Declaration of a congestion by TSO and/or regulatory authority
- Control of cross-border exchange via limited transmission rights
- Internalization of congestion costs into the market price

Market-based Congestion Management:

- 1st Step: Capacity Calculation
- 2nd Step: Capacity Allocation

Goal: non-discriminatory – market-based – transparent allocation



Introduction

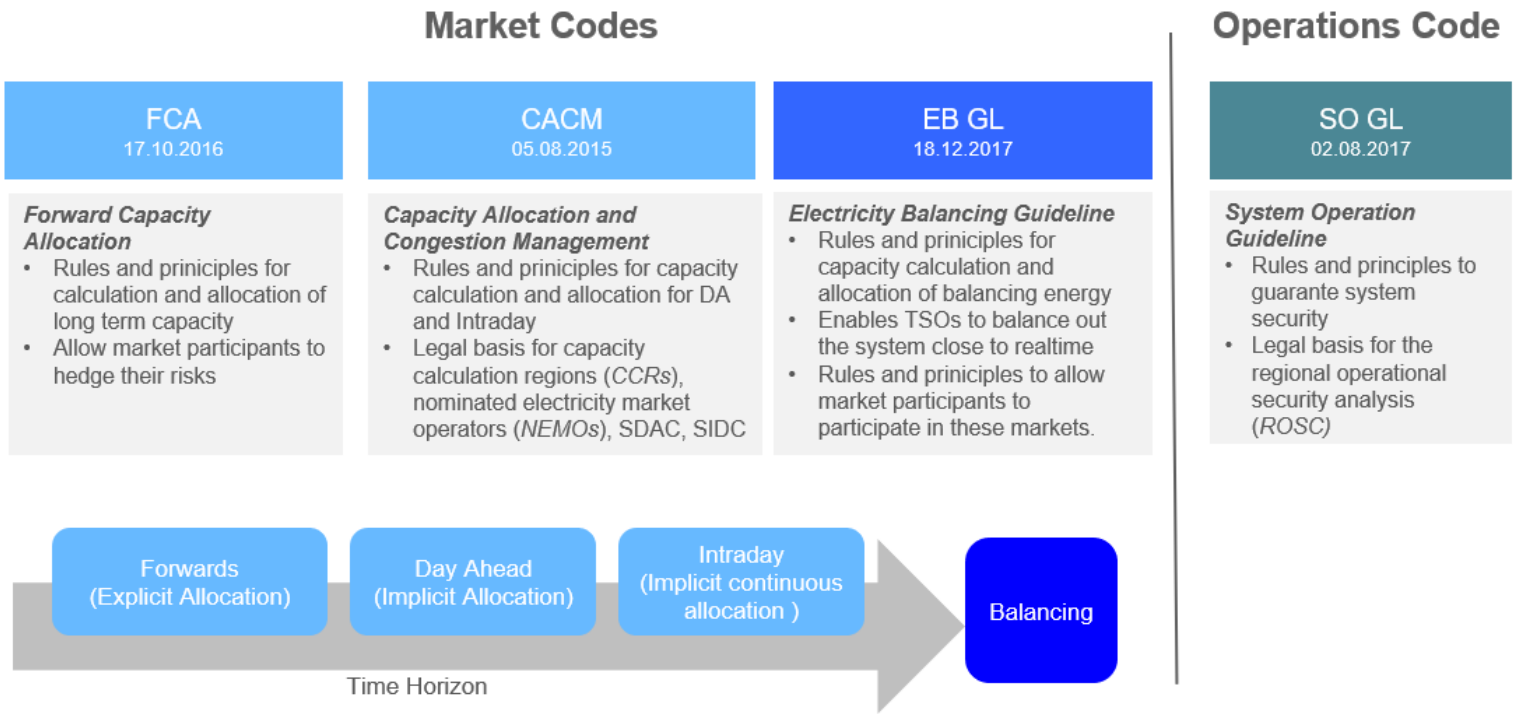
From day-ahead to other market time frames: Increased complexity

Day-Ahead market coupling is the “easy part” of market integration

- Established Power Exchanges active
- Still reasonable time from real time delivery

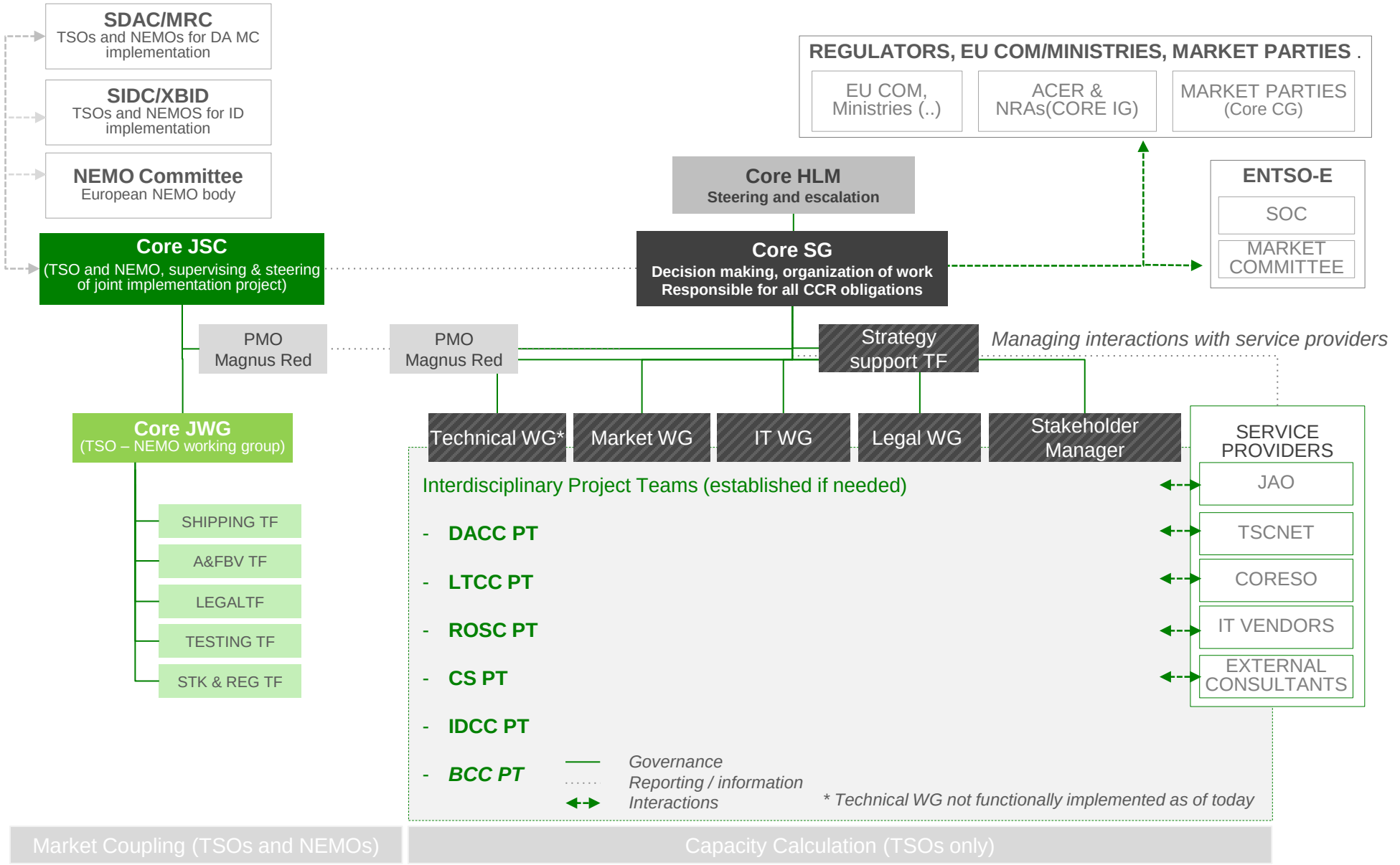
Other aspects will follow

- Long term allocation
- Intra-Day allocation
- Allocation for balancing capacity and energy
- Redispatch and countertrade



Core Governance

Overview



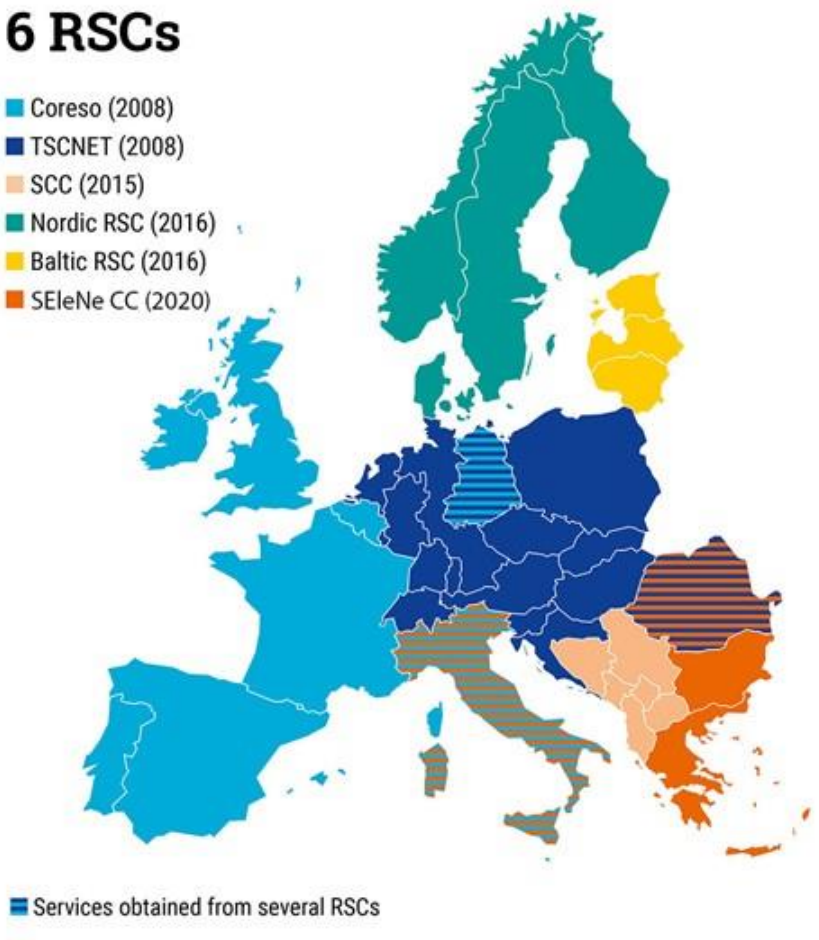
Regional Security Centers (RSCs)

“New” Entities: Regional Security Centers (RSCs) as Regional Coordination Centers

RSCs are TSO cooperations delivering services to their members:

- Security analysis
- Capacity calculation
- Outage coordination
- Adequacy forecast
- Common grid model

Relevant for Core:



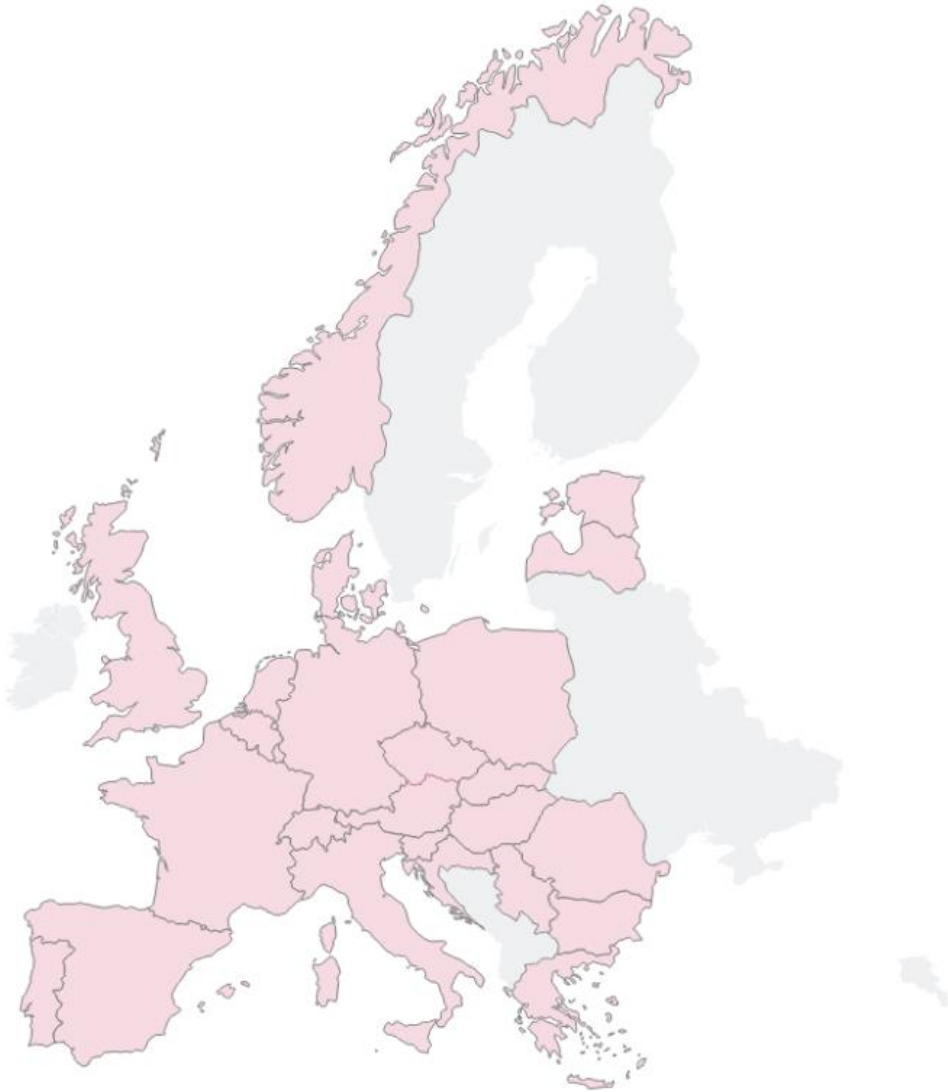
More info: https://www.entsoe.eu/regions/

Introduction

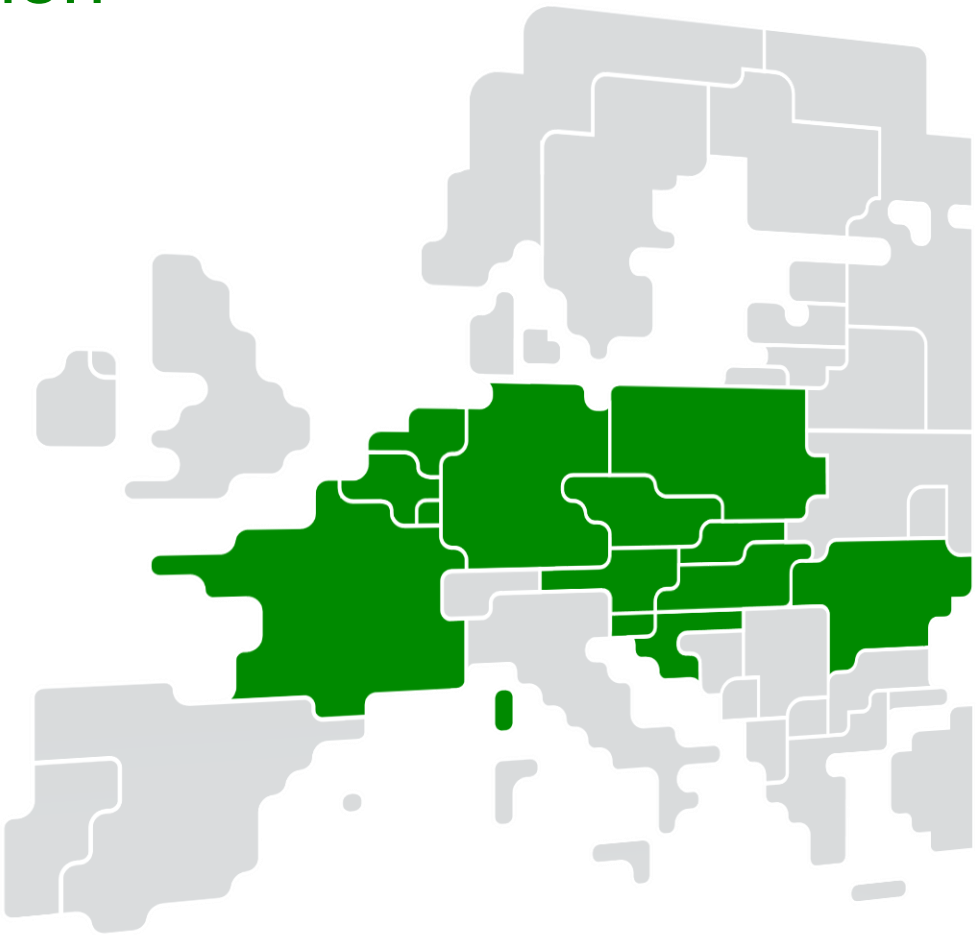
Joint Allocation Office

JAO tasks for Core

- JAO is the Post-coupling operator of the Core capacity calculation tool
- JAO is responsible for:
  - the congestion income distribution for TSOs,
  - handle certain data publication for them on ENTSO-E Transparency Platform as well as
  - using the publication tool on the JAO website.
- JAO runs the shadow auctions in their system (eCAT) and also provides the REMIT platform



Introduction capacity calculation



1. Capacity Calculation

Two approaches on how to define cross-zonal capacity

- **Physical conditions**
  - Electricity is transmitted using power lines and other equipment in the power stations and grid
  - All these elements have limited transmission capacity due to their physical limits

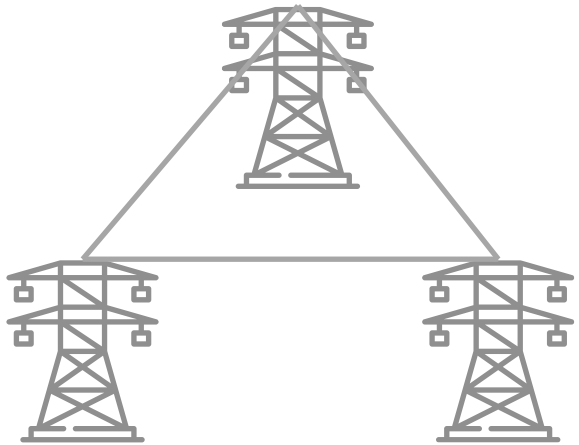
- **Within a bidding zone** we assume **unlimited capacity**

- For **cross zonal transactions, transmission rights** have to be **bought** in case of **congestions**

- **Cross-zonal capacities** are **calculated and coordinated by TSOs** and **offered to the market** in different **time-frames**:
  - Long-term (yearly/monthly)
  - Day-ahead
  - Intraday

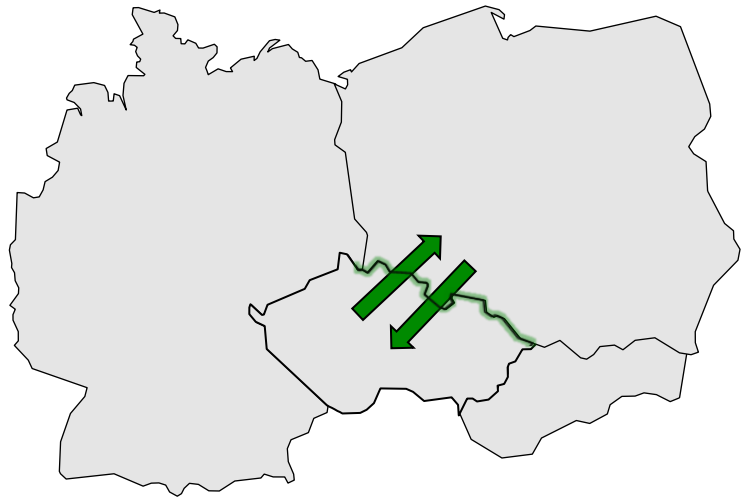
- **2 types of cross-zonal capacity calculation**:
  - Net Transfer Capacity (NTC)
  - Flow Based (FB)

➔ By **capacity calculation**, we refer to **cross-border capacities** and the **methodology how to compute the available capacities in a certain region**



Net Transmission Capacity (NTC) calculation – main features

- **One value** per bidding zone border and direction
- Every TSO performs **individual calculation**
  - Harmonization between neighbors
- **Limited representation** of the physical nature of the flows (loop flows, transit flows)
- **Offered capacities** have to be **independent**
  - Low utilization of capacity on one border does not allow increase on other border



NTC harmonization	CZ->PL	PL->CZ
CZ NTC value	**1000 MW**	1000 MW
PL NTC value	2000 MW	**700 MW**
Final NTC	1000 MW	700 MW

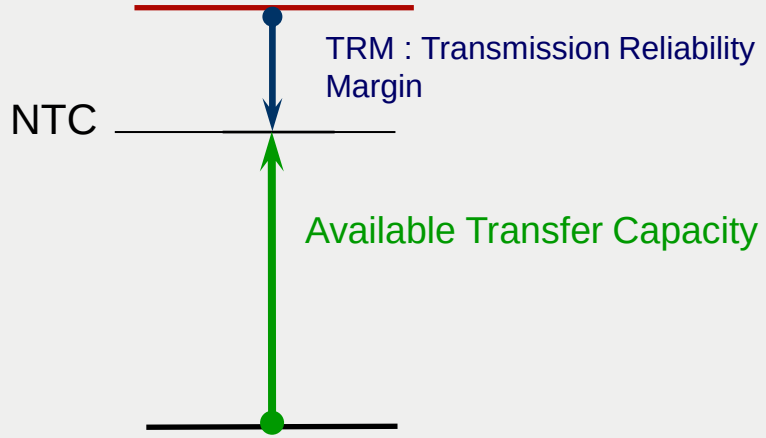
Net Transmission Capacity (NTC) calculation principles

- Calculation is performed **using a grid model**:
  - Prediction of load and generation
  - Prediction of grid status
  - Prediction of status of other countries (loopflows, parallel flows)
  - Applying the N-1 criterion
- **Iterative process of increasing cross-zonal flow** as long as no security limits are breached
- The **resulting NTCs need to be independent** (simultaneously feasible)

NTC: Capacity by border - bilateral exchanges

NTC: Net Transfer Capacity

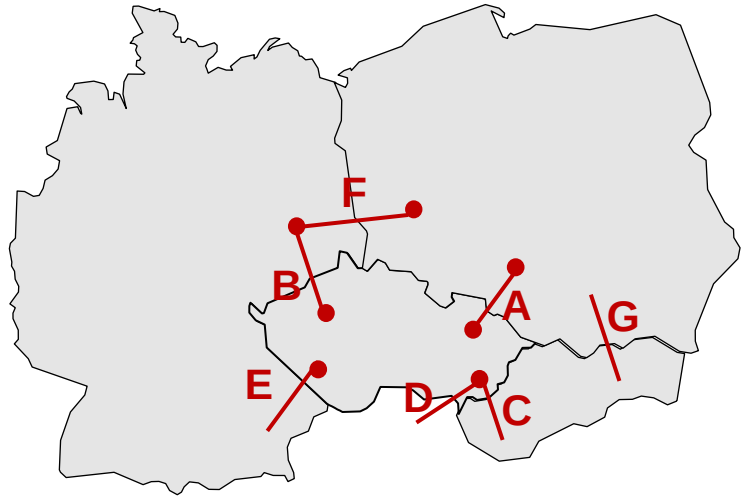
TTC: Total Transfer Capacity of a border, taking into account N-1, and possibly loopflows and interdependency with other borders



Allocation: based on the principle that an exchange from bidding zone A to bidding zone B uses the $NTC_{A>B}$ defined on the respective Bidding Zone Border

Flow based (FB) capacity calculation – main features:

- **Separate capacity** for **every critical element** (relevant elements)
- **Calculation** is **performed centrally** using coordinated rules and common input
- **Less assumptions** than NTC approach: Simultaneous feasibility of cross-zonal exchanges is ensured at allocation time (not by fixed bilateral exchange limits at capacity computation, as with NTCs)
- **Results for every critical network element**:
  - RAM – Remaining Available Margin
  - PTDF – Power Transfer Distribution Factor



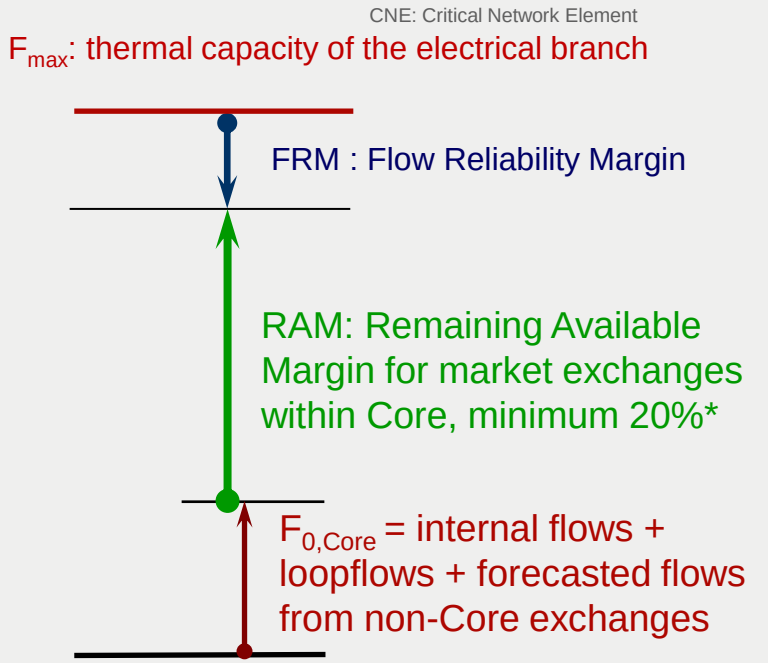
CNEC	RAM	PTDF CZ->PL	PTDF DE->PL
A	1000 MW	0,6	0,15
B	2000 MW	0,15	0,3
C	800 MW	0,2	0,1

Transaction of 1 MW between CZ and PL will result in flow of 0,6 MW on CNEC A, 0,15 MW on CNEC B and 0,2 MW on CNEC C.

Flow based capacity calculation principles

- **Every participating TSO** submits:
  - Its **grid model** including their **prediction**
  - **List of** Critical Network Elements and Contingencies (**CNECs**)
- Calculation is performed **using a merged common grid model**
- **For every CNEC** its **RAM and PTDF** are calculated

Flow based: Margin by electrical branch, expressed in N-1 (CNE + Contingency)



Allocation: optimizes exchanges by considering how much RAM each exchange uses on each CNEC (relationship = PTDF)

* And minimum 70% for all market exchanges (Core and non-Core) – subject to different values according to national action plans or derogations

1. Capacity Calculation

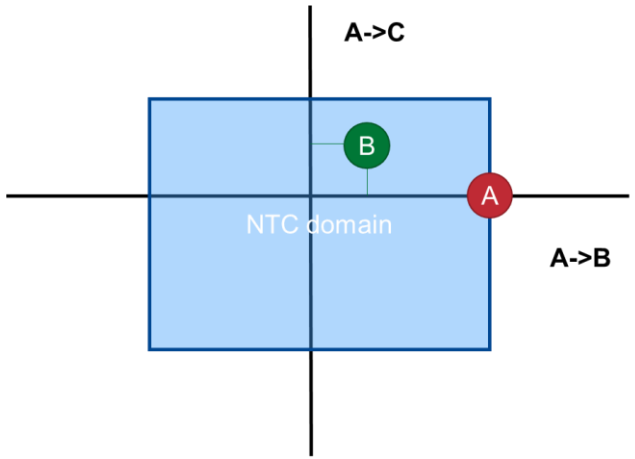
Capacity domain is a graphical representation of the capacities

Capacity domain defines a space of **allowed cross-zonal transactions**

- Axis – bilateral exchanges
- Allowed transaction – inside the domain
- 2D example (12 Bidding Zones (+2 virtual ALEGrO Bidding Zones) in the Core CCR – 12 dimensional Domain)

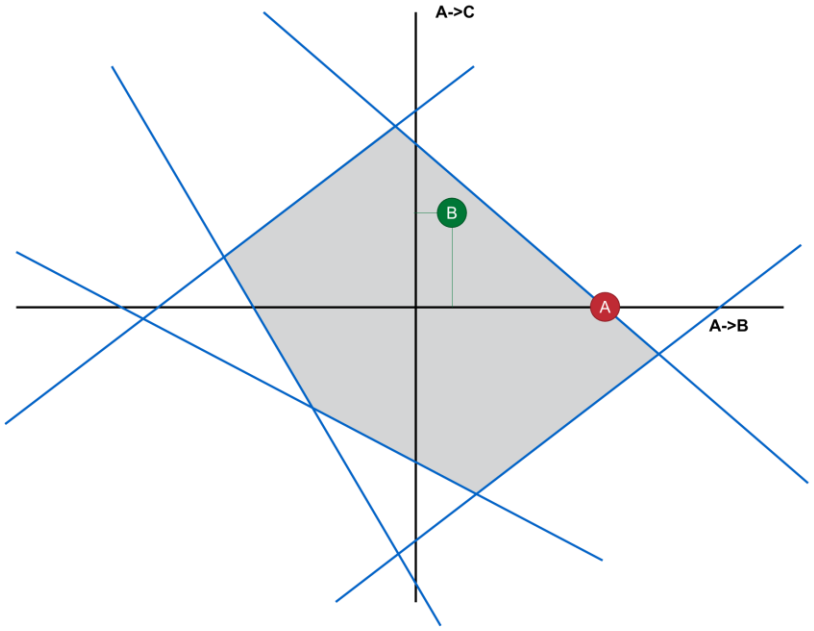
NTC Domain

- **NTC limits**: import and export limit for every border
- **Market result A**: Capacity in A→B direction is used fully, no Exchange in direction A→C
  - Regardless of Exchange in A→C direction, more Exchange in A→B direction is not allowed
- **Market result B**: Transaction in direction A→B and A→C



FB Domain

- **FB limits**: lines = CNEC
  - RAM – distance from origin, PTDF – incline
- **Market result A**: Capacity in A→B direction is used fully, no Exchange in direction A→C
  - More transaction in A→B direction is allowed if there is negative transaction in A→C direction



1. Capacity Calculation

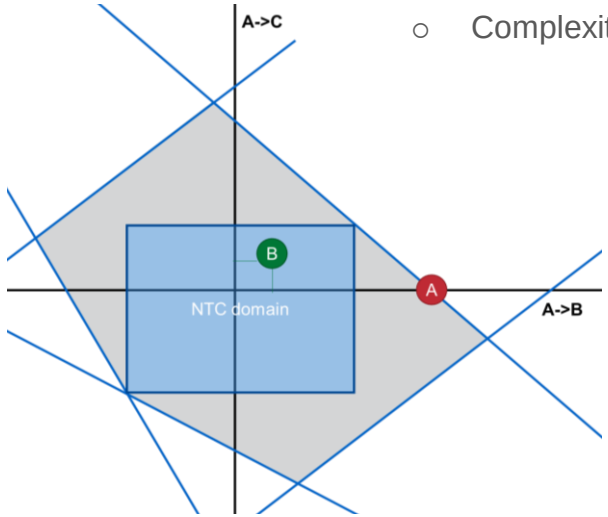
Summary of the two approaches

NTC capacity calculation

- **Result**
  - Constraint per border (import/export)
- **Calculation**
  - Individually by TSOs
  - Harmonization by neighbors
- **Pros**
  - Simple approach
  - Proven concept
  - Coordinated NTC suitable for regions with low dependency between borders
- **Cons**
  - Limited representation of physical flows (loop flows, transit flows)
  - Final NTC are fixed independent values

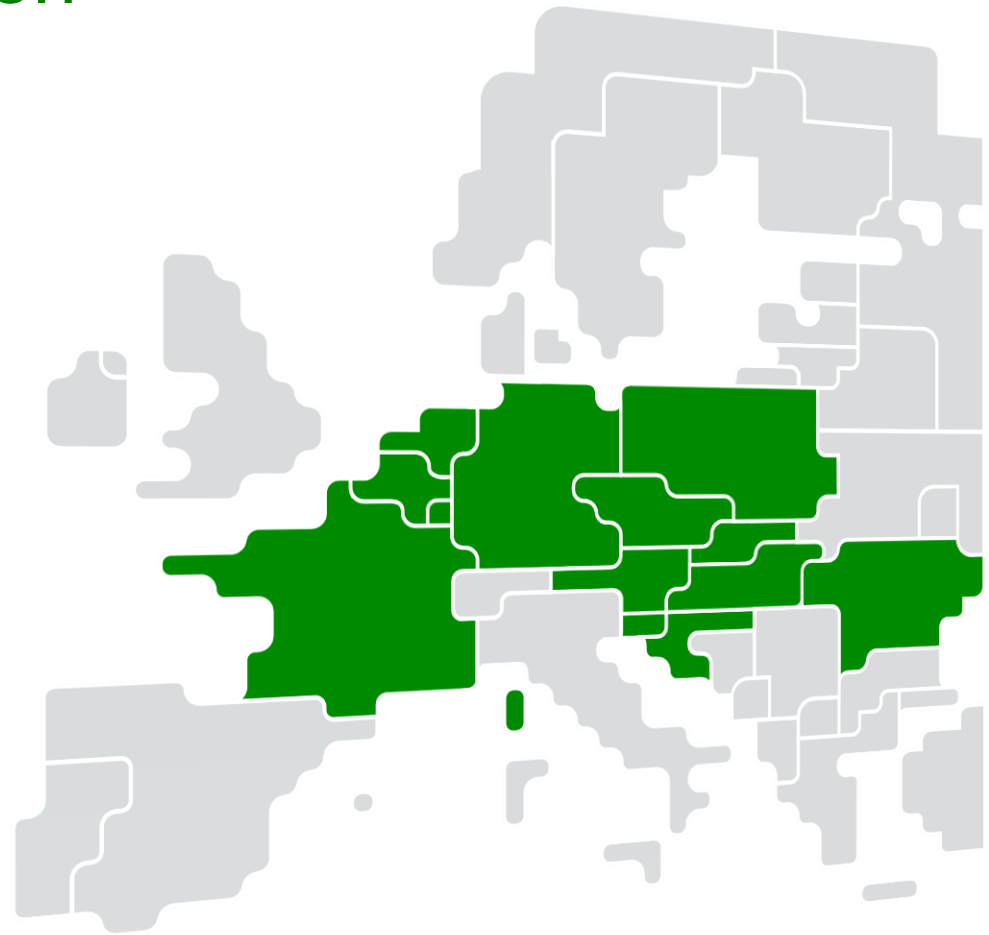
FB capacity calculation

- **Result**
  - Constraint per critical network element and contingency (CNEC)
- **Calculation**
  - Coordinated within a capacity calculation region
- **Pros**
  - Common inputs and rules
  - Good representation of physical flows (loop flows, parallel flows are included)
  - Final constraints are linked
  - More flexible utilization for those exchanges that are highly valued by the market participants.
- **Cons**
  - Complexity of the process




Q
A

Introduction capacity allocation



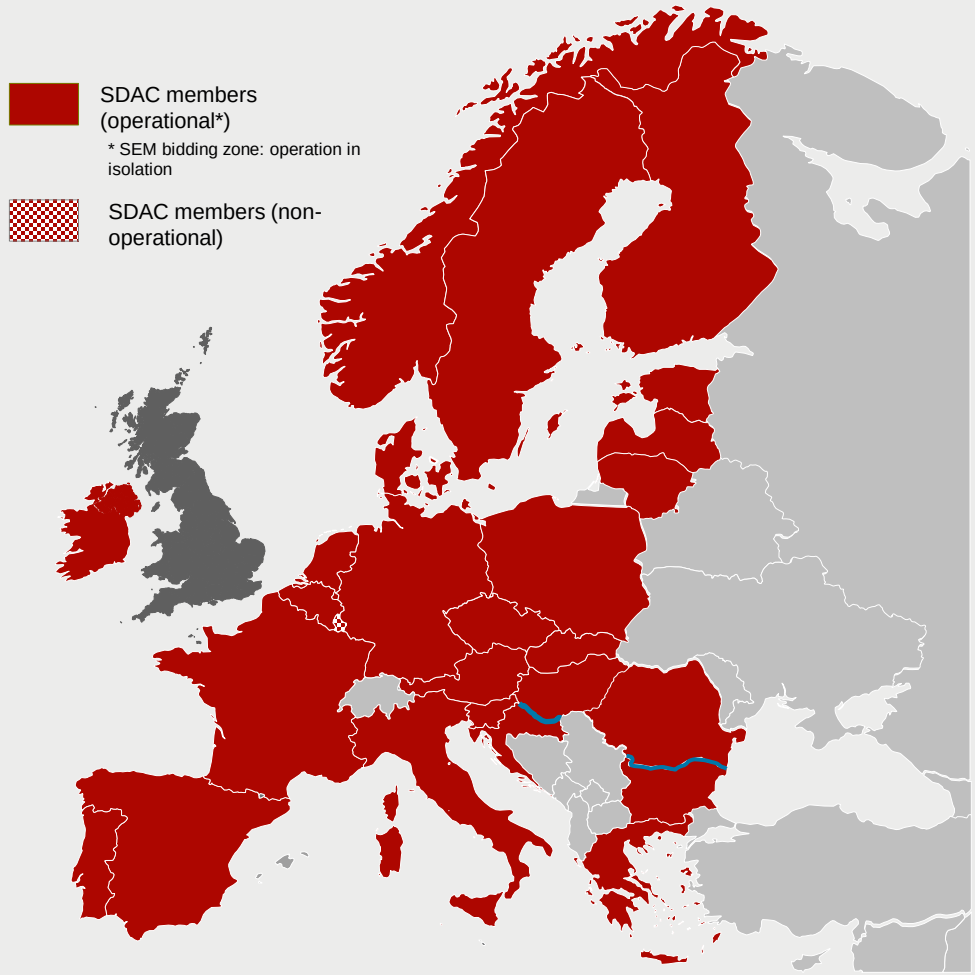
SDAC parties/countries involved and their status

- The **aim** of Single Day-ahead Coupling (SDAC) is to create a **single pan European cross zonal day-ahead electricity market**.

- SDAC **allocates** scarce **cross-border transmission capacity** in the most efficient way by **coupling wholesale electricity markets from different regions** through a **common Algorithm**, simultaneously taking into account cross-border transmission constraints thereby **maximising social welfare**.

47 parties forming SDAC

Members
Operational parties: NEMOs: BSP, CROPEX, Eirgrid/SONI (SEMO PX, non-coupled), EPEX, EXAA, GME, HEnEX, HUPX, IBEX, Nord Pool EMCO, OKTE, OMIE, OPCOM, OTE, TGE TSOs: 50Hertz, Admie, Amprion, APG, AST, ČEPS, EirGrid, Elering, ELES, Elia, Energinet, ESO, Fingrid, HOPS, Litgrid, MAVIR, PSE, REE, REN, RTE, SEPS, SONI, Statnett, SvK, Terna, Transelectrica, TransnetBW, TTG, TTN
Non-operational parties: NEMOs: Nasdaq TSOs: Creos

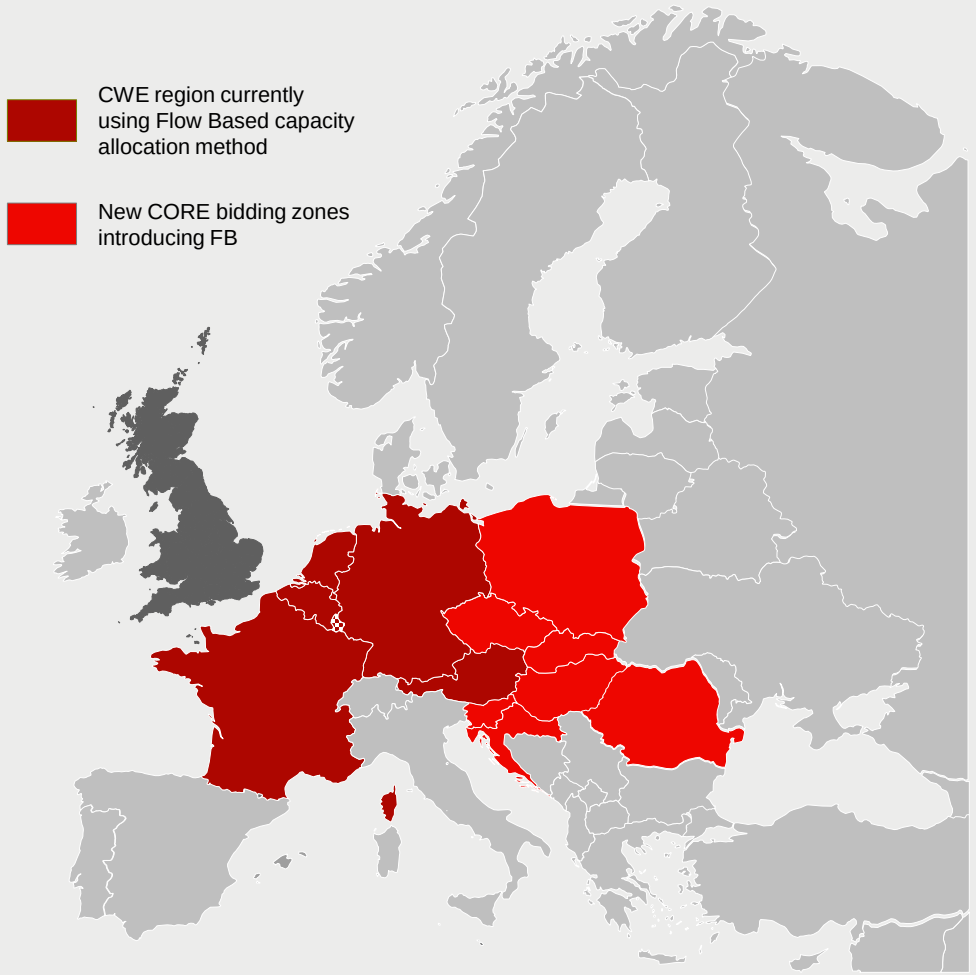


Core: regional coupling and change of capacity calculation methodology

- The Core Flow Based Market Coupling project promotes the development and implementation of a Flow Based day-ahead market coupling (FBMC) across the whole **Core capacity calculation region** (Core CCR) in the framework of SDAC.

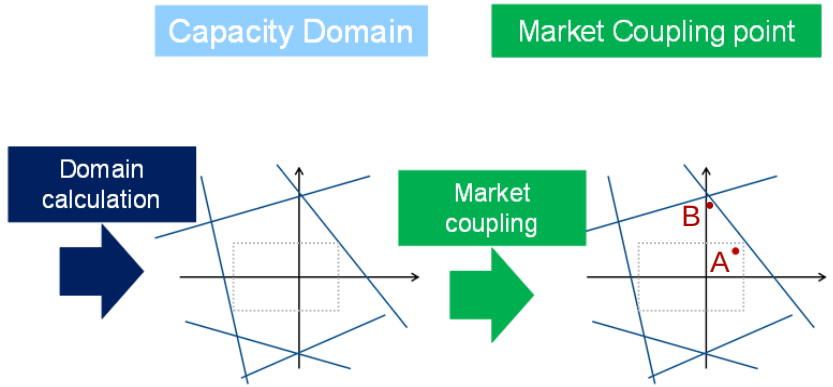
- FBMC is currently deployed within the Single Day-Ahead Coupling across Central Western Europe (CWE)

- With the Core Flow-Based Market Coupling project, all borders of the Core Capacity Calculation Region (CCR) will be **coupled based on a Flow-Based capacity calculation methodology** developed in the framework of the CACM Regulation.



Flow-Based methodology for capacity allocation

- Flow-based allocation mechanism **maximizes the welfare of exchanges in and between bidding zones**, taking into account the limitations imposed by critical network elements of the transmission system in normal conditions (N state) and in outage conditions (N-1 situation where one element of the transmission system is no more available in the grid on allocation day)
  - In FB, the domain is considered as a whole: increasing 1MW in 1 BZ impacts net positions in every other BZ of the domain (even not directly connected)
  - In ATC, net positions are calculated using only bilateral constraints: exchanges are only maximized per border
- Output of the Flow-based Market Coupling (FBMC) optimization is the **set of zonal Net Positions (NP) and corresponding market clearing prices**
  - Optimization aims to find the combination of NPs which maximizes social welfare with **Social Welfare = Producer surplus (producers) + Consumer surplus (consumers) + Congestion rent (TSOs)**
  - FB domain is defined by a set of constraints forming a polyhedral. Each edge is a limiting critical line where flow could be impacted by any change of NP via the Power Transfer Distribution Factors (PTDF) matrix. Physical flows for each line must be lower than the commercially available capacity or Remaining Available Margin (RAM, in MW): **SUM(PTDF)*NP ≤ RAM**
  - Euphemia, the calculation algorithm, uses a heuristic approach (set of rules to determine the optimum). Due to the non-linearity of the equation (8 inputs), it's almost impossible to determine the optimal solution by considering all variables at once: the algorithm has **17min to find the best solution**



Market clearing point A is within both the FB domain and the ATC domain

Market clearing point B is outside the ATC domain. Capacity allocated would be much less in case of ATC methodology than FB methodology

Overview of operational processes

1. Normal Day process

2. Partial Decoupling of SDAC (declared at 12:45)

3. Backup, Special or Other Procedures

4. Full Decoupling of SDAC (declared at 14:00)

1. Normal Day process

Normal Procedures

Normal Procedures describe per phase the normal actions to be performed by the SDAC parties in a so called “clear-weather” scenario. They are performed before the respective target time on a daily basis.

- Cross Zonal Capacities Submission and Allocation Constraints Submission
- Final Confirmation of Results
- Market Coupling Results and Scheduled Exchanges Transfer
- Trading Confirmation and Scheduled Exchanges Notification

Please note that shipping-related activities are not included in the MRC/SDAC procedures and are addressed locally

These Procedures are accompanied by several NEMO-only procedures (PCR/ANDOA):

- Configuration Synchronization
- Network Data Sending and Receiving
- Order Data Sending and Receiving
- Calculation Process
- Results Sharing and Receiving
- Preliminary Confirmation of the Results
- Final Confirmation of the Results (parallel to the joint procedures)
- Daily Report and Euphemia Session Dump
- Time to get first solution gathering

1. Normal Day process

General Concepts

1 Pre-coupling

- **Verification** that the NEMO systems use the **same parameters** and are **configured accordingly**
- **TSO submission** of Cross Zonal Capacities (CZC) and Allocation Constraints (AC) and **reception by NEMOs**
- **Network Data** (all CZCs and ACs) and **market orders** sending to **market coupling systems**

2 Coupling

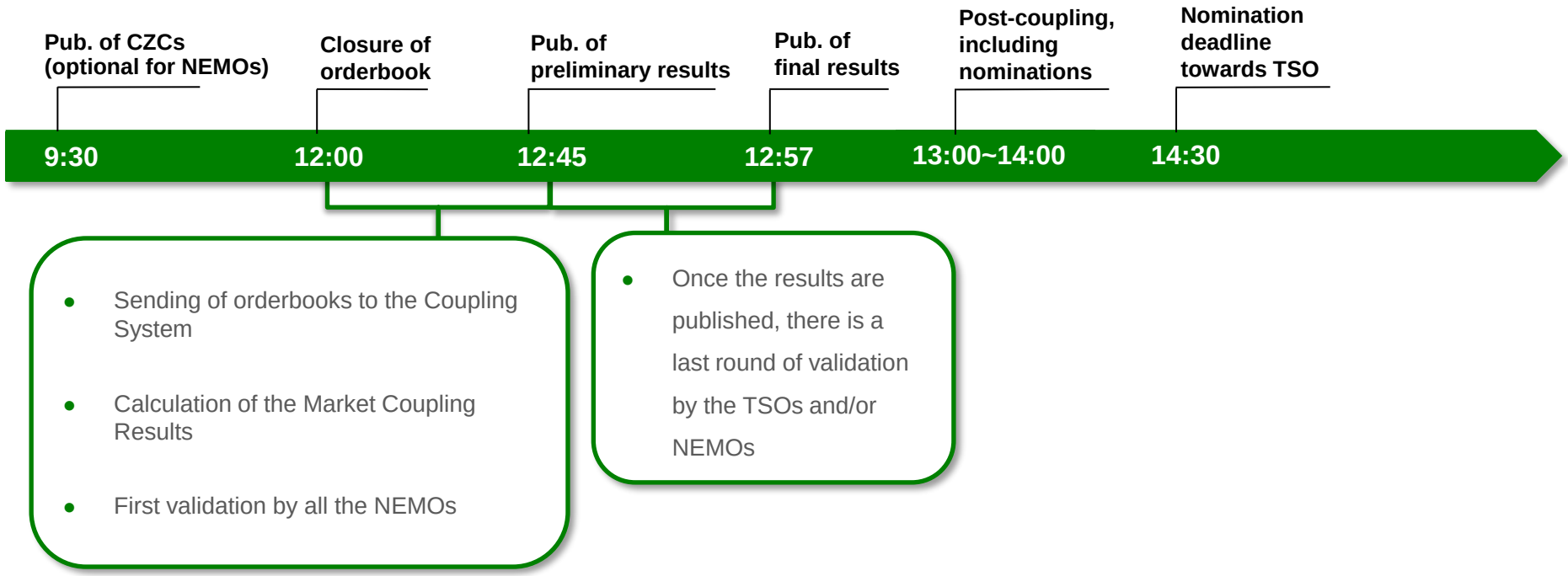
- **Price calculation process**
- **Results sharing** and **receiving** among NEMOs
- **Preliminary confirmation** of the results by NEMOs
- **Final confirmation** of market coupling results **by involved parties** and considering them **final**

3 Post-coupling

- **Transfer** final market coupling **results and scheduled exchange** to post-coupling systems
- **Provision** of **local and cross-border trade files** to CCP and/or cross-border shipper entities
- **Share information** on timing of processes and store it for further analysis
- **Reporting and archiving** coupling related information
- **Publication** of results

1. Normal Day process

Timings



Please note: All timings are in CET/CEST and refer to the procedures in place as of the ICP go-live. They reserve additional five minutes for the algorithm to derive the results. The point in time to publish the results are shifted accordingly.

Pub. = publication
CZC = Cross-Zonal Capacity

Overview of operational processes

1. Normal Day process

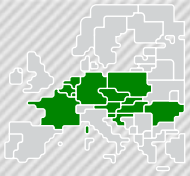
3. Backup, Special or Other Procedures

2. Partial Decoupling of SDAC (declared at 12:45)

4. Full Decoupling of SDAC (declared at 14:00)

2. Partial Decoupling of SDAC (declared at 12:45)

Fallback Procedures – general concepts



Fallback Procedures are triggered when the Market Coupling Results cannot be given in due time to start an Incident Committee by using normal, backup or special procedures.

- Incident Management
- Full Decoupling
- Partial Decoupling

Fallback Procedure can be split into two parts:

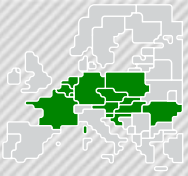
- Preparation of the Decoupling (triggering an Incident Committee)
- Decoupling of the relevant interconnectors from the Market Coupling process
  - Capacities are allocated via explicit (shadow) auctions
  - Order books are reopened locally, and a new (local) price calculation is launched

In the event that the issue is resolved,
a fallback procedure can still be stopped.

The respective procedures also exist for the NEMO-only tasks (both Incident Management and Full/Partial Decoupling).

2. Partial Decoupling of SDAC (declared at 12:45) & 4. Full Decoupling of SDAC (declared at 14:00)

Fallback Procedures – general concepts



Core principle of the Single Day-ahead Coupling (SDAC):

Ensure as many bidding areas / interconnectors as possible remain coupled

At SDAC level, two main decoupling situations exist:

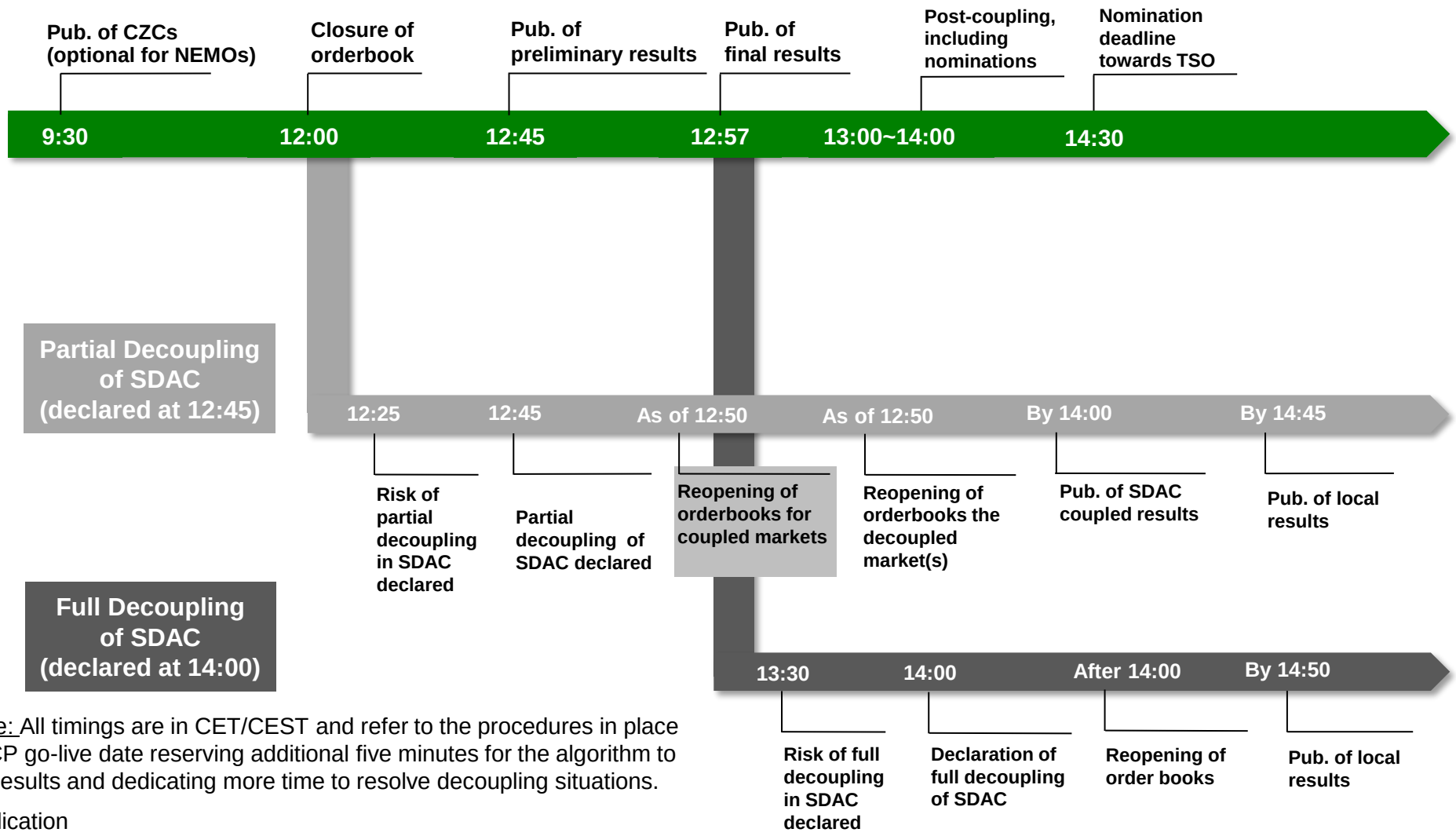
- A **Partial Decoupling of SDAC** is a situation that is triggered at 12:45 where one or more operational NEMOs are unable to participate in SDAC. The impact of the decoupling can be realized at interconnector level or orderbook level. The remaining bidding areas and interconnectors still participate in the SDAC.
  - Special case for Multi-NEMO setup: As long as one or more MNA NEMOs remain coupled, the respective bidding area and interconnectors still participate in SDAC.
  - Special case for interconnectors: One or more interconnectors can be decoupled at 11:30 without removing the respective bidding zone(s) from SDAC (if they remain coupled via other interconnectors).

- A **Full Decoupling of SDAC** is a situation where no bidding area and interconnector remain coupled due to the unavailability of the Market Coupling Results at the deadline of 14:00.

In a decoupling case, the Cross-Zonal Capacities for the decoupled interconnectors are allocated via the available fallback allocation solutions (e.g. Shadow/Explicit Auctions, Regional Coupling, Capacity goes back to Interconnector Owner, Intraday Continuous Market etc.).

2. Partial Decoupling of SDAC (declared at 12:45) & 4. Full Decoupling of SDAC (declared at 14:00)

Fallback Procedures – general concepts



Please note: All timings are in CET/CEST and refer to the procedures in place as of the ICP go-live date reserving additional five minutes for the algorithm to derive the results and dedicating more time to resolve decoupling situations.

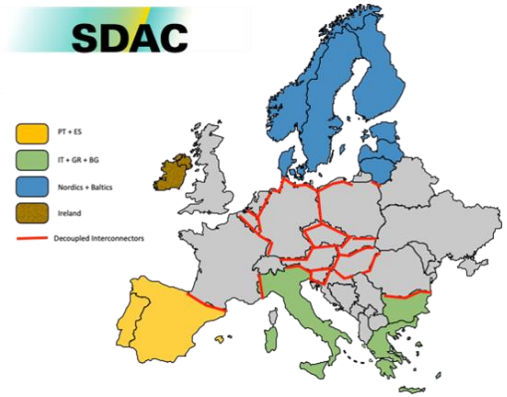
Pub. = publication
CZC = Cross-Zonal Capacity

2. Partial Decoupling of SDAC (declared at 12:45)

Core Fallback Procedure

Context

- Art. 4.2 of the Acer decision 10/2018 mentions that shadow auctions must be used to allocate cross zonal capacity in case a Bidding Zone is not able to determine the market coupling results.
- As in FB domain the internal borders cannot be decoupled one by one, the application of this decision has been defined as the **complete decoupling of all the Core borders: internal and external**.

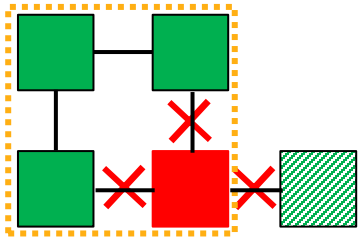


Fallback solutions have been optimized to minimize consequences of a decoupling due to missing order book, 'isolate' issues and limit its impact if possible

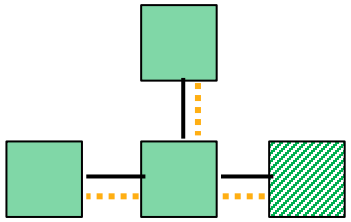
All the borders remain coupled except those (External or Internal) connecting the affected Bidding Zone*

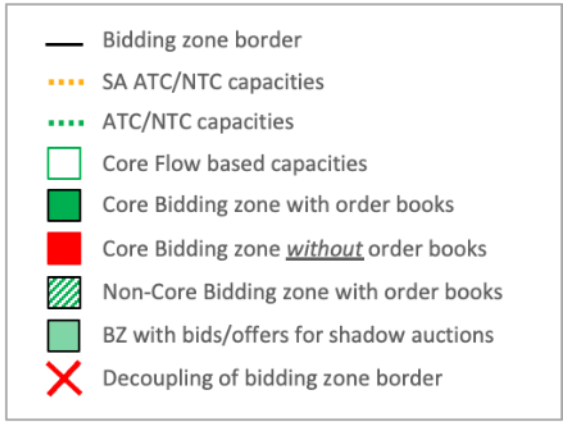
- Core internal Capacities would be allocated via NTC Market Coupling; Capacity on Core external borders is allocated via NTC
  - The FB domain is put to 0, the values used for Core internal Capacities are the same as for potential Shadow Auctions
- Shadow auctions will be held for the borders linked to the affected Bidding Zone

Affected borders



Fallback applied





* *This solution will be fine-tunes after Go Live in order to avoid some adverse effects, such as prevention of transit scheduled exchanges. In case of any significant changes, Market parties will be kept informed*

Overview of operational processes

1. Normal Day process

2. Partial Decoupling of SDAC (declared at 12:45)

3. Backup, Special or Other Procedures

4. Full Decoupling of SDAC (declared at 14:00)

3. Backup, Special or Other Procedures

Backup procedures

Backup Procedures describe the actions that are available to overcome any issue. Ideally, they should be triggered once the target time associated to a specific process step cannot be met or is foreseen not the be met with Normal Procedures.

- Cross Zonal Capacities Submission and Allocation Constraints Submission
- Final Confirmation of Results

Please note that Backup Procedures are triggered to ensure that Market Coupling can still be performed. They might be linked to any Special Procedure, but they are independent and different to Fallback Procedures activities. In fact, they exist to avoid a decoupling event described by Fallback Procedures.

The number of NEMO only procedures is more extensive. They illustrate that there are backups for all normal day procedure in the end.

- Configuration Synchronization
- Network Data Sending and Receiving
- Order Data Sending and Receiving
- Calculation Process
- Results Sharing and Receiving
- Preliminary Confirmation of the Results
- Final Confirmation of the Results (in parallel to the joint procedure)
- Daily Report

3. Backup, Special or Other Procedures

Backup procedures – examples

Exchange of information

- Use automatized backup system
- Exchange information manually (in pre-agreed processes to ensure efficiency)

Generation of reports

- Trigger manual processes

Calculation process

- Apply different technical configurations
- Trigger manual processes
- Use other parties' resources

3. Backup, Special or Other Procedures

Special and Other procedures

Special procedures

- Special Procedures are executed when exceptional situations occur in the market requiring specific measures to be taken.

Backup Procedures can still be applied during Special Procedures

- Impact of Second Auctions
- Impact of thresholds Nordic-Baltic reached

Other Procedures

- Other Procedure are related to certain planned specific situations, which need to be managed by a formalized procedure and for any other subject that needs a common approach on SDAC level.
  - Procedure Reading Instructions
  - Internal and External Communications (joint and NEMOs only)
  - Norwegian Bidding Area Change
  - Change Control Procedure
  - Modification of Maximum Clearing Price
  - Maximum Clearing Price Management (NEMOs only)

3. Backup, Special or Other Procedures

Core Rollback procedure

Rollback triggers and timeframe

- During 6 weeks after Core Go-Live, **rollback will be triggered** if the following situation happens during 3 consecutive days:
  - **Full decoupling** of SDAC
  - **Partial decoupling** of Core
  - Capacity calculation results in **default FB parameters**
  - **Serious market issues in price formation** as a rollback trigger.
    - If there is consensus among Core NRAs that this rollback trigger should be included, NRA guidance should be provided as to which situations serious market issues in the price formation would apply.

- **Rollback process** will take **2 days**:
  - D: rollback is triggered
  - D+1: local auctions under Core topology
  - D+2: coupled auction under pre-Core regional topology

Approach for regional coordination

- **Coordination** between **Core and affected SDAC regional projects** (IBWT, ICP, CWE MNA, PL MNA, Nordic MNA, Litgrid) is **ongoing** to prepare the rollback
- Procedure ROB_01 describing the rollback will be shared with the affected parties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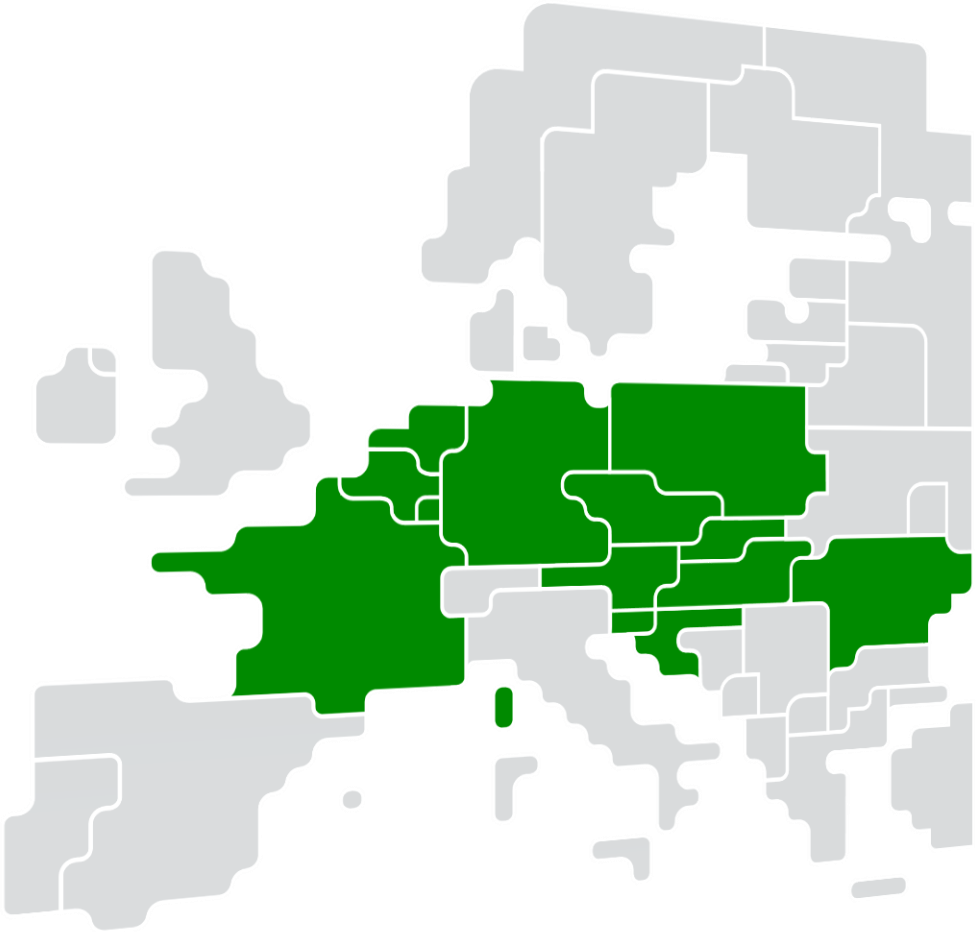
Core Flow-based Day-ahead Capacity Calculation Methodology

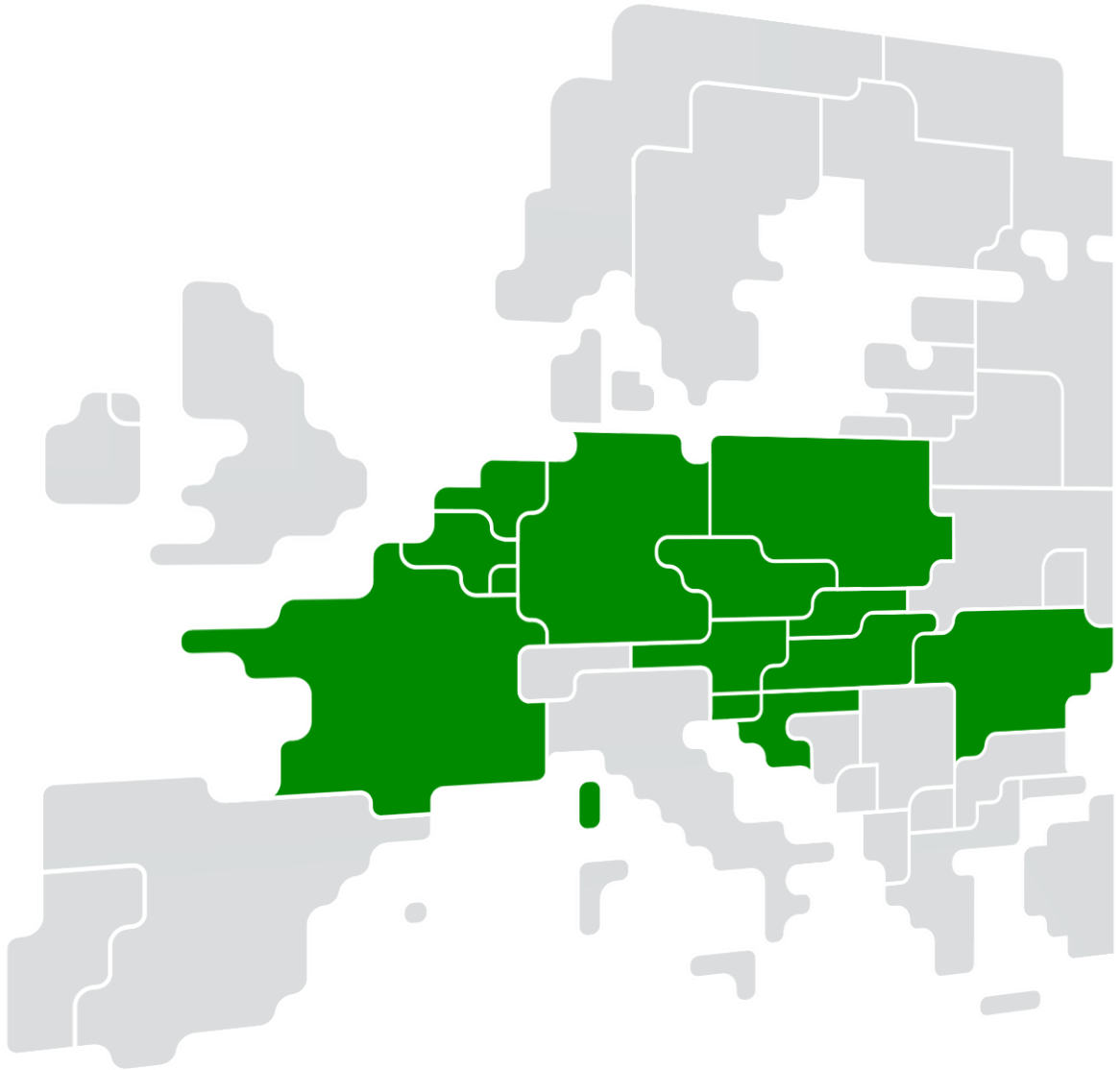


1. Core day-ahead capacity calculation methodology – Core DA CCM

General information

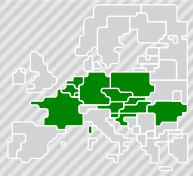
Legal Framework for the Core DA CCM

- **CACM Regulation**
  - Article 20ff. of Commission Regulation (EU) 2015/1222 of 24 July 2015 **establishing a guideline on Capacity Allocation and Congestion Management** (“CACM Regulation”)
- **ACER Decision 02/2019** on Day-ahead capacity calculation methodology in the Core CCR (February 2019)
- **Core NRAs Decision** on the first amendment of the Day-ahead capacity calculation methodology in the Core CCR (May 2021)



1. Core day-ahead capacity calculation methodology – Core DA CCM

General information



The day-ahead capacity calculation process consists of four main stages:

1. Delivery of **capacity calculation inputs** by Core TSOs
2. Capacity **calculation process** by Coordinated Capacity Calculator (CCC)
3. Capacity **validation** by Core TSOs in coordination with CCC
4. **Final capacity calculation** by CCC

Multiple actors are involved in the process:

Transmission System Operators of the Core region – Core TSOs

Regional Security Coordinators – RSCs (TSCNET, CORESO)

- Merge grid models, optimize application of non-costly remedial actions,…

Coordinated Capacity Calculator – CCC (TSCNET, CORESO)

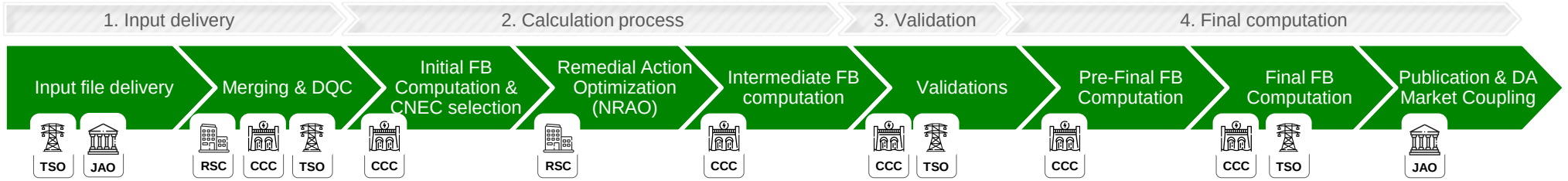
- Calculates the capacity at regional level.

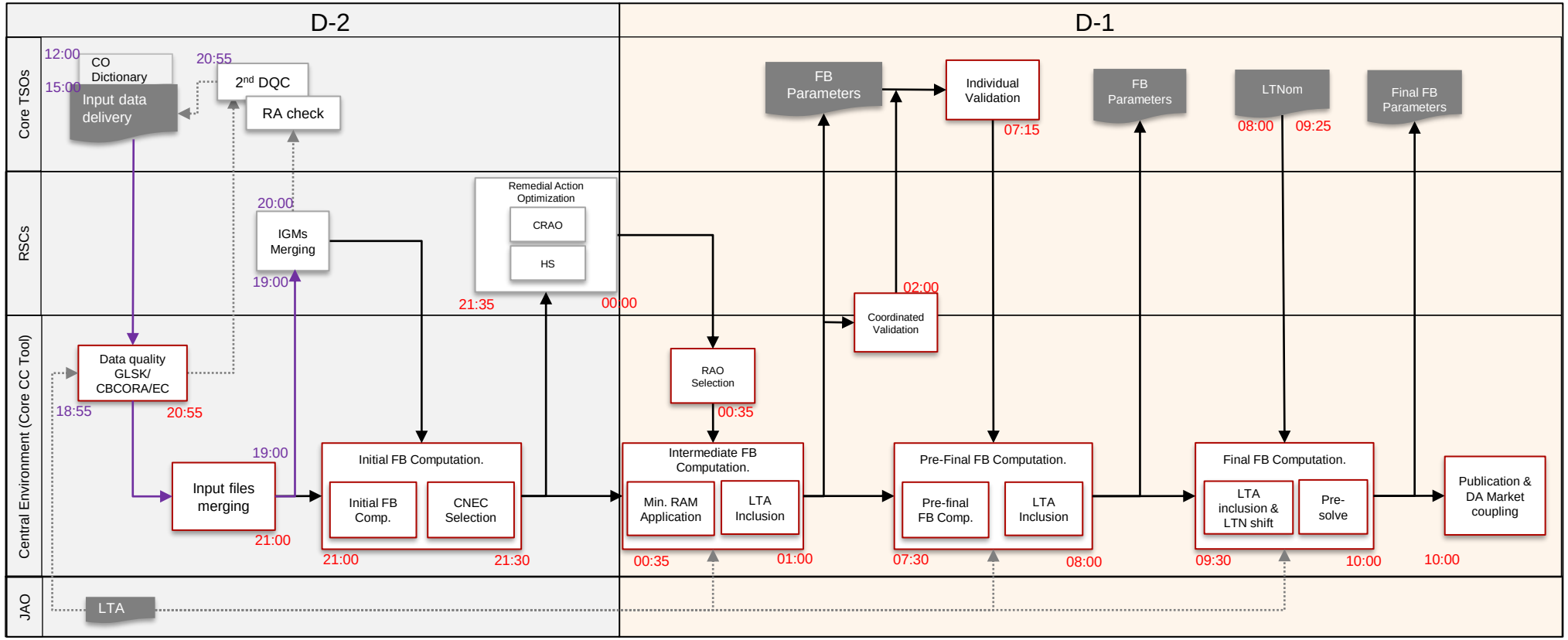
Auction Office (JAO)

- Provides information about capacity allocated in the long-term markets

2. Core DA flow based capacity calculation process explained

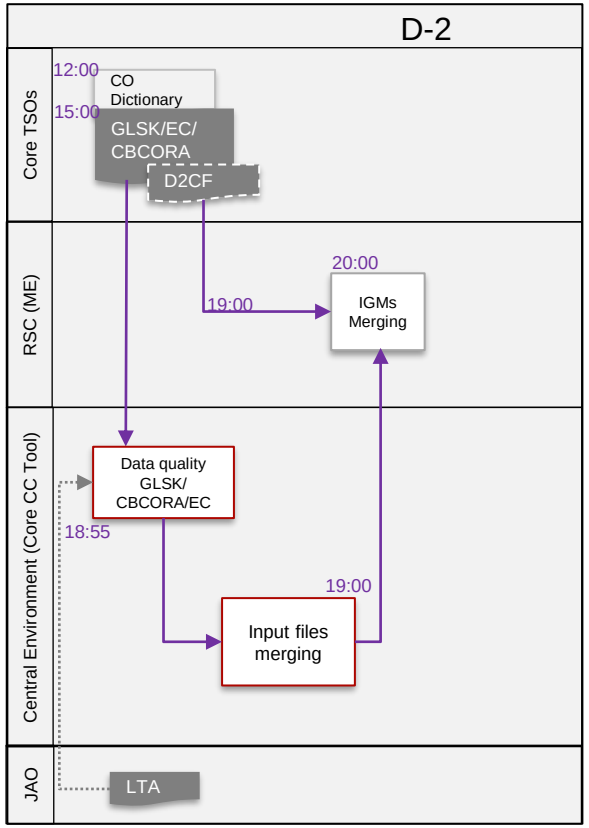
Overall DA capacity calculation process





2. Core DA flow based capacity calculation process explained

Step 1 – Delivery of capacity calculation inputs



Delivery of the input files

- Before the common merging starts, **individual TSO input files must be prepared and delivered for merging** by the Core capacity calculation tool (CCCt) and Merging Entity

- Input files:
  - **D2CF individual grid model** (IGM) – 24 models generated in D-2
  - **EC file** – maximum import and export limits (can be used by some TSOs)
  - **GLSK file** – generation and load shift keys
  - **CBCORA file** – network elements with contingencies and remedial actions
  - JAO sends the **LTA file** to the CCCt

2. Core DA flow based capacity calculation process explained

Step 1 – Delivery of capacity calculation inputs

D2CF Individual Grid Model (IGM)

- **TSOs'** best **two days ahead prediction** of their **power system characteristics**: generation, load and grid topology
- When **merged** with **IGMs** of other TSOs, the **Common Grid Model (CGM)** is created
  - CGM is the fundamental input for the grid calculations

External Constraints (EC)

- Type of **allocation constraint that limits** the **maximum import and/or export** of a given bidding zone
- **Used in specific cases** when operational security limits cannot be transformed efficiently into network elements limitations
- Under condition of the **Core NRAs' approval**

Generation Load Shift Keys (GLSK File)

- Translates a **change in a bidding zone net position into** a specific **change of injection or withdrawal** in the CGM
- **Defined** by the Core TSOs **individually based on historical behavior** of the generation and/or load units
- Used when **change of a net position** of a given bidding zone **in the CGM needs to be performed**

2. Core DA flow based capacity calculation process explained

Step 1 – Delivery of capacity calculation inputs

CBCORA file – list of CNECs and RAs

- **Network elements** and **contingencies (NEC)**
  - Network elements (NEs) – **overhead lines, cables, transformers**
    - Can be defined in 2 directions (A → B and B → A)
  - Contingency (C) – unplanned outages (**N-1 criterion**) associated to NEs

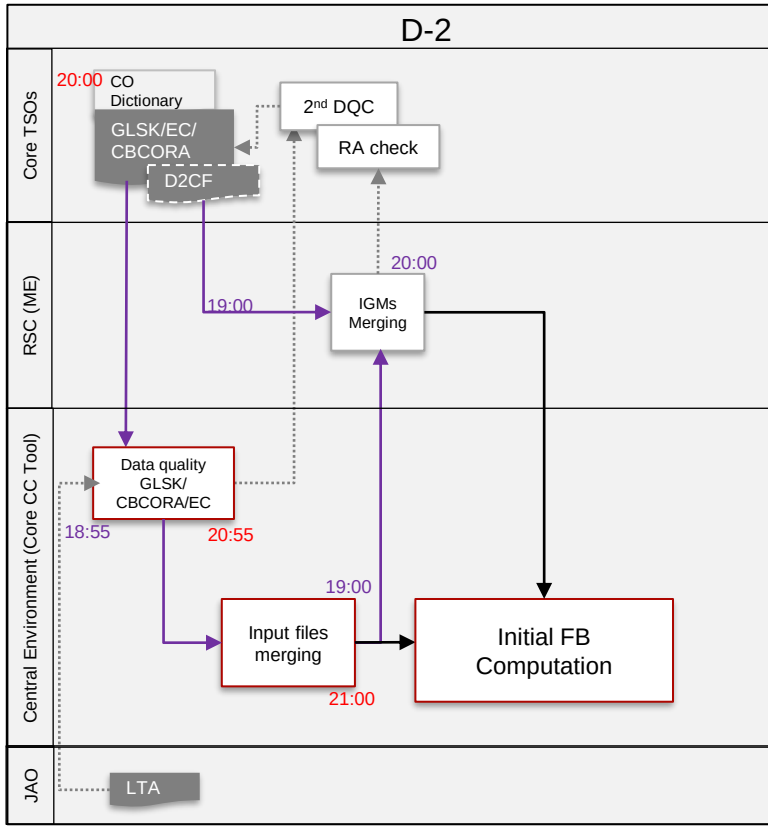
  - **2 types of NECs**
    1. **CNEC** – critical network element, **can limit** the **Flow Based domain**
       - Currently both relevant internal and cross-zonal elements
       - 18 months after implementation (and later every 2 years), internal elements only if their justification is approved by Core NRAs
    2. **MNEC** – monitored network element, **cannot limit** the **Flow Based domain**, monitored during RA optimization

- **Non-costly remedial actions (RA)**
  - For the purpose of remedial actions optimization
  - All expected available non-costly RAs

CNEC #	Critical Network Element	Direction	HubFrom	HubTo	Contingency
1	Hradec - Etzenricht	DIRECT	CZ	DE	BASECASE
2	Hradec - Etzenricht	OPPOSITE	CZ	DE	BASECASE
3	Hradec - Etzenricht	DIRECT	CZ	DE	Prestice - Etzenricht
4	Hradec - Etzenricht	OPPOSITE	CZ	DE	Prestice - Etzenricht

2. Core DA flow based capacity calculation process explained

Step 1 – Delivery of capacity calculation inputs



Data Quality Checks – DQC

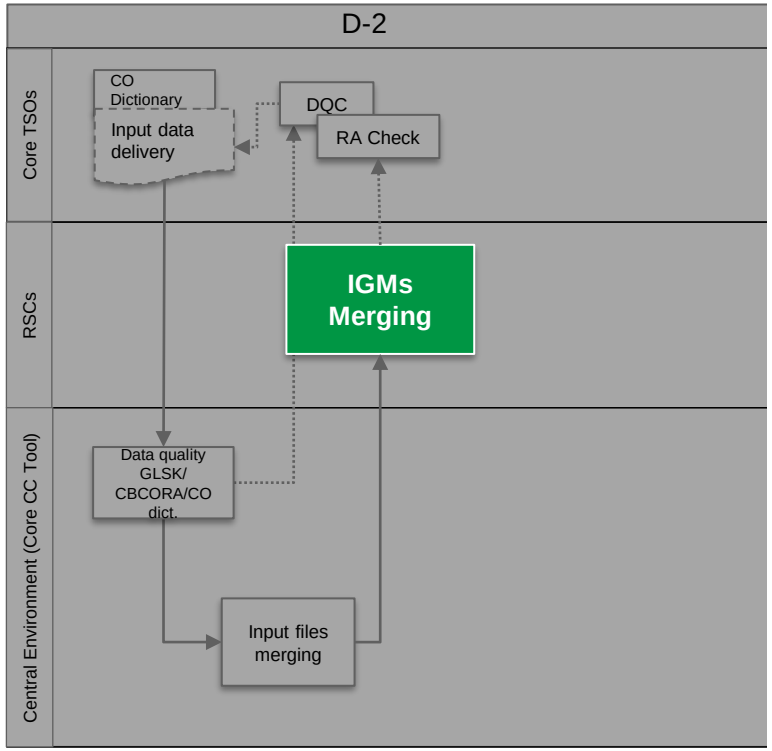
- **Data quality check** of the **individual TSO input files** performed by both the Merging Entity and Core capacity calculation tool (CCCt)

- **Two rounds** of DQC:
  1. Syntax check
  2. Coherence check

- In case an **error** is **identified**, TSOs can **resend** their **input data**

2. Core DA flow based capacity calculation process explained

Step 1 – Delivery of capacity calculation inputs



Merging

- **Merging** of the Individual Grid Models (**IGMs)** to create the Common Grid Model (CGM) is the **task of the RSCs** being the Merging Entities.

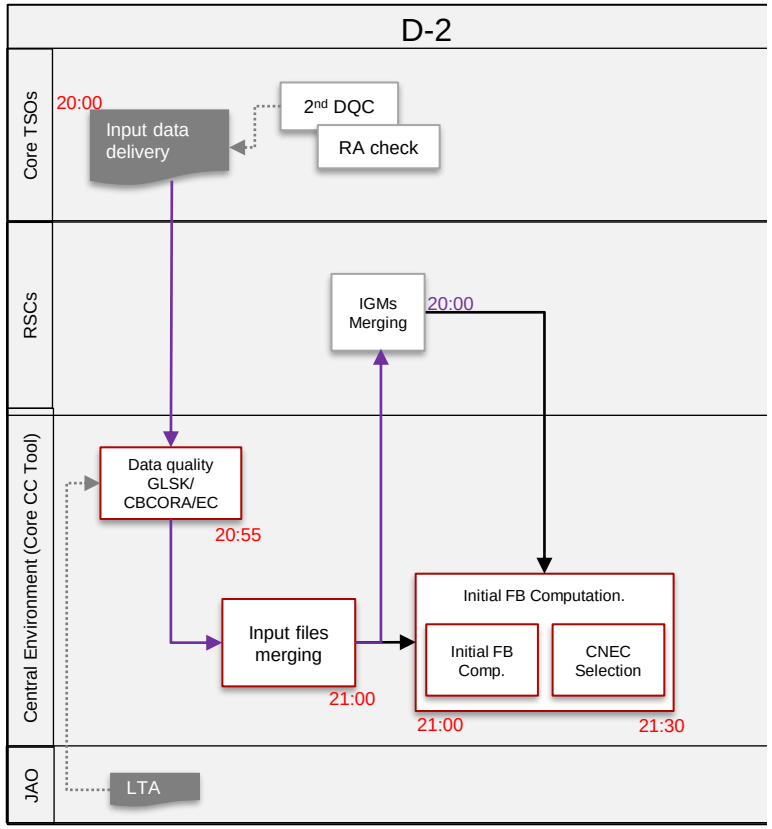
- For the purpose of achieving a **balanced CGM**, during the merging, the **net position of the IGMs is shifted** toward the **consistent forecasted net position**.

2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator

Input file delivery | Merging & DQC | **Initial FB Computation & CNEC selection** | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC



Initial flow-based computation by CCC

- **Parameters comput**ed based on the merged input files
- During this computation, in addition to other flow based parameters, the **sensitivity of the network elements** (PTDF) **are also computed.**
- PTDF can be expressed as:
  - **Zone-to-slack PTDF**
    - Sensitivity of the network element to a change on Net Position of a given bidding zone
  - **Zone-to-Zone PTDF**
    - Sensitivity of the network element to an exchange between two bidding zones
- The following rule applies:

$$PTDF_{A\rightarrow B,l} = PTDF_{A,l} - PTDF_{B,l}$$

2. Core DA flow based capacity calculation process explained

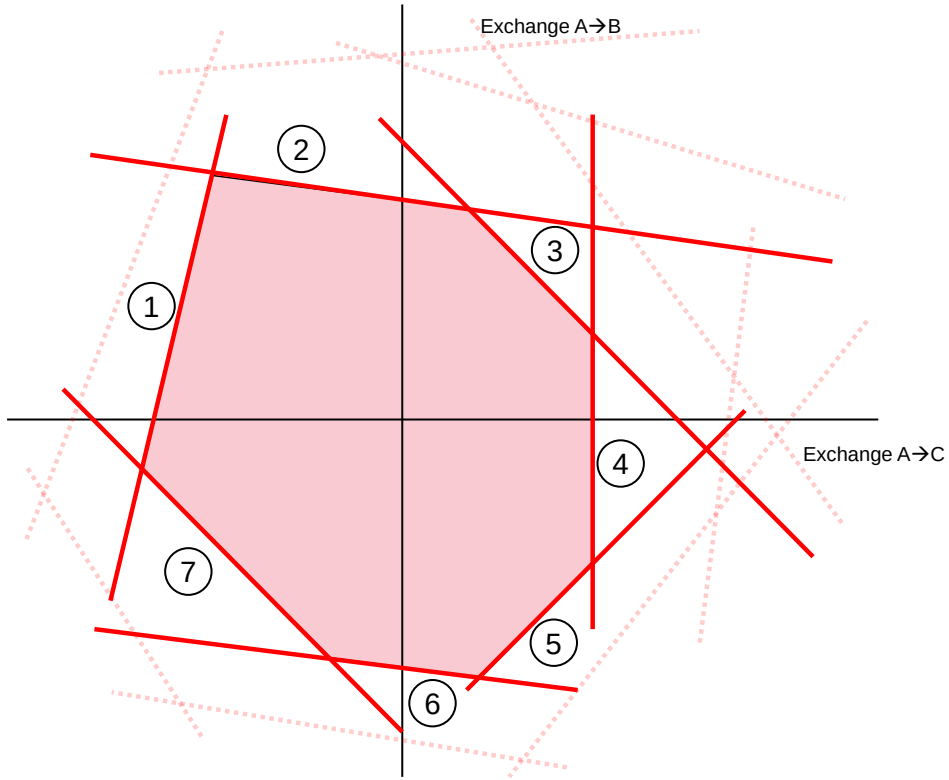
Calculation example

Input file delivery → Merging & DQC → **Initial FB Computation & CNEC selection** → Remedial Action Optimization (NRAO) → Intermediate FB computation → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

CCC

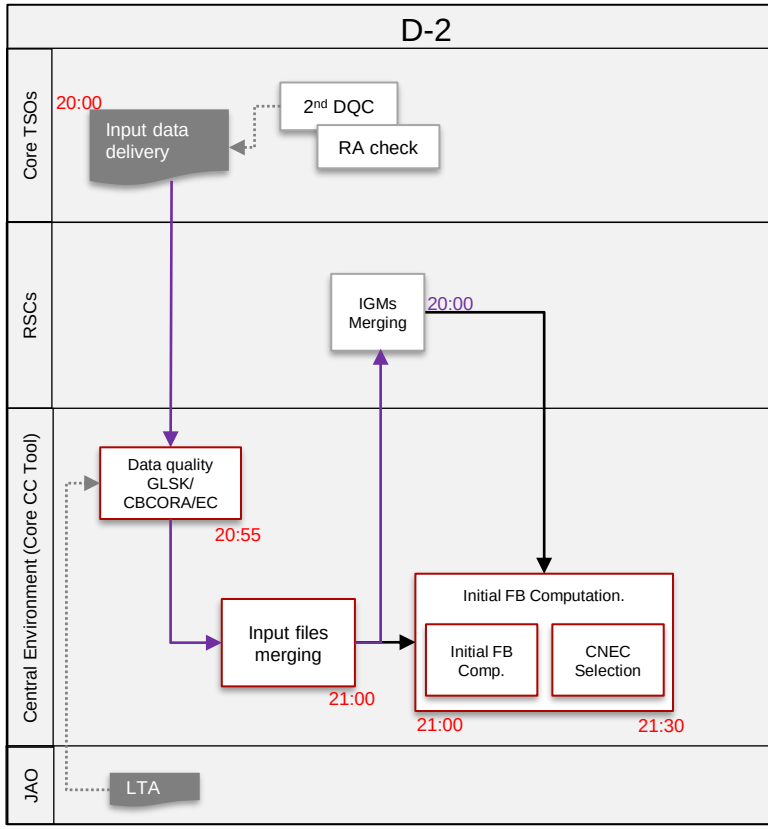
CNEC	RAM	Fmax	FRM	F_{ref}	PTDF A->B	PTDF C->D	PTDF E->F
1	800	**1000**	**100**	100	0,12	0,10	0,04
2	700	**1000**	**100**	200	0,15	0,12	0,20
3	600	**1000**	**100**	300	0,02	0,16	0,18
4	500	**1000**	**100**	400	0,3	0,25	0,2
5	500	**1000**	**100**	400	0,15	0,03	0,09
6	600	**1000**	**100**	300	0,18	0,09	0,21
7	700	**1000**	**100**	200	0,23	0,19	0,28
8	500	**1000**	**100**	400	0,01	0,03	0,02
9	500	**1000**	**100**	400	0,02	0,04	0,03
10	700	**1000**	**100**	200	0,01	0,04	0,04
11	600	**1000**	**100**	300	0,03	0,01	0,01

$$\overrightarrow{RAM}_{init} = \vec{F}_{max} - \overrightarrow{FRM} - \vec{F}_{\mathrm{ref}}$$



2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator



Critical Network Element associated with a Contingency (CNEC) selection

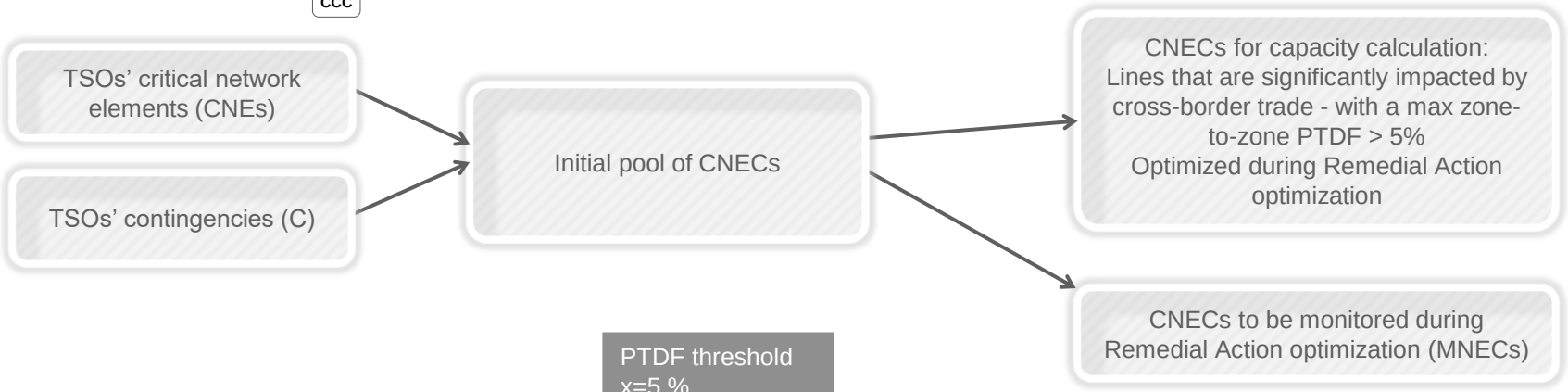
- **Purpose**: **Identify** those **critical network elements** from the initial CBCORA file that are **not sensitive to cross-border exchanges** and therefore their **relevance** for the calculation is **limited**.

- If the maximum **zone-to-zone PTDF** of an element is **smaller** than **5 % threshold**, **those CNEs are removed** from the CNEC list and will not limit the Flow Based domain.

- These CNE are **turned into monitored network elements** (MNEC). As a result, they don't limit the calculated capacity further in the process

2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator



PTDF threshold x=5 %

CNEC	RAM	Fmax	FRM	F_{ref}	AMR	LTA_{margin}	CVA IVA	PTDF A->B	PTDF C->D	PTDF E->F	CNEC	MNEC
1	800	**1000**	**100**	100				0,12	0,10	0,04	TRUE	TRUE
2	700	**1000**	**100**	200				0,15	0,12	0,20	TRUE	TRUE
3	600	**1000**	**100**	300				0,02	0,16	0,18	FALSE	TRUE
4	500	**1000**	**100**	400				0,3	0,25	0,2	TRUE	FALSE
5	500	**1000**	**100**	400				0,15	0,03	0,09	TRUE	FALSE
6	600	**1000**	**100**	300				0,18	0,09	0,21	TRUE	TRUE
7	700	**1000**	**100**	200				0,23	0,19	0,28	TRUE	TRUE
8	500	**1000**	**100**	400				~~0,01~~	~~0,03~~	~~0,02~~	~~TRUE~~ FALSE	TRUE
9	500	**1000**	**100**	400				~~0,02~~	~~0,04~~	~~0,03~~	~~TRUE~~ FALSE	TRUE
10	700	**1000**	**100**	200				~~0,01~~	~~0,04~~	~~0,04~~	~~TRUE~~ FALSE	~~FALSE~~ TRUE

CNECs to be monitored during Remedial Action optimization (MNECs)


Q
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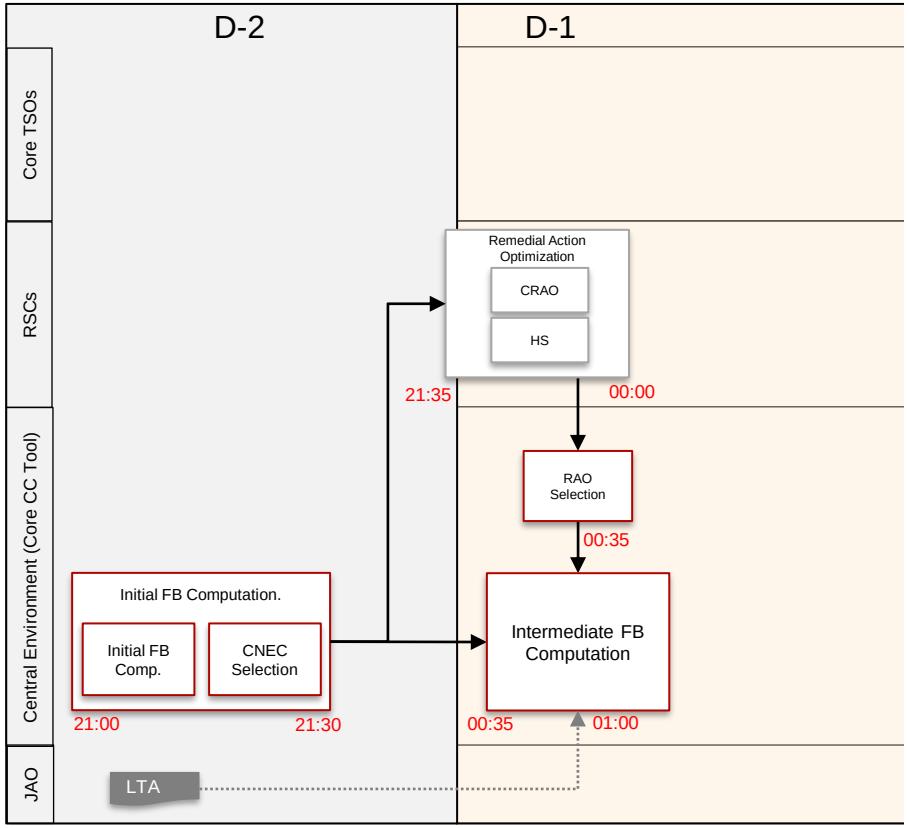
2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator



Optimization of non-costly remedial actions

- **Non-costly remedial actions** are **defined in CBCORA**
- **Goal** of the Non-costly Remedial Actions Optimization (NRAO):
  - ➔ **expand flow based domain** based on its objective function **by non-costly remedial actions**,
  - ➔ e.g. topological measures or change in tap position of a phase shifting transformer (PST).
- **Not guaranteed** that the **selected remedial actions** by the NRAO **must be activated in real time** as well. This depends on D-1 operational security analysis and the outcome of the DA auction.
- Two different optimization tools (CRAO and HS) are used.
- RAO Selection – results from the two tools are compared and the better one is selected to be used in the calculation.
- **Resulting set of RAs** is **applied to** the **CGM** which is used for later FB Computation.

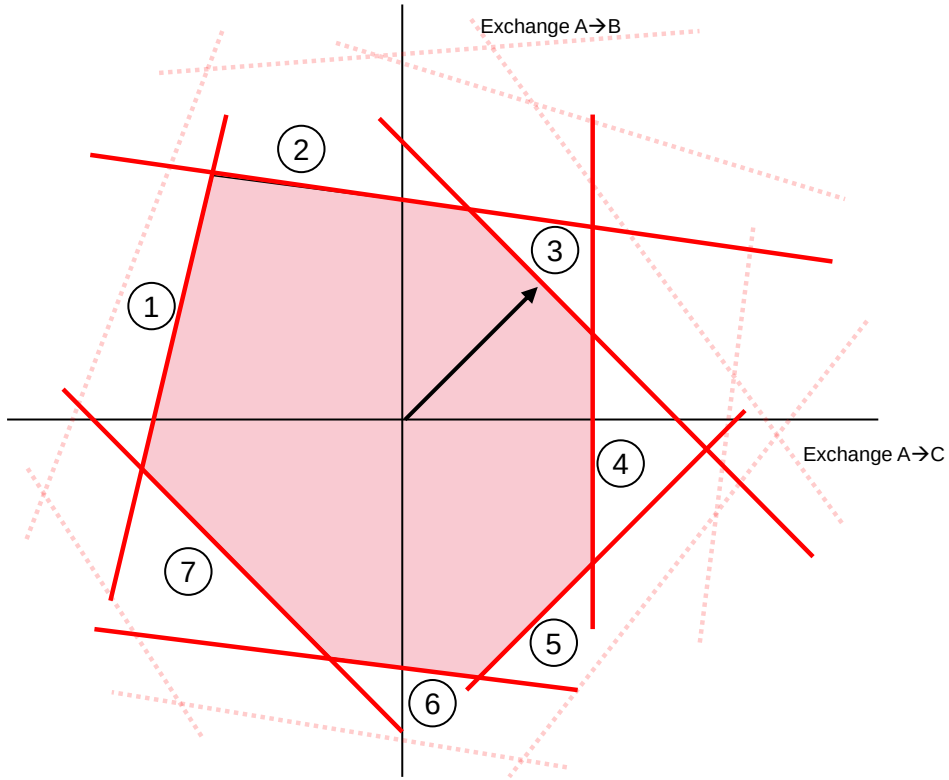
2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → **Remedial Action Optimization (NRAO)** → Intermediate FB computation → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

RSC

CNEC	RAM	Fmax	FRM	F_{ref}	AMR	LTA_{margin}	CVA IVA
1	800	**1000**	**100**	100			
2	700	**1000**	**100**	200			
3	600	**1000**	**100**	300			
4	500	**1000**	**100**	400			
5	500	**1000**	**100**	400			
6	600	**1000**	**100**	300			
7	700	**1000**	**100**	200			



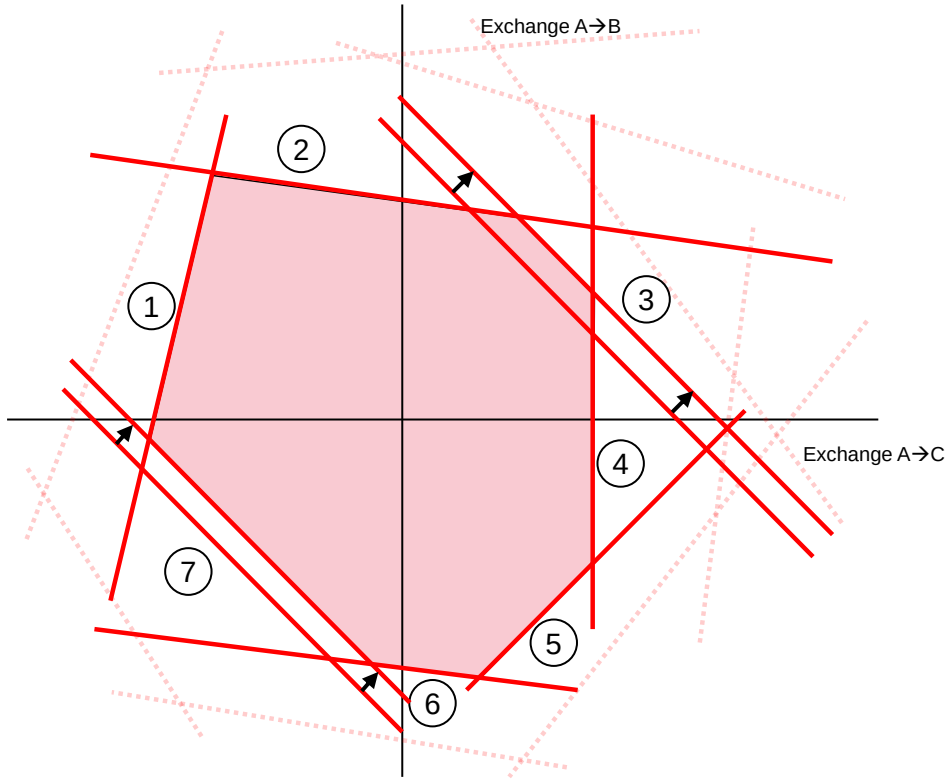
2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → **Remedial Action Optimization (NRAO)** → Intermediate FB computation → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

RSC

CNEC	RAM	Fmax	FRM	F_{ref}	AMR	LTA_{margin}	CVA IVA
1	800	**1000**	**100**	100			
2	700	**1000**	**100**	200			
3	650	**1000**	**100**	250			
4	500	**1000**	**100**	400			
5	500	**1000**	**100**	400			
6	600	**1000**	**100**	300			
7	650	**1000**	**100**	250			

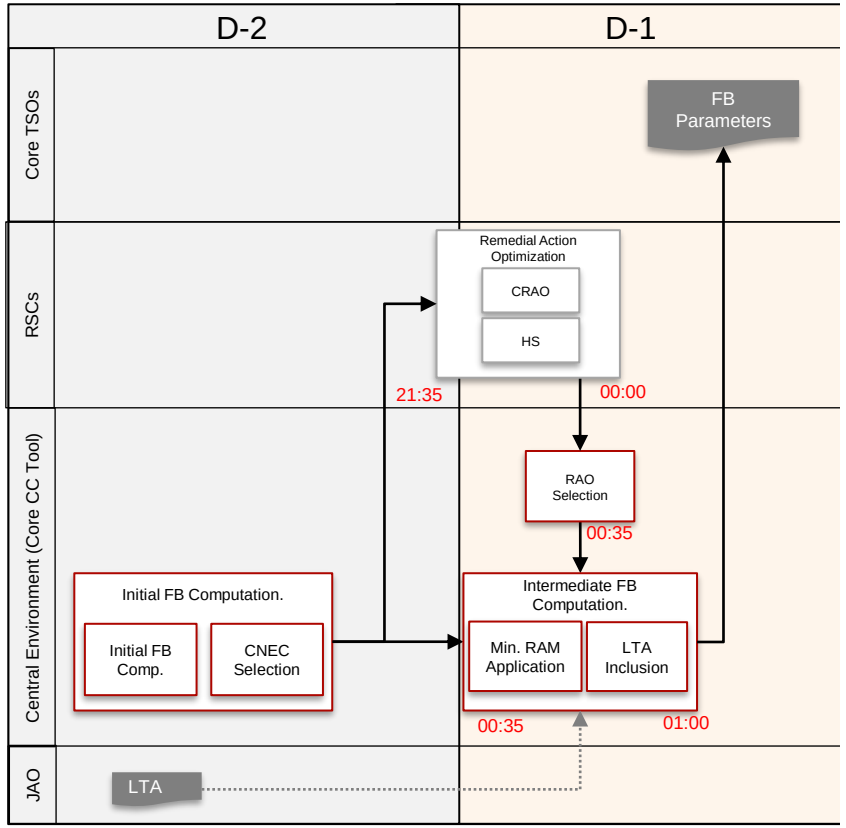


2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | **Intermediate FB computation** | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC



Intermediate flow based computation

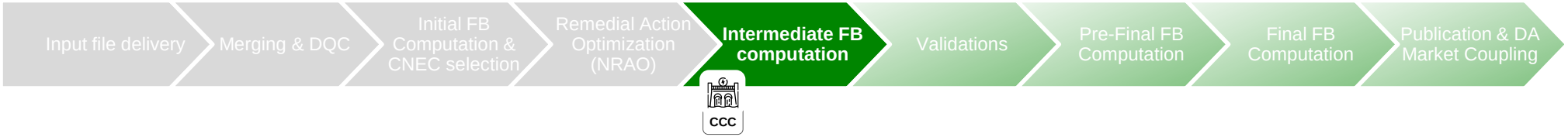
- **Intermediate flow based domain** with CNECs that have a PTDF above the threshold **is computed**. **Including** the **selected remedial actions** after the NRAO selection

- According to the requirements of the DA CCM, the **intermediate cross-zonal capacities are enlarged**:
  - Adjustment for minimum RAM **(minRAM)**
  - Long-term allocated **(LTA) capacity inclusion**

- Given the enlargement of the cross-zonal capacities, the **remaining available margin (RAM) per CNEC is calculated**

2. Core DA flow based capacity calculation process explained

Calculation example



Adjustment for minimum RAM (minRAM)

- **Aim**
  - Specific **percentage** of Fmax **reserved for commercial exchanges on all bidding zone borders**, incl those outside Core CCR
  - 2 conditions in the Capacity Calculation Methodology:
    - **Percentage of Fmax** for commercial exchanges – 70 % if a derogation or an action plan is not in force accordingly to the Article 16 of Regulation (EU) 2019/943.
    - **20 % Fmax** for internal Core commercial exchanges – beyond requirements of the Article 16 of Regulation (EU) 2019/943.
- **Computation**
  - RAM is increased by the Adjustment for the Minimum Remaining available margin (AMR)
- **Risk**
  - **Application of AMR creates** a **virtual capacity** on CNEC, which is **not supported by the physical calculation** and may **endanger operational security**

$$AMR = max \begin{pmatrix} R_{amr} \cdot F_{max} - F_{uaf} - \left(F_{max} - FRM - F_{0,Core}\right), \\ 0.2 \cdot F_{max} - \left(F_{max} - FRM - F_{0,Core}\right), 0 \end{pmatrix}$$

$F_{0,Core}$: flow per CNEC in the situation without commercial exchanges within the Core CCR
$F_{0,all}$: flow per CNEC in the situation without commercial exchanges within Continental Europe
F_{uaf}: flow resulting from cross-border exchanges over non Core borders, e.g. HU-UA

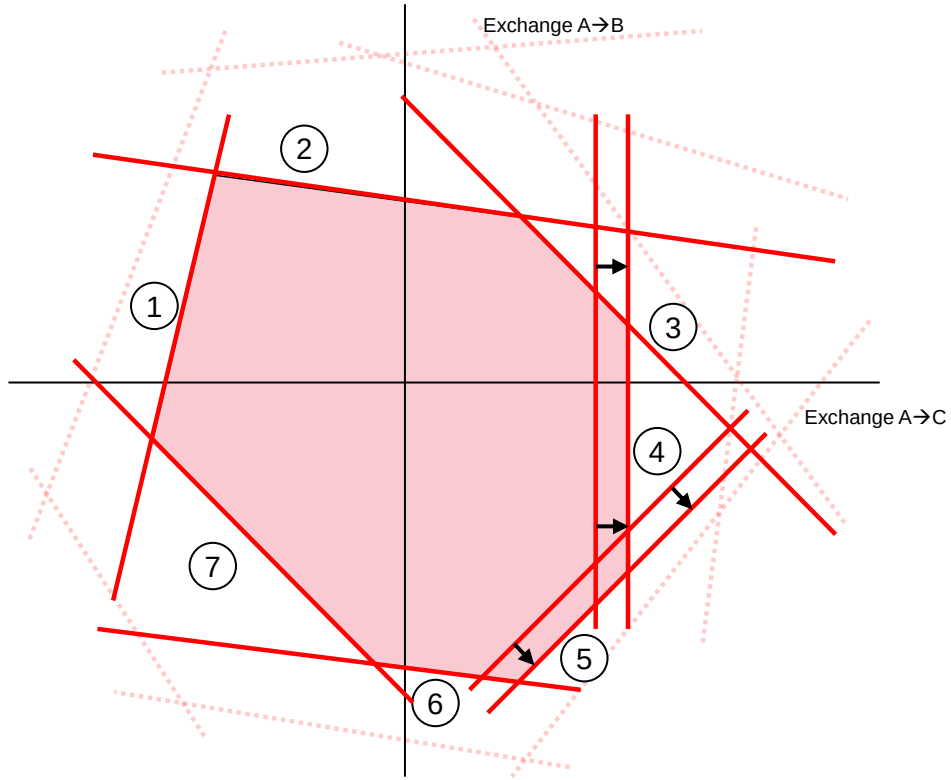
2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → **Intermediate FB computation** → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

CCC

CNEC	RAM	Fmax	FRM	$F_{0,core}$	AMR	LTA_{margin}	CVA IVA
1	800	**1000**	**100**	100			
2	700	**1000**	**100**	200			
3	650	**1000**	**100**	250			
4	550	**1000**	**100**	400	50		
5	550	**1000**	**100**	400	50		
6	600	**1000**	**100**	300			
7	650	**1000**	**100**	250			



2. Core DA flow based capacity calculation process explained

Calculation example

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CCC

CNEC	RAM	Fmax	FRM	$F_{0,core}$	AMR	LTA_{margin}	CVA IVA
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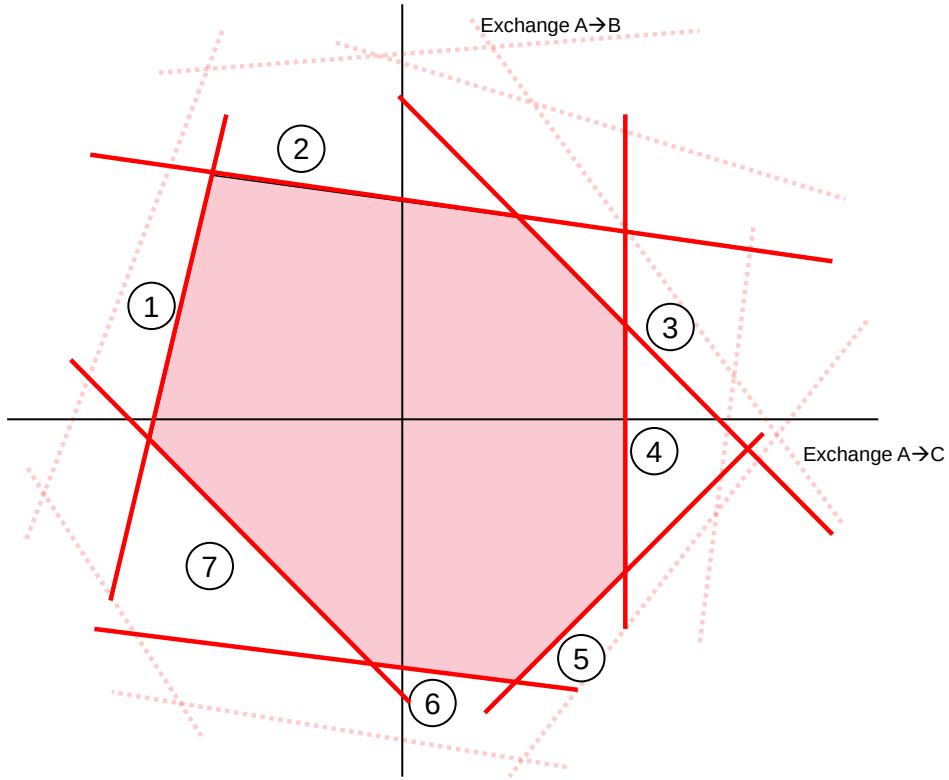
3	650	**1000**	**100**	250			
4	550	**1000**	**100**	400	50		
5	550	**1000**	**100**	400	50		
6	600	**1000**	**100**	300			
7	650	**1000**	**100**	250			

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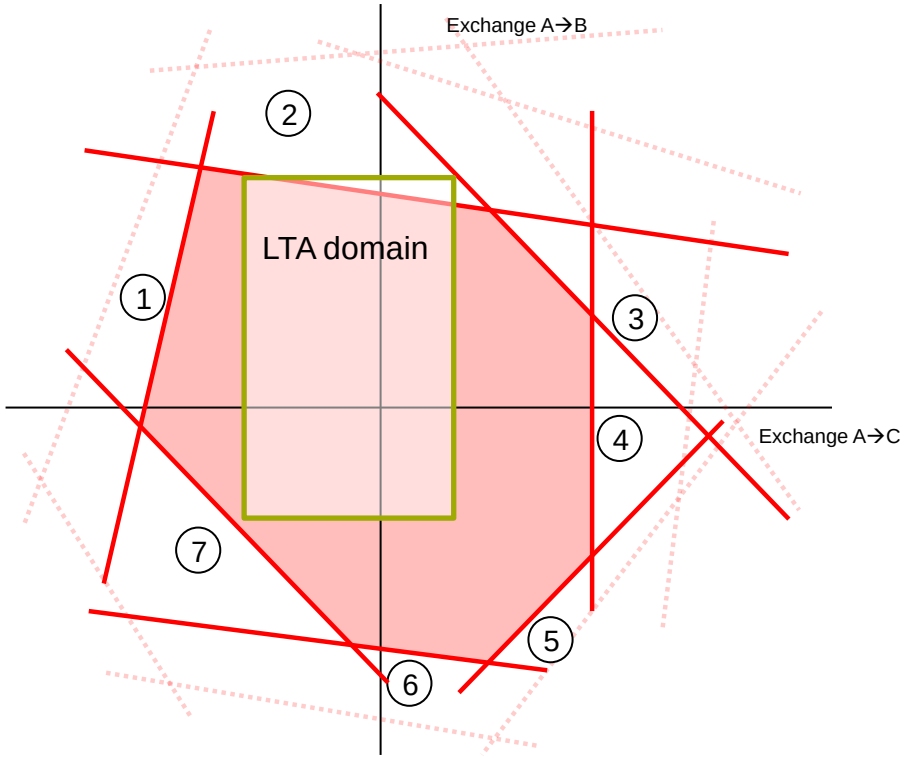
2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | **Intermediate FB computation** | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC



Long Term Allocation (LTA) Inclusion

- **Legal Framework**: According to Article 35 of the Regulation (EU) 2016/1719 establishing a guideline on Forward Capacity Allocation ('FCA'):
  - for BZBs where the capacity is allocated implicitly, **TSOs shall remunerate Long Term Transmission Rights (LTTRs) holders** with the **price spread** as long as the **price difference** is **positive in the direction of LTTRs**. LTTRs in this context are FTRs or non-nominated physical LTTRs.
- **Reason** for LTA inclusion
  - **Remuneration of LTTRs** in case of **insufficient capacities** coming from the **Flow Based computation** itself to **cover** the **financial remuneration of capacities allocated in long-term** time frame.
- **Two approaches** to perform LTA inclusion:
  - **Extended LTA formulation (ELI)** – default option according to the current Core DA CCM
  - LTA margin approach
    - Method used in the original Core DA CCM
    - Temporary / rollback option according to the current Core DA CCM

2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator

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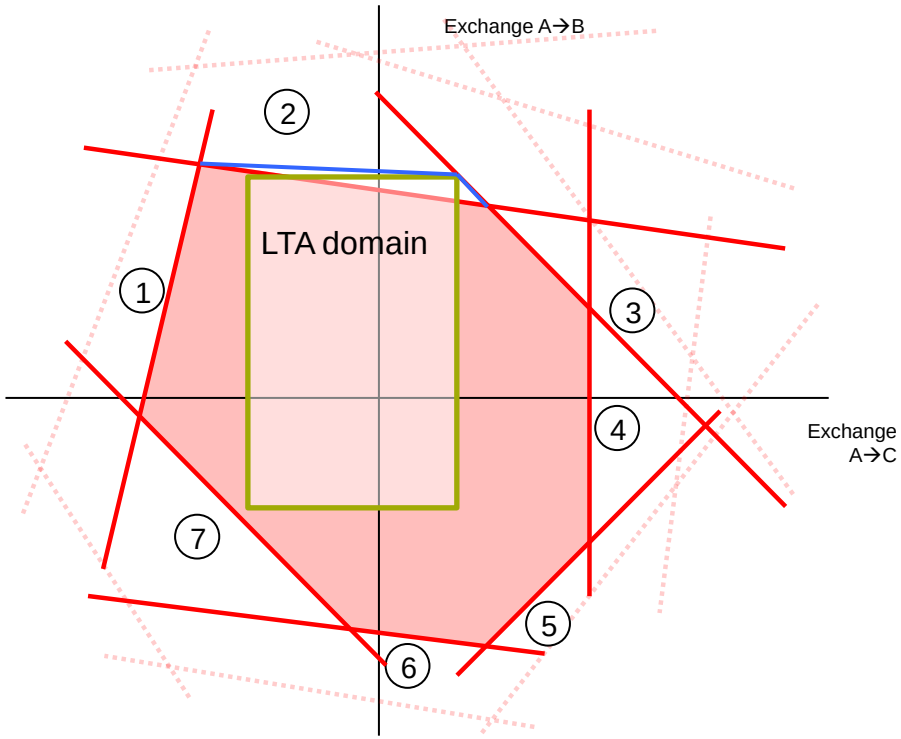
CCC



Extended LTA Formulation

- **Characteristic**
  - **Cross-zonal capacity** consists of a flow based **domain without LTA inclusion** and **LTA domain**
  - LTA inclusion is **performed directly in** the market coupling algorithm **Euphemia**
  - Resulting convex hull **minimizes** the **amount of virtual capacity**
- **Computation**
  - **Direct determination** of the **convex hull** is **not possible**
  - It is possible to **verify** whether a **given point is within the convex hull** without computing it
  - **SDAC** can **utilize entire convex hull** based on separately provided FB and Bilateral Exchange (BEX) domains
- **Graphical representations**
  - Convex hull covering both FB and LTA Domain
- **Benefits**
  - Proved in CWE that Extended LTA formulation (ELI) leads to comparable min/max net position and welfare with virtual branches approach
  - Fulfils LTA coverage conditions while limiting the extent of potential unsecure virtual capacity

2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → **Intermediate FB computation** → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

CCC

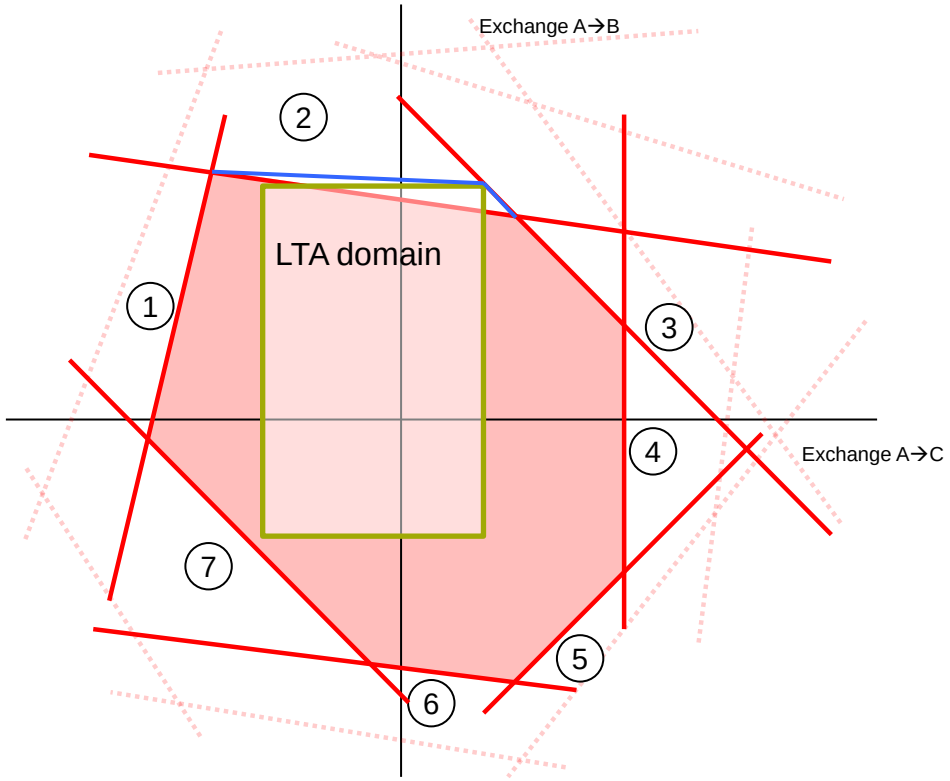
FB Domain

CNEC	RAM	Fmax	FRM	$F_{0,core}$	AMR	CVA IVA
1	800	**1000**	**100**	100		
2	700	**1000**	**100**	200		
3	650	**1000**	**100**	250		
4	550	**1000**	**100**	400	50	
5	400	**1000**	**100**	400	50	
6	600	**1000**	**100**	300		
7	650	**1000**	**100**	250		

LTA Domain

Oriented border	Limitation
A->C	100
C->A	200
A->B	800
B->A	180

Extended LTA Formulation

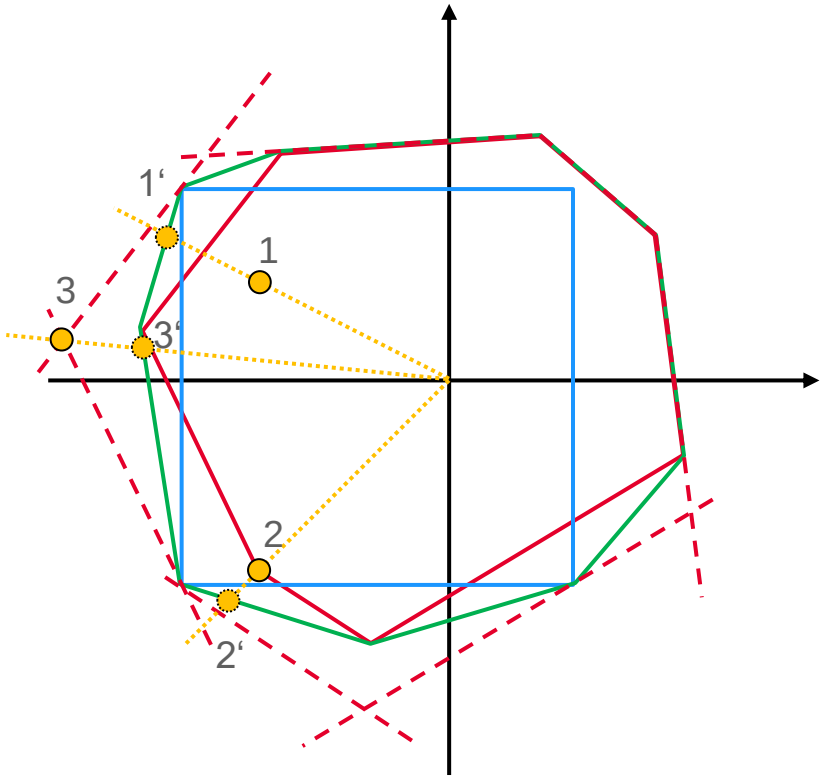


2. Core DA flow based capacity calculation process explained

Step 2 – Capacity calculation process by Coordinated Capacity Calculator

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | **Intermediate FB computation** | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC



Virgin domain
LTA domain
Balas domain
LTAmargin domain

Balas approach – Helper function to understand Extended LTA formulation

- A **way** how **to verify**, whether **given market point is feasible** by the DA cross-zonal capacity
- A **linear optimization algorithm**
  - **Assumption:**
    - Convex hull is created by scaling FB Domain and LTA Domain by coefficient alpha (and 1-alpha respectively)
  - **Objective function**:
    - maximize your market point (vector of net positions)
  - **Constraints**:
    - Split market point between LTA Domain and FB Domain
    - Flow resulting from the LTA market point is smaller than scaled LTA Domain
    - Flow resulting from the FB market point is smaller than scaled FB Domain
    - Alpha is greater equal to zero (result is in FB Domain) and smaller equal to one (result is in LTA Domain)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2. Core DA flow based capacity calculation process explained

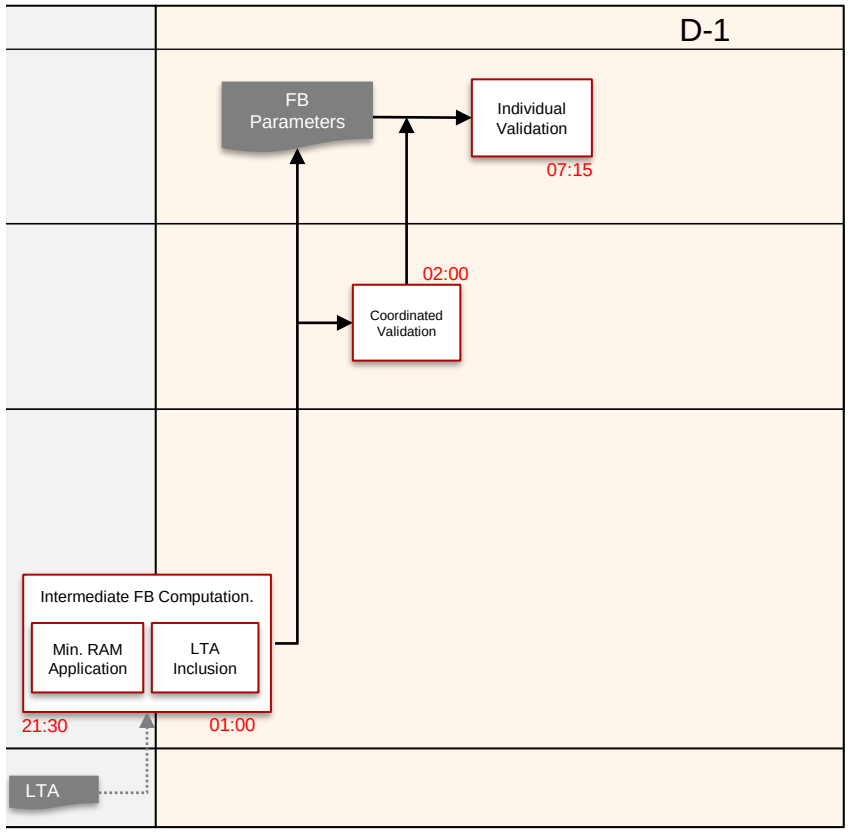
Step 3 – Capacity validation by Core TSOs in coordination with CCC

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | **Validations** | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC TSO

Validation

- **Objective:**
  - **Identify** and **apply measures** for **resolving** the **potential violation of operational security** given by the intermediate flow base domain results
- **Assessment** of sufficient **available remedial actions**
  - **Non-costly** remedial actions – PST and topological measures
  - **Costly** remedial actions – redispatch
- **Two-step process**:
  1. Coordinated Validation
  2. Individual Validation



2. Core DA flow based capacity calculation process explained

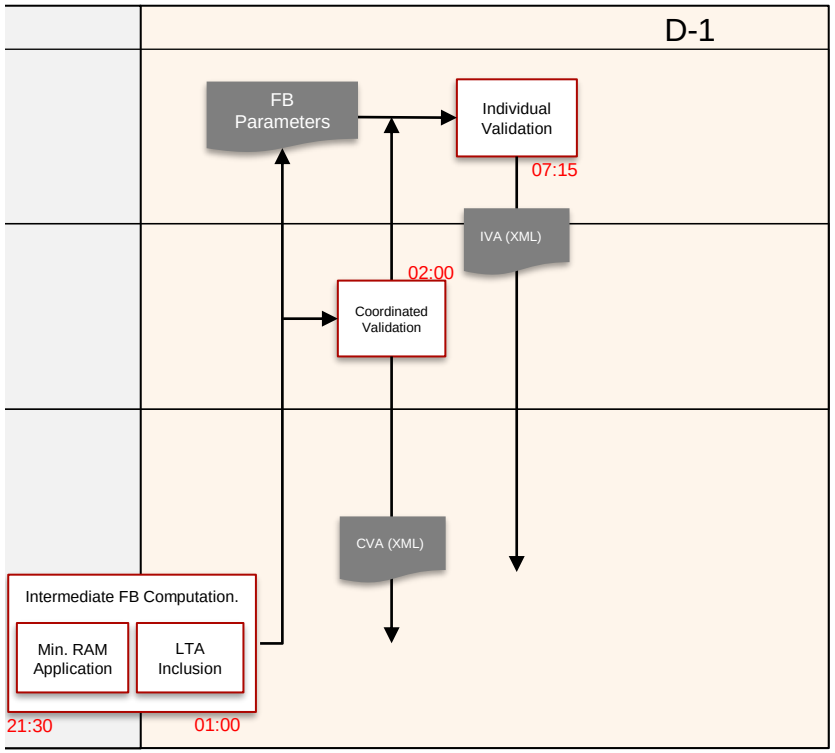
Step 3 – Capacity validation by Core TSOs in coordination with CCC

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | **Validations** | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC TSO

Coordinated Validation

- Performed by the **CCCs** (RSCs) in cooperation with the **TSOs**
- **Main focus**: **exchange** of information **on all expected** available (non-costly and costly) **RAs** and the **validation** whether any **potential violation of system security** can be avoided with the available RAs
- **No sufficient remedial action** available → **relevant TSOs** in coordination with CCC **may apply validation adjustment** (CVA) to decrease the RAM



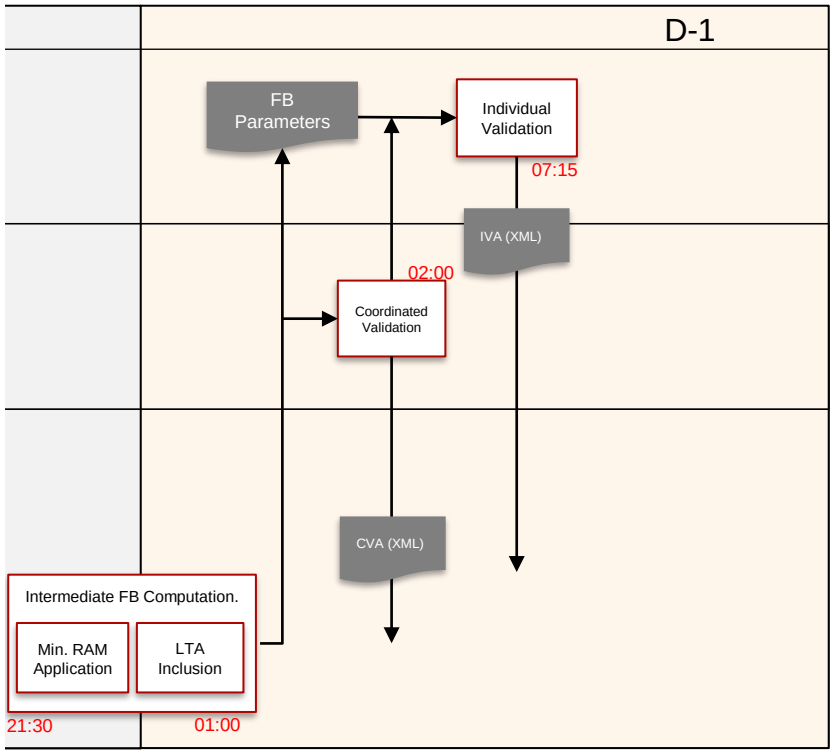
Gradual implementation in Core CCR

- **Simplified approach** (first years of operation)
  - Exchange of information on the available RAs
  - CCC's advice to individual TSOs based on its operational experience
- **Full approach**
  - Coordinated assessment
  - 18 months after implementation→ TSO proposal
  - not specified yet

2. Core DA flow based capacity calculation process explained

Individual Validation

- **Based on** results of the **coordinated validation**
- **Performed by the TSOs** in their **own control area**
- TSO may apply **individual validation adjustment** (IVA) in the following situations:
  - Occurrence of **exceptional con**tingency or **forced outage**
  - When all available **RAs** are **not sufficient** to ensure operational security
  - **Mistake in input data**, that leads to an **overestimation** from an operational security perspective
  - Potential need to **cover reactive power flows** on certain CNECs
- In **exceptional cases**, **TSO may add an internal CNEC** to the **final list of CNECs** if all available RAs are not sufficient to ensure operational security on an internal network element / contingency
- IVA application is **subject to a detailed reporting**



2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | **Validations** | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

CCC TSO

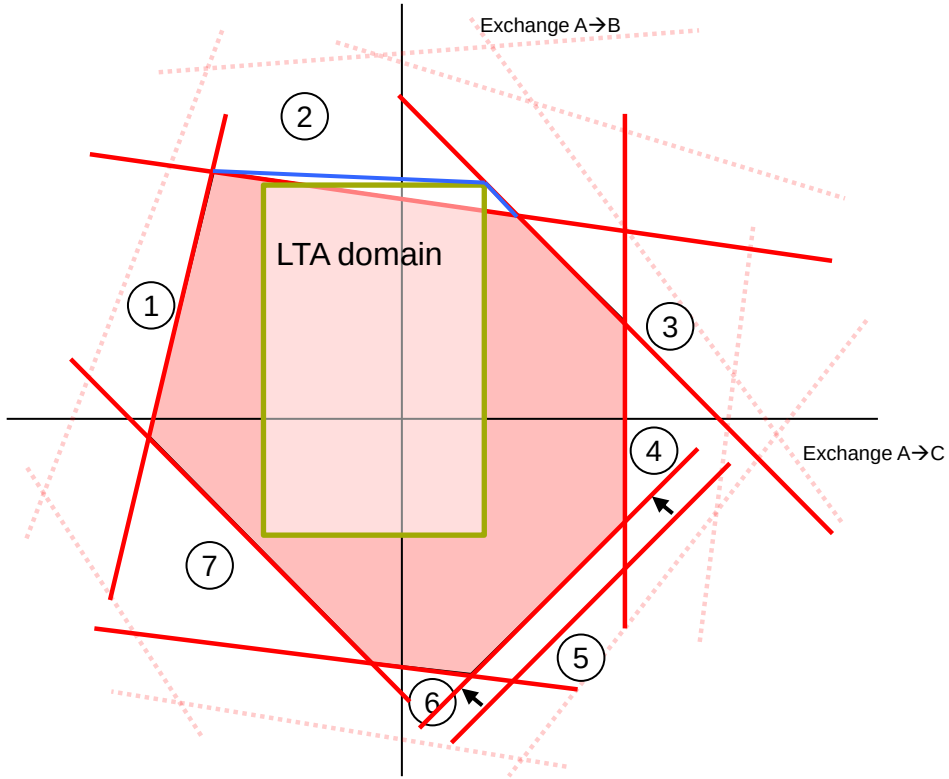
FB Domain

CNEC	RAM	Fmax	FRM	$F_{0,core}$	AMR	CVA IVA
1	800	**1000**	**100**	100		
2	700	**1000**	**100**	200		
3	650	**1000**	**100**	250		
4	550	**1000**	**100**	400	50	
5	400	**1000**	**100**	400	50	150
6	600	**1000**	**100**	300		
7	650	**1000**	**100**	250		

$$\overrightarrow{RAM_{bn}} = \overrightarrow{RAM_{bv}} - \overrightarrow{CVA} - \overrightarrow{IVA}$$

LTA Domain

Oriented border	Limitation
A->C	100
C->A	200
A->B	800
B->A	180

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2. Core DA flow based capacity calculation process explained

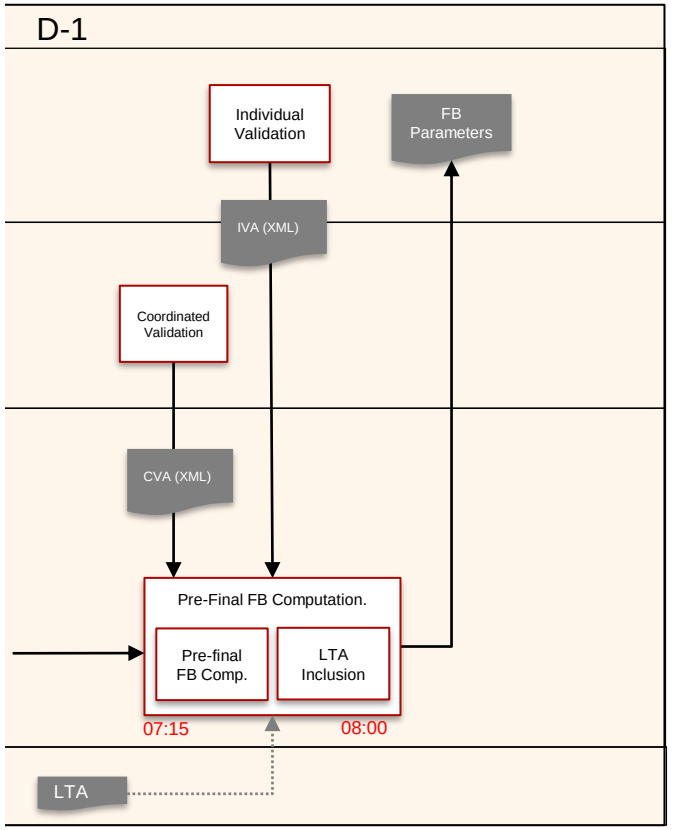
Step 4 – Final capacity calculation by CCC

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | **Pre-Final FB Computation** | Final FB Computation | Publication & DA Market Coupling

CCC

Pre-final flow-based computation

- The pre-final cross-zonal capacity consists of the **presolved flow based parameters shifted to zero balance** + **LTA restrictions**:
  - Performed **to publish FB parameters** for the Market **before** the **LT adjustment**
  - The **LT nominations** are **set to zero,** so the **resulting FB parameter correspond to Net Transfer Capacity values** and not to Available Transfer Capacity values
  - Only the **pre-final FB parameters** are **sent to JAO** for publication



2. Core DA flow based capacity calculation process explained

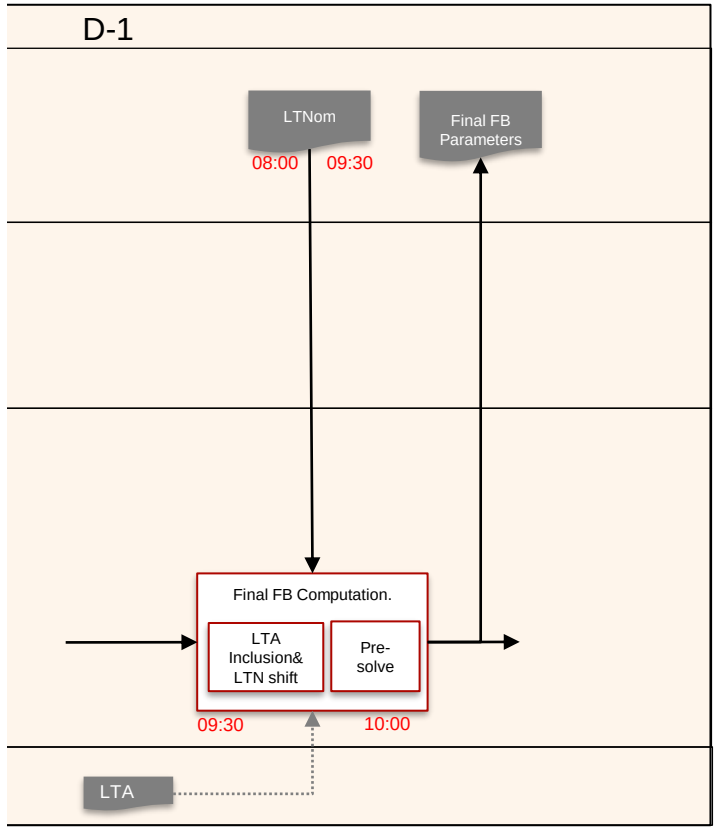
Step 4 – Final capacity calculation by CCC

Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | **Final FB Computation** | Publication & DA Market Coupling

CCC TSO

Final flow-based computation

- Performed based on the **results of coordination and individual validation**
- The **calculated capacity** (both FB Domain and LTA Domain) is **adjusted based on the flows resulting from long term nominations**
  - The domain is shifted and computed at the Long-Term Nominations (LTNom) reference point
  - The LTNoms of PTR borders have to be delivered to the capacity calculation tool until 09:30 D-1



2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → Intermediate FB computation → Validations → Pre-Final FB Computation → **Final FB Computation** → Publication & DA Market Coupling

CCC TSO

FB Domain

CNEC	RAM	Fmax	FRM	$F_{0,core}$	AMR	CVA IVA
1	800	**1000**	**100**	100		
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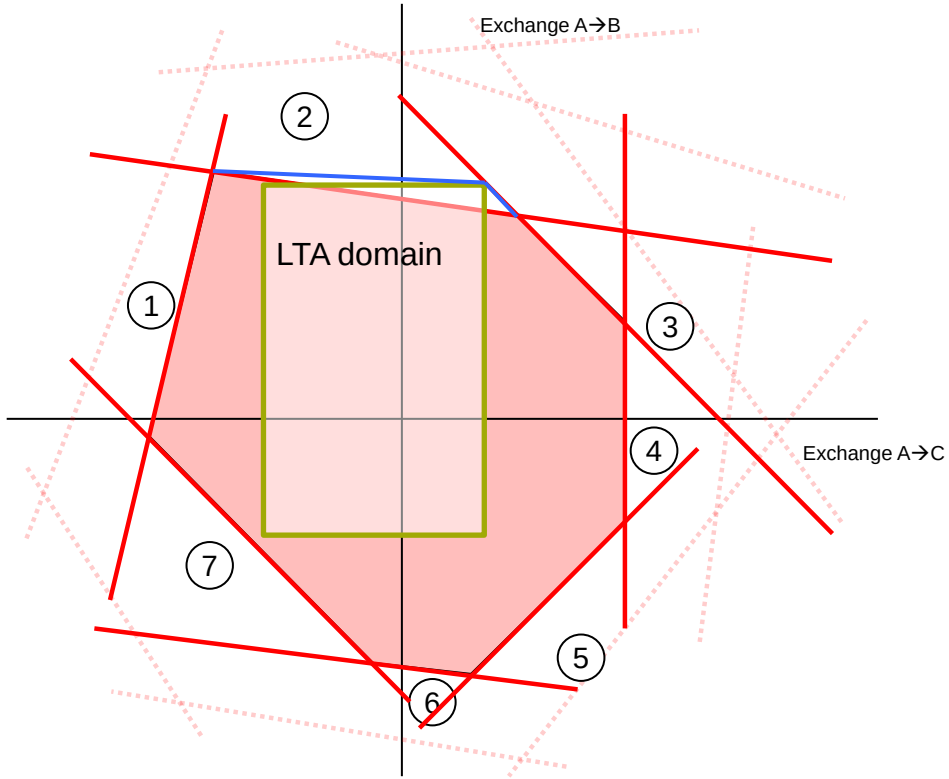


LTA Domain

Oriented border	Limitation
A->C	100
C->A	200
A->B	800
B->A	180

2. Core DA flow based capacity calculation process explained

Calculation example

Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → Intermediate FB computation → Validations → Pre-Final FB Computation → **Final FB Computation** → Publication & DA Market Coupling

CCC TSO

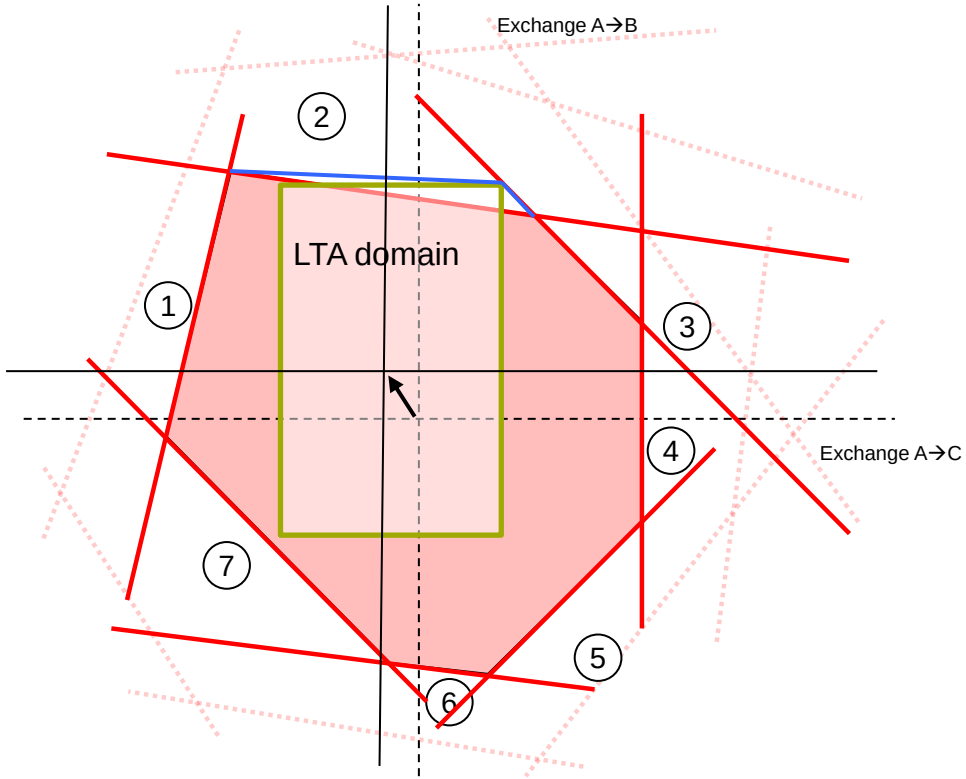
FB Domain

CNEC	RAM before LTN	Final RAM
1	800	750
2	700	750
3	650	650
4	550	600
5	400	450
6	600	650
7	650	650

$$\overrightarrow{RAM_f} = \overrightarrow{RAM_{bn}} - \vec{F}_{LTN}$$

LTA Domain

Oriented border	Limitation before LTN	Final Limitation
A->C	100	150
C->A	200	150
A->B	800	750
B->A	180	230



2. Core DA flow based capacity calculation process explained

Step 4 – Final capacity calculation by CCC

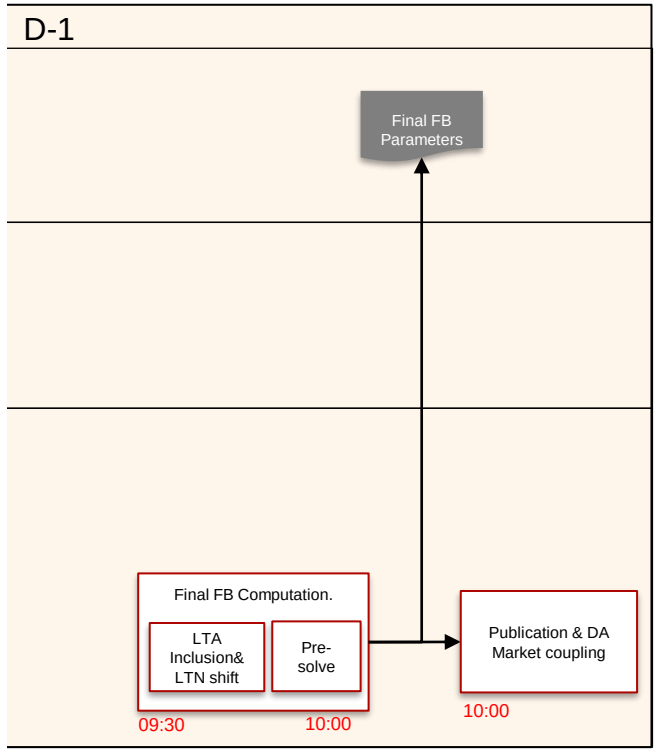
Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | Final FB Computation | **Publication & DA Market Coupling**

JAO

Publication & DA Market Coupling

- **Results** generated during the day-ahead flow based capacity **calculation process** are **published** by JAO on a dedicated online communication platform **toward the market participants**

- The **Market Clearing Point** (MCP) from the DA Market Coupling is the result of the set of NPs calculated from the final cross-zonal capacity (FB Domain + LTA Domain)



3. Core DA flow based capacity calculation fallback procedures

Possible triggers for fallback

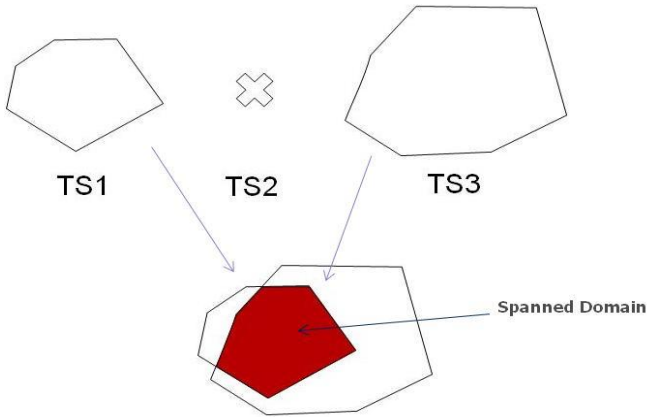
- Technical **failure** in the tool, **error** in communication infrastructure, **corrupted** or **missing input data**

Multiple fallback options

- **Re-use** the **initial** FB calculation **results**
  - Use the initial FB calculation results to the computation of the final FB parameters

- **Spanning method**
  - If the flow based capacity **calculation fails** for **strictly less than three consecutive hours**
  - **Union of previous and subsequent available FB parameters**; minimum of previous and subsequent LTA domain

- **Default FB parameters**
  - When the flow based capacity calculation **fails for three or more consecutive hours**
  - **LTA capacity increased** by minimum of the two **adjustments values provided** by the TSOs on each side of the bidding zone border

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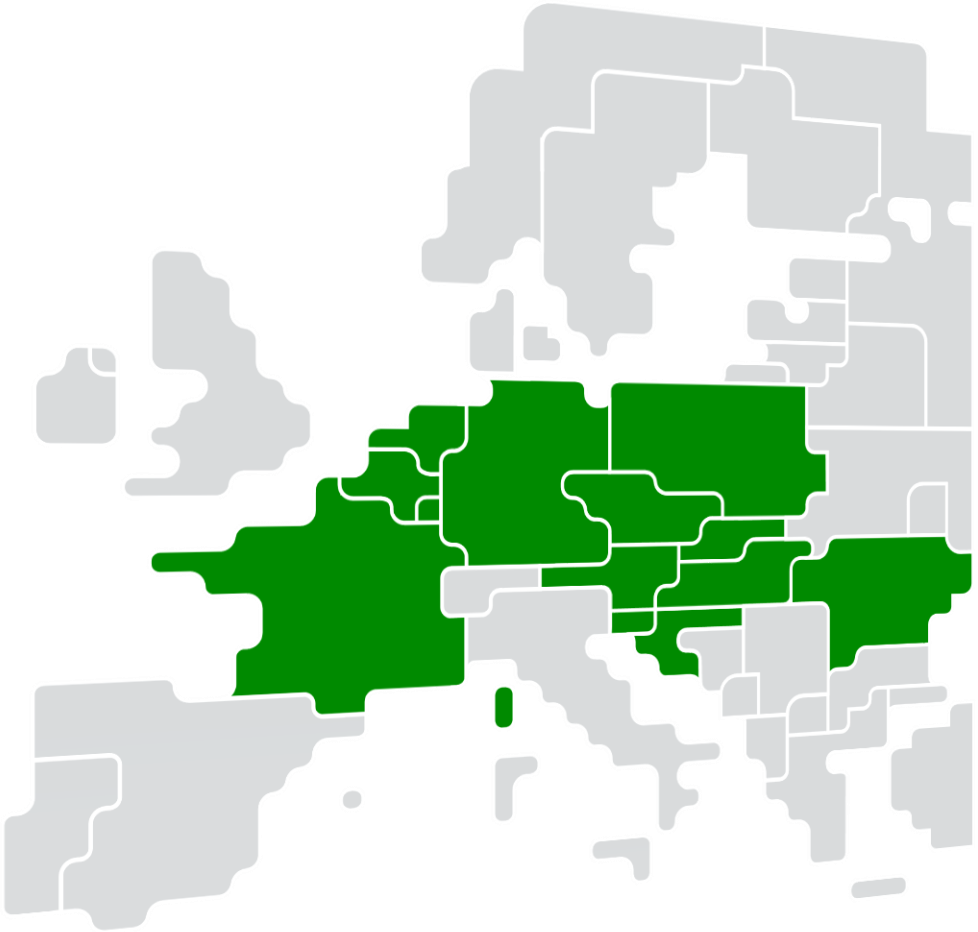
Core Flow-based Intraday Capacity Calculation Methodology



4. Core Intraday Capacity Calculation Methodology – Core ID CCM

Core IDCC Process and Roadmap

The Core Intraday capacity calculation process has similarities to the Core FB DA process

- Both methodologies follow a **flow based approach**
- Most significant **difference**: **no minRam adjustment or LTA inclusion** in Intraday capacity calculation
- **IDCC tool design** is building on the **fundamental components** of the **DA CC tool**

- **Three capacity calculation processes** (gradual implementation):

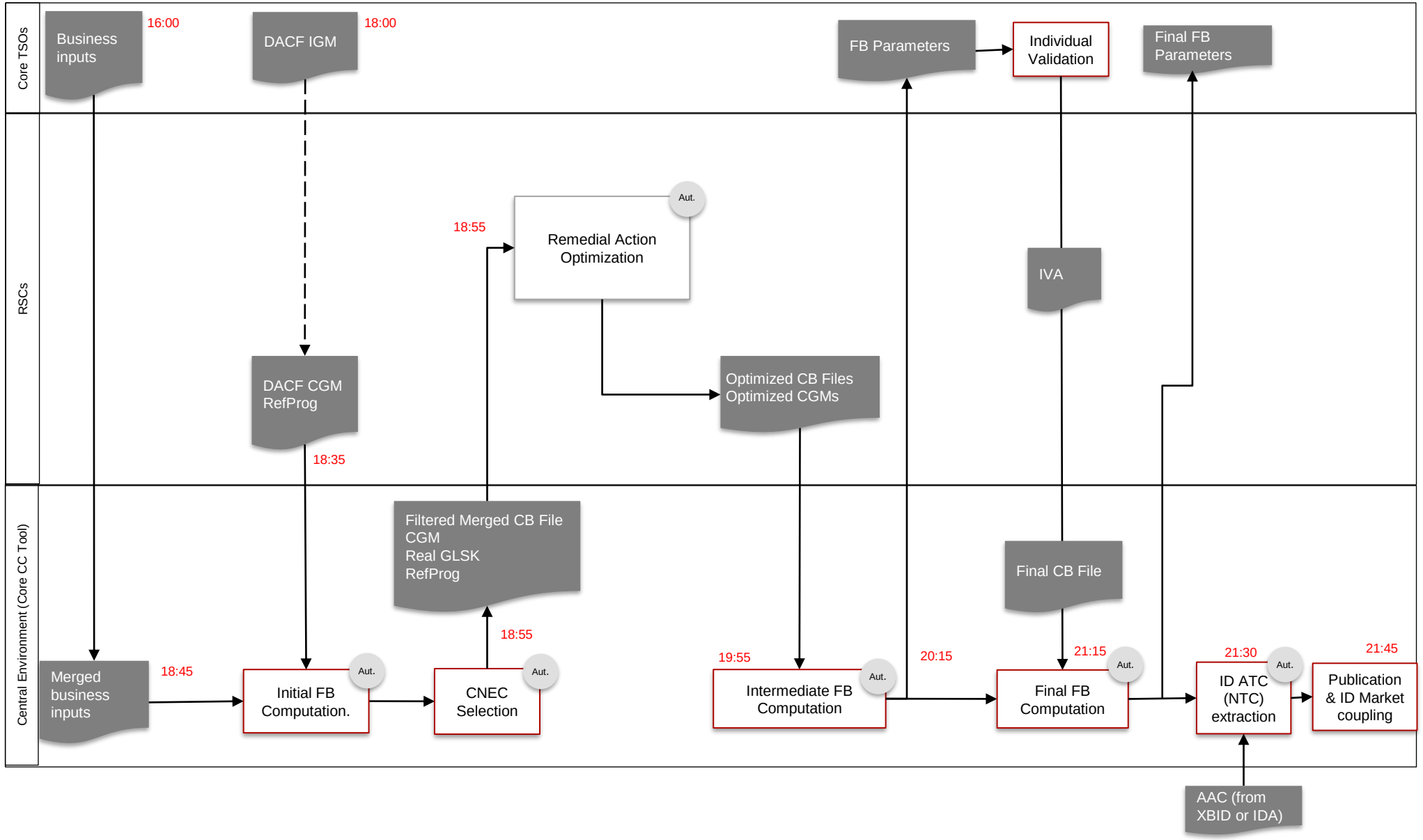
3 auctions will be introduced into SIDC

- Continuous intraday trading will be interrupted to perform intraday auctions (IDA)
- IDA uses fresh capacity from the IDCC process
- After IDA, follow the SIDC continuous trading

# IDA	Auction	Delivery Period
IDA1	D-1 15:00	D 00:00 – D+1 00:00
IDA2	D-1 22:00	D 00:00 – D+1 00:00
IDA3	D 10:00	D 12:00 – D+1 00:00

4. Core Intraday Capacity Calculation Methodology – Core ID CCM

Current High-Level Core IDCC Business Process

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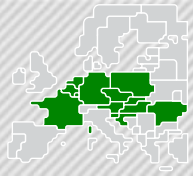
Key takeaways Core FB CC



The Core Flow Based Day-ahead capacity calculation is **a new regional coordinated** process.

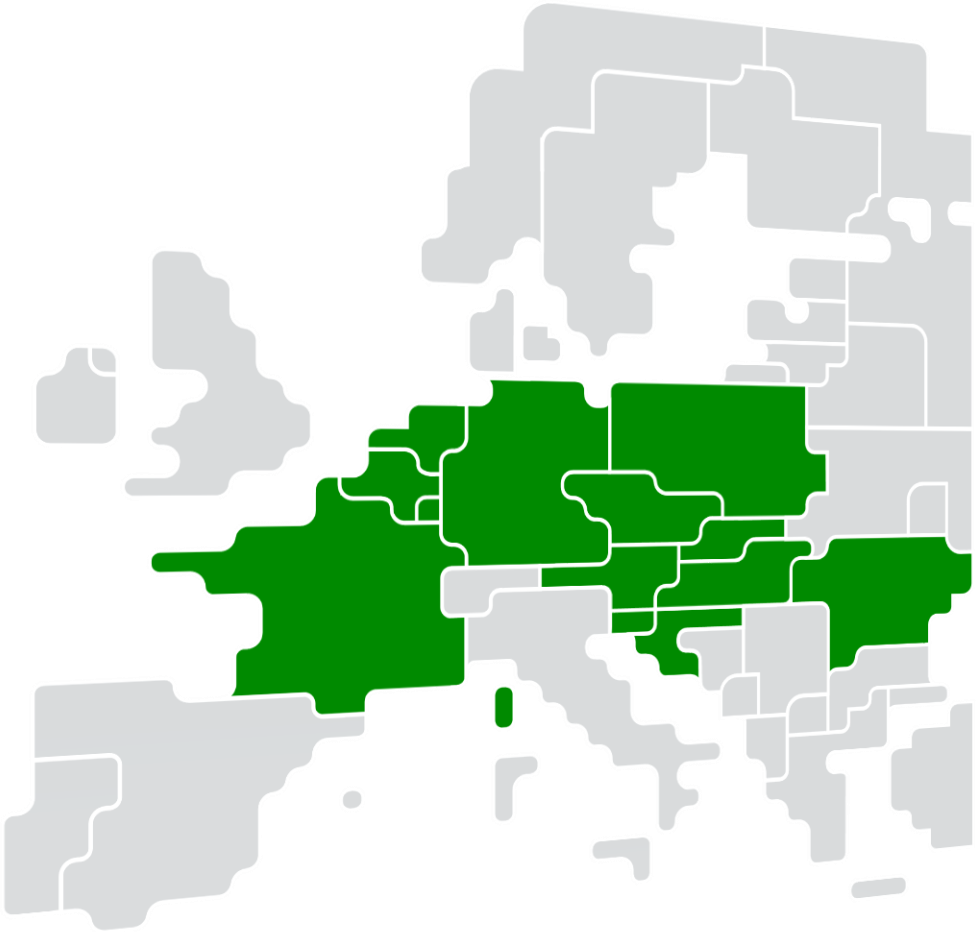
- **Aim:**
  - Calculate precise, efficient, transparent and secure cross-zonal capacities for the European Single Day Ahead Market.

- **Technical specifics:**
  - The calculation is based on the D-2 predictions.
  - Many parties are involved in the coordinated capacity process.

- **Final cross-zonal capacities consist of 2 parts:**
  - **Flow based Domain**
    - Remaining Available Margin (RAM): Capacity of a network element available for commercial exchanges
    - Power Transfer Distribution Factor (PTDF): Sensitivity of a network element to cross-zonal exchanges
  - **LTA Domain**

General introduction - afternoon

22 November 2021



Introduction

Today's speakers

MODERATORS

Ruud OTTER
Core Consultative Group's co-Chair, TenneT BV

Gertjan MEUTGEERT
Core DA FB Project Manager, Magnus

SPEAKERS

Michael NEMY
Core FB expert, CEPS

Adele ROY
Core MC expert, EPEX-SPOT

Steve VAN CAMPENHOUT
Core FB expert, Elia

Syed RAHMAN
JAO Publication Platform

Marius SCHRADE
Core FB expert, 50Hertz

Today's participants: more than 400 registrations

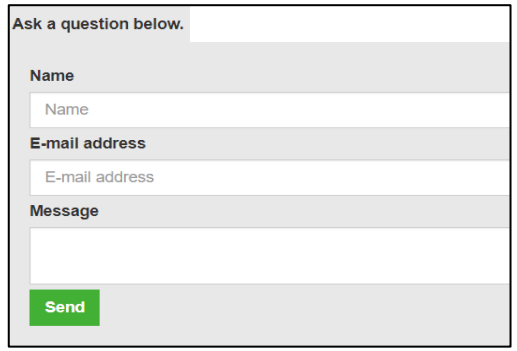
Introduction

Practicalities

- Interaction during the webinar

Q&A

- Ask questions via the portal
- Questions that cannot be answered today, as well as the full set of Q&As will be shared with participants afterwards



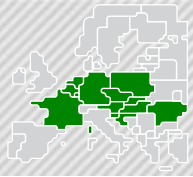
Mentimeter

- Have your phone ready for an interactive quiz with Mentimeter

Mentimeter

- Session will be recorded and published via ENTSO-E Core CCR page afterwards

Agenda



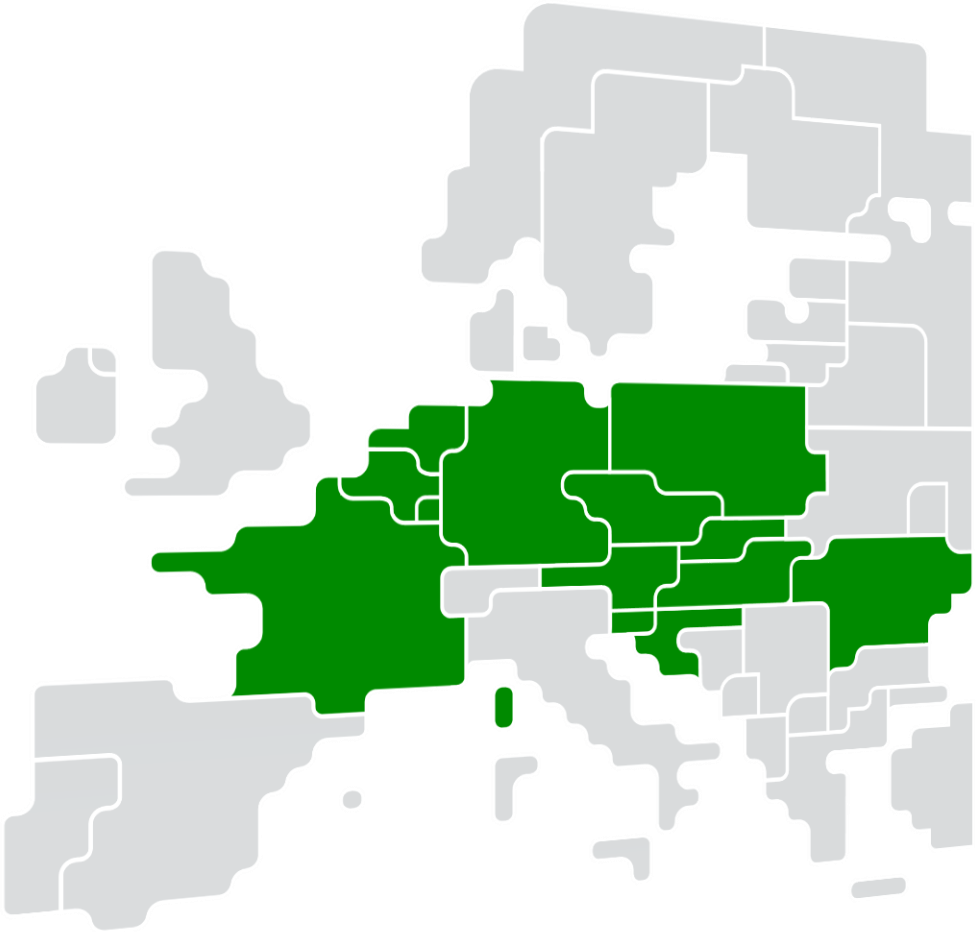
MONDAY NOVEMBER 22nd 2021 – morning session 09.00-12.00

09.00	INTRODUCTION Ruud Otter & Gertjan Meutgeert
	• General background (Ruud Otter)
	• Capacity calculation (Michael Němý)
	• Capacity allocation (Adèle Roy)
10.15	Q&A SESSION
10.30	CORE DA CAPACITY CALCULATION METHODOLOGY Michael Němý
	• Core DA high-level business process
	• Detailed explanation Core DA FB capacity calculation methodology
11.45	Q&A SESSION
12.00	*Closure*

MONDAY NOVEMBER 22nd 2021 – afternoon session 13.00-16.00

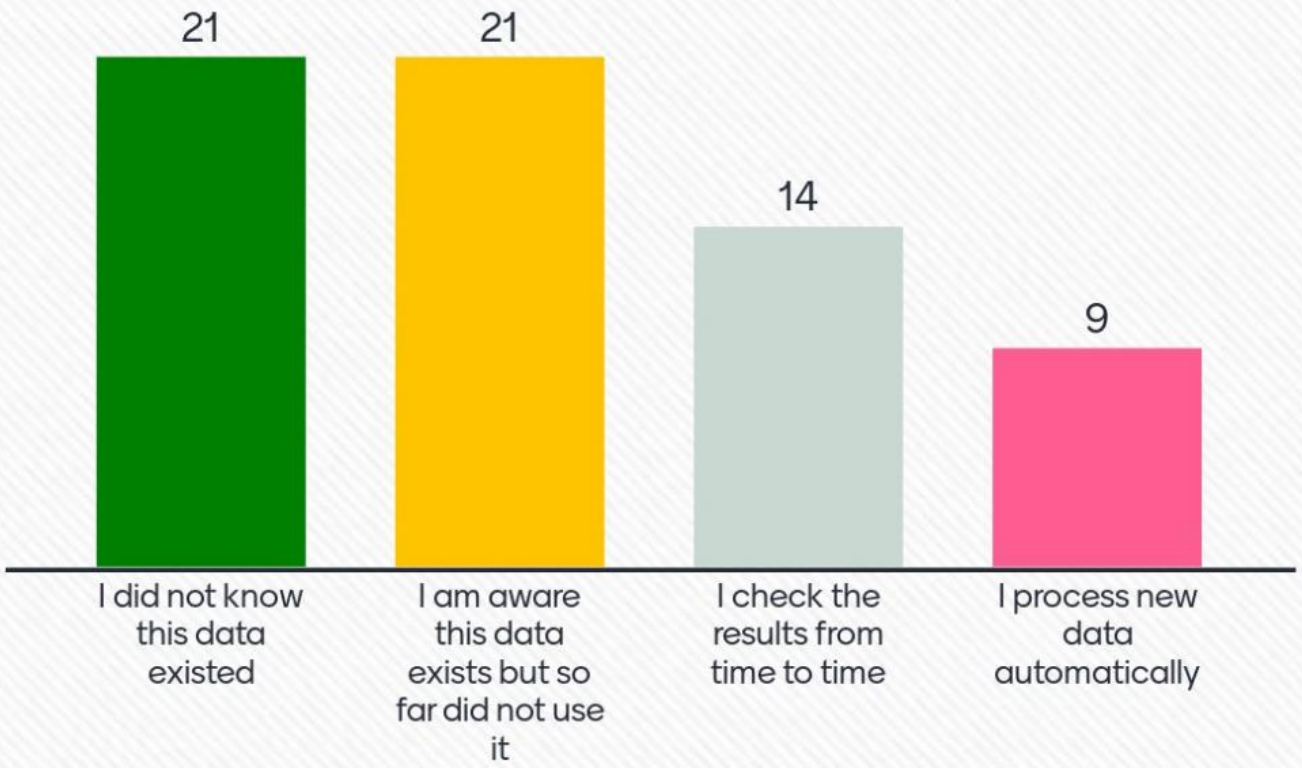
13.00	INTRODUCTION Ruud Otter & Gertjan Meutgeert
13.10	CORE TRANSPARANCY FRAMEWORK Steve Van Campenhout
13.30	CORE PUBLICATION OF DATA Steve Van Campenhout / Syed Rahman / Marius Schrade
	• Explanation Core Publication tool
	• Explanation Monthly KPI reports
15.30	Q&A SESSION
16.00	*Closure*

Core Transparency Framework and Publication of Data




go to
code
4699 1149
Mentimeter
Or
scan
menti.com

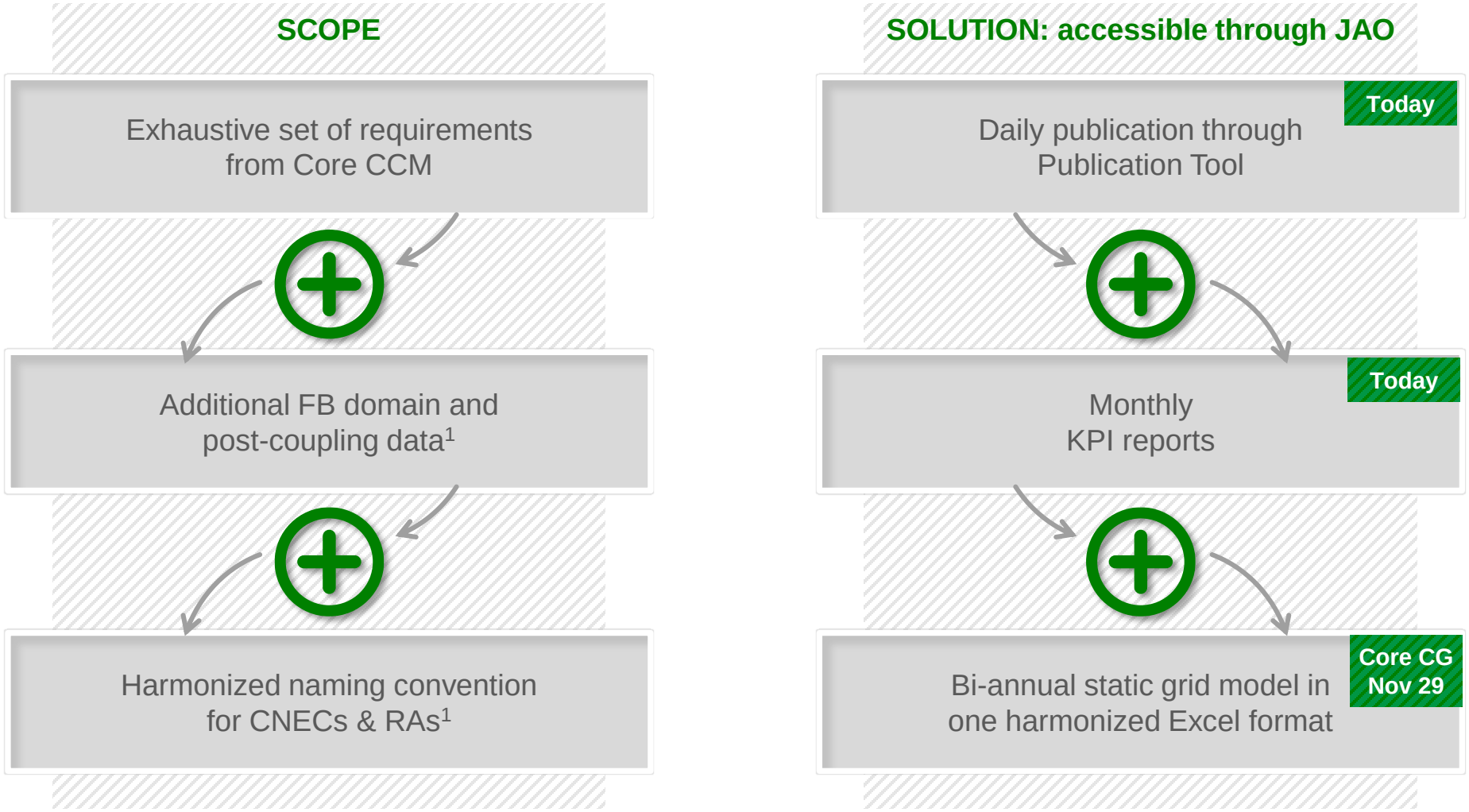
Publication platform & transparency - How extensively have you been analysing available data from the Core parallel run?



Publication platform & transparency - What type of analysis do you perform based on the publication platform?

Transparency & Publication

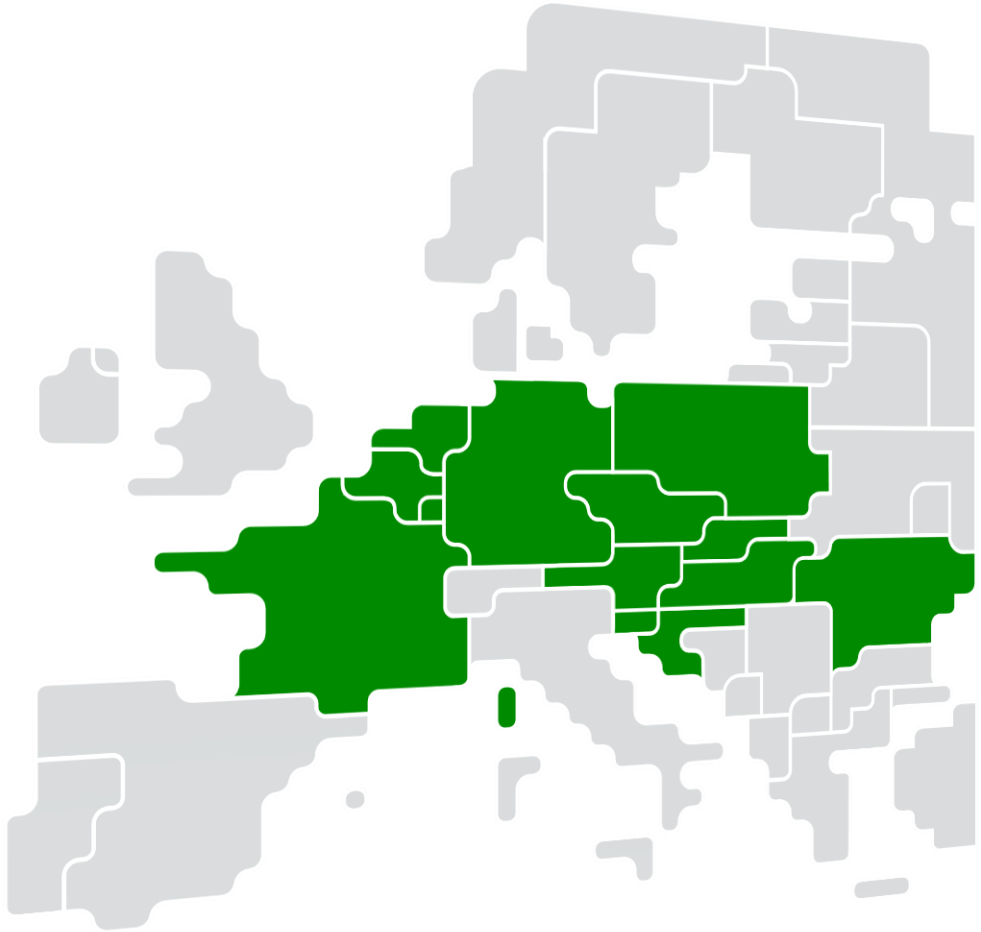
Framework



1) As previously aligned between Core TSOs and MPs, building upon CWE experience

PART 1: Publication Tool

Publication Tool | JAO



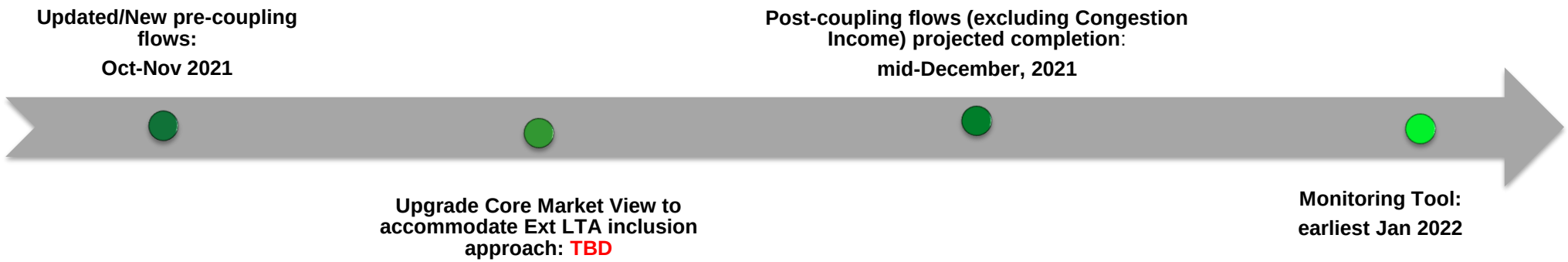
Transparency & Publication

Publication Tool: introduction

A modern website-based solution supporting web services. Better performance stability compared to the existing Excel based Utility Tool in CWE.

- Main functionalities:
  - Web based solution
  - Search capability
  - Download/export functionality (csv etc.)
  - Supporting web services

- Dec 2020: publication tool went live, around the time Core TSOs started the progressive EXT // run
  - Oct/Nov 2021: finalization of pre-coupling flows, including new information
    - LTA domain
    - RAs used by the NRAO
    - Allocation constraints
    - Minimum capacity requirements following CEP70 implementation
  - Dec 2021: post-coupling data (exception: Congestion Income)
  - Jan 2022: monitoring on daily basis the data completeness

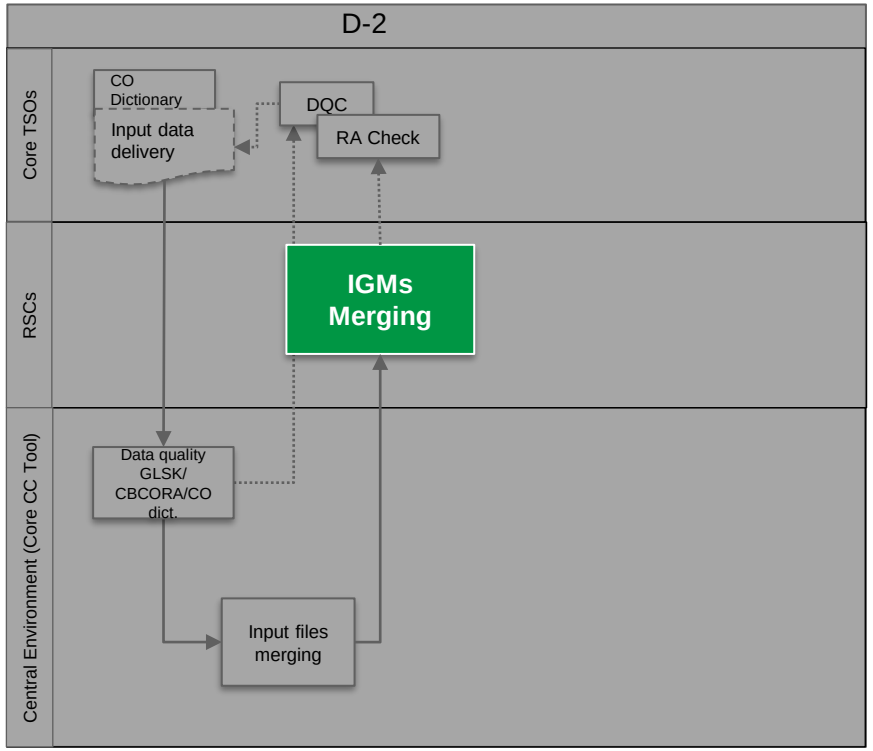


Transparency & Publication

Publication Tool: DEMO

S. VAN CAMPENHOUT + SYED RAHMAN

Input file delivery | **Merging & DQC** | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling



Core TSOs publish the forecasted information contained in the CGM

Page ‘D2CF’

- For capacity calculation purposes, each Core TSO generates one individual grid model per MTU.
- The D2CF page publishes the assumptions reflected in the IGM for each Core hub/TSO: vertical load, generation and Core net position

Page ‘RefProg’

- The RefProg page publishes the exchange data per border that are used for merging of the European grid models, including HVDC-interconnectors within the synchronous area in MW

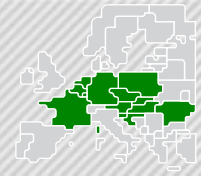
Page ‘Reference Net Position’

- This page displays the reference net position assumed for creating the CGM for non-core hubs in the common grid model
- It concerns the global (SDAC) Net Positions

Transparency & Publication

Publication Tool: DEMO

S. VAN CAMPENHOUT + SYED RAHMAN



Input file delivery → **Merging & DQC** → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → Intermediate FB computation → Validations → Pre-Final FB Computation → Final FB Computation → Publication & DA Market Coupling

D2CF

IGM assumptions

D2CF per Hub (in MW)

Date	Vertical Load									Generation											Core Net Position			
	AT	BE	CZ	DE	FR	HR	HU	NL	PL	BE	CZ	DE	FR	HR	HU	NL	PL	RO	SI	SK	FR	HR	HU	NL
2021-11-04 00:00:00	6004	8150	5938	29019	50134	762	4518	5419	13737	8957	9377	32096	51738	406	2981	7289	13834	5624	1106	2124	-4239	-805	-1890	2031
2021-11-04 01:00:00	5950	7852	5943	27224	48255	614	4214	5640	13470	7904	8862	30472	50252	399	3084	7274	13921	5639	1054	2006	-3905	-639	-1475	1795

Refprog

Date	AT▸CZ	AT▸HU	AT▸SI	BA▸HR	BE▸DE	BE▸NL	BE▸UK	BG▸TR
2021-11-04 00:00:00	-1890	505	753	-357	-126	-1546	710	-234

Exchanges on borders of the Continental European grid model

Reference Net Position

Date	AL	BA	BG	CH	DK1	ES	GR	IT	ME	MK	PT	RS	TR	UA
2021-11-04 00:00:00	-37	109	2076	-3349	1632	1366	-1048	-5152	-519	-448	-454	-667	284	256
2021-11-04 01:00:00	-49	163	1958	-3602	1687	2033	-1203	-4746	-360	-410	-510	-707	284	256

SDAC NP of non-Core hubs

Transparency & Publication

Publication Tool: DEMO

Remedial Action Preventive & Remedial Action Curative

- As part of the daily publication, Core TSOs publish the RAs used by the NRAO in such way that is made clear what the RA does:
  - Type of RA: PST, topological, complex, …
  - Location of RA: which line being opened/closed etc.
  - Whether the RA is curative or preventive
  - In case of curative RA, which CNECs are associated to it
  - In case of PSTs: initial tap position and new tap position

Link with bi-annual static grid model

- Supported through a harmonized naming convention
- Description of RAs will be published as part of the static grid model
- Note: a presentation on the static grid model is foreseen on Core CG Nov 29

Harmonized naming convention for RAs

- **Topological**
  - Opening a line: TOP_OPEN_SubstationA_SubstationB_ElementIdentifier ➔ Example: TOP_OPEN_Mercator_Horta_73
  - Closing a line: TOP_CLOSE_SubstationA_SubstationB_ElementIdentifier ➔ Example: TOP_CLOSE_Mercator_Horta_73
  - Split in multiple nodes: TOP_#NODES_Substation ➔ Examples: TOP_2N_Dellmensingen; TOP_3N_VIGY

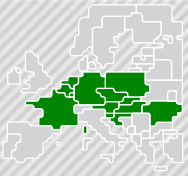
- **Complex action**
  - TOP_COMPLEX_SubstationA_SubstationB_SubstationC_... ➔ Example: TOP_COMPLEX_GYOR_LITR_GABC
  - TSOs may include an optional suffix '_PRA' or '_CRA' in case the RA is specifically designed to be applied only as PRA or CRA ➔ Example: TOP_COMPLEX_GYOR_LITR_GABC_CRA

- **PST taps**
  - PST_SubstationName_Enumeration ➔ Example: PST_DIELE_441; PST_VANYK_2

- **Miscellaneous**
  - Special protection schemes that are applied in case of tripping of network elements are indicated with prefix "SPS" ➔ Example: "SPS1_Pleinting_St. Peter Tr3_CRA".
  - Transfomers with angle regulation are indicated with prefix "AT" e.g. "AT_Mikulowa_1_PRA", "AT_Mikulowa_2_PRA", "AT_Mikulowa_1_CRA", "AT_Mikulowa_2_CRA". Their impact as remedial action is implemented as a change of the phase angle between the coupled girds (400/220kV) .

Transparency & Publication

Publication Tool: DEMO



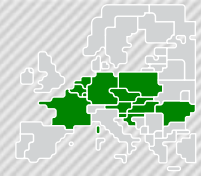
Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | **Remedial Action Optimization (NRAO)** | Intermediate FB computation | Validations | Pre-Final FB Computation | Final FB Computation | Publication & DA Market Coupling

Remedial Action Preventive

	pRA Information		Parameters	
Date	pRA Name	TSO	Baseline	After NRAO
2021-10-06 11:00:00	PST_Roehrsdorf_442	50Hertz	0	10
2021-10-06 11:00:00	PST_URECHESTI_400/220_1	Transelectrica	-2	-1
2021-10-06 11:00:00	PST_Gronau	Amprion	4	10
2021-10-06 11:00:00	PST_EHPST_PRA	Apg	0	-1
2021-10-06 11:00:00	PST_Meeden_W	TennetBv	0	-2
2021-10-06 11:00:00	PST_Meeden_Z	TennetBv	0	-2
2021-10-06 11:00:00	PST_Diele_T441	TennetGmbh	0	-10
2021-10-06 11:00:00	PST_VANYK D1_PRA	Elia	-6	-5
2021-10-06 11:00:00	PST_Diele_T442	TennetGmbh	0	-10
2021-10-06 11:00:00	PST_Roehrsdorf_441	50Hertz	0	3

Remedial Action Curative

	cRA#1 Information				
Date	CNEC TSO	CNEC Name	Name	Baseline	After NRAO
2021-08-07 22:00:00	TransnetBW	Grafenrheinfeld - Hoepfingen ge |N-1 Ensdorf - Vigy VIGY1 N	TOP_2N_VIGY_tronconnement_CRA		
2021-08-07 22:00:00	TransnetBW	Grafenrheinfeld - Hoepfingen ge |N-1 Ensdorf - Vigy VIGY2 S	TOP_COMPLEX_VIGY_quarterbar1A_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Meiningen gn |N-1 Ensdorf - Vigy VIGY1 N	TOP_2N_VIGY_tronconnement_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Meiningen gn |N-1 Ensdorf - Vigy VIGY2 S	TOP_COMPLEX_VIGY_quarterbar1A_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Westtirol rt |N-1 Ensdorf - Vigy VIGY1 N	TOP_2N_VIGY_tronconnement_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Westtirol rt |N-1 Ensdorf - Vigy VIGY2 S	TOP_COMPLEX_VIGY_quarterbar1A_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Westtirol ws |N-1 Ensdorf - Vigy VIGY1 N	TOP_2N_VIGY_tronconnement_CRA		
2021-08-07 22:00:00	TransnetBW	Buers - Westtirol ws |N-1 Ensdorf - Vigy VIGY2 S	TOP_COMPLEX_VIGY_quarterbar1A_CRA		



Validation Reductions

- This page lists **CNECs**:
  - For which **capacity is reduced as an outcome of the validation processes** – *individual validation implemented; coordinated validation subject to future implementation and recognizable via column 'CVA'*
  - That have been **added to the final list of CNECs during the validation processes** cf. CCM Art 20(6) – *not yet applied in EXT // run, if applied in future it can be recognized via the 'Returned Branch' column*

- The TSOs **50 Hertz, Amprion, APG, TNG, TTG, TTN** run the **individual validation process** commonly **with a centralised tool** thus resulting in **common justifications**.

- **Fallback**: an issue in the local tooling used for validation can trigger a **TSO to apply a fallback strategy**. The **IVA** reflects how the **fallback strategy** plays out:
  - The fallback strategy applied by each TSO can be consulted here (worksheet: local fallback options)
  - A best practice amongst TSOs is to indicate the application of fallback through the justification field

Date	CNEC Name	TSO Name	Returned Branch	CVA (MW)	IVA (MW)	Justification
2021-10-10 00:00:00	PAFFENDORF - ROMMERSKIRCHEN PAFFEN S / GRAMME - CHAMPION 380.32	Amprion			2503	DAvinCy failed. Applying high IVA.
2021-10-10 00:00:00	PAFFENDORF - ROMMERSKIRCHEN PAFFEN S / DOEL - ZANDVLIET 380.26	Amprion			2504	DAvinCy failed. Applying high IVA.


Q
A

Transparency & Publication

Publication Tool: DEMO

Core TSOs publish the FB domain at 3 steps during the process

1. Initial Computation (Virgin Domain) – not required by Core CCM, best practice from CWE
2. Pre-Final Computation (Early Publication) – CCM requirement: no later than 8:00 market time of D-1
3. Final Computation – CCM requirement: no later than 10:30 market time of D-1

The structure of these 3 pages is the same: information on CNE, information on contingency, breakdown of RAM incl. PTDF parameters

Breakdown of RAM

- Core TSOs recently added parameters to the pre-final and final computation describing the minimum capacity targets in relation to CEP70 implementation (70%, action plan, derogation)
  - R_amr %: describes the target for the totality of market exchanges incl. non-Core exchanges
  - minRAM target Core %: describes the capacity for Core exchanges by deducing the non-Core exchanges from the R_amr
- Following parameters will always be zero in the Initial Computation as they created only later on in the process: F_NRAO, AMR, LTA margin, IVA, CVA, Ftotal_LTN

Transparency & Publication

Publication Tool: DEMO

Structure CNE / Contingency	Business rule
EIC-Code	Unique Code for each CNE (for each contingency) *Example: 22T20161020----I*
Publication Name	Human readable names defined by TSOs *Example: 380.101 AVELGEM - HORTA*
Hub From	AT, BE, FR, NL, etc.
Hub To	
Substation From	Human readable names defined by TSOs *Example: AVELGEM*
Substation To	
Element Type	Tieline, line, PST, DC-Link, Transformer, Generation, Load, Busbar
TSO	AMPRION, ELIA, RTE, etc.
Direction (only relevant for CNE)	• DIR: direction CNE is to be read as substation_from ➔ substation_to • OPP: direction CNE is to be read as substation_to ➔ substation_from
Fmax Type (only relevant for CNE)	FIXED, SEASONAL, DYNAMIC

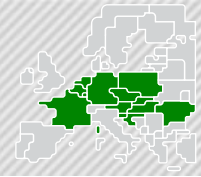
Naming conventions CNEs, Contingencies

- Line: "AVELGEM-HORTA 380.101“
- PST: “**PST** ZANDVLIET 1”
- Tripod line: “**Y**-DELLMENSINGEN-HOHENECK-VÖHRINGEN rot”, where the Y stands for the node connecting all three branches of the tripod. The firstly mentioned substation after the Y defines the branch of the tripod that is monitored i.e. Dellmensingen to the Y-node in this case

In case the **contingency** is a **tripod**: **each branch** is **displayed as one row** associated to the CNE to which the Contingency is applied.

Transparency & Publication

Publication Tool: DEMO



Input file delivery | Merging & DQC | **Initial FB Computation & CNEC selection** | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | **Pre-Final FB Computation** | **Final FB Computation** | Publication & DA Market Coupling

Pre-final Computation

Pre-Final Computation (Early Publication)

Dow

SEARCH

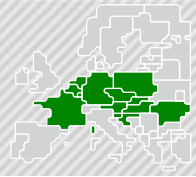
	Information on the CNE										Information on the Contingency								
Date	TSO	CNE_Name	EIC_Code	Direction	Hub From	Hub To	Substation From	Substation To	ElementType	FmaxType	TSO	Contingency Name	BranchName	EIC_Code	Hub From	Hub To	Substation From	Substation To	ElementType
2021-11-02 00:00:00	APG	Hessenberg - Weissenbach 223	14T-221-0-00223Q	DIRECT	AT	AT	Hessenberg	Weissenbach	Line	SEASONAL	APG	Hessenberg - Weissenbach 224	Hessenberg - Weissenbach 224	14T-220-0-00224Y	AT	AT	Hessenberg	Weissenbach	Line
2021-11-02 00:00:00	APG	Obersielach - Rosegg 267C	14T-220-0-0267BG	DIRECT	AT	AT	Obersielach	Rosegg	Line	SEASONAL	APG	Feistritz - Villach 266C	NA	14T-220-0-0266CH	NA	NA	NA	NA	
2021-11-02 00:00:00	APG	Obersielach - Rosegg 267C	14T-220-0-0267BG	DIRECT	AT	AT	Obersielach	Rosegg	Line	SEASONAL	APG	Feistritz - Obersielach 268	Feistritz - Obersielach 268	14T-220-0-00268E	AT	AT	Feistritz	Obersielach	Line
2021-11-02 00:00:00	APG	Oststeiermark - Wien Suedost 477	14T-380-0-004771	OPPOSITE	AT	AT	Oststeiermark	Wien Suedost	Line	SEASONAL	APG	Kainachtal - Y_Mellach 476KT	Kainachtal - Y_Mellach 476KT	14T-380-0-004763	AT	AT	Kainachtal	Y_Mellach	Line
2021-11-02 00:00:00	APG	Salzburg - Tauern 231A	14T-220-0-0231AB	DIRECT	AT	AT	Salzburg	Tauern	Line	SEASONAL	APG	Salzburg - Tauern 232A	Salzburg - Tauern 232A	14T-220-0-0232A8	AT	AT	Salzburg	Tauern	Line

Detailed breakdown of RAM

Presolved	RAM	Imax	U	F_max	FRM	F_(ref,init)	F_nrao	F_ref	F0core	F0all	F_uaf	AMR	R_amr %	R_imr_justification	minRAM_target_Core %	ItaMargin	CVA	IVA	Ftotal_LTN	PTDF_ALBE	PTDF_ALDE	PTDF_AT	PTDF_BE	PTDF_CZ	PTDF_DE	PTDF_FR	PTDF_HR	PTDF_HU	PTDF_NL	PTDF_PL	PTDF_RO	PTDF_SI	PTDF_SK
✔	281	800	220	312	30	0	0	-61	1	-3	3	0	18.4		0.901	0	0	0	0	-0.0348	-0.03503	-0.03672	-0.03475	-0.0213	-0.0362	-0.034	0.00513	-0.00276	-0.03475	-0.02162	-0.0006	0.01399	-0.00899
✔	662	2000	220	779	76	0	0	183	41	0	41	0	18.4		0.85	0	0	0	0	-0.05455	-0.05399	-0.10734	-0.05473	-0.02669	-0.05522	-0.05607	0.00728	-0.0042	-0.05363	-0.02974	-0.00083	0.02224	-0.01161
✔	683	2000	220	779	76	0	0	175	20	-19	39	0	18.4		0.877	0	0	0	0	-0.05455	-0.05399	-0.11051	-0.05473	-0.02669	-0.05522	-0.05607	0.00728	-0.0042	-0.05363	-0.02974	-0.00083	0.02224	-0.01161
✔	1279	2400	380	1663	158	0	0	778	226	152	74	0	18.4		0.769	0	0	0	0	0.00431	0.00713	-0.03455	0.00345	0.0624	0.0104	-0.00448	-0.07999	0.04622	0.00729	0.04789	0.0088	-0.18611	0.06247
✔	343	1000	220	390	35	0	0	228	12	-15	27	0	18.4		0.879	0	0	0	0	-0.00014	0.00082	-0.04136	-0.00042	0.01038	-0.0001	-0.00284	-0.00538	0.00307	0.00087	0.00695	0.00062	-0.01101	0.0057

Transparency & Publication

Publication Tool: DEMO



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Final Computation

Final Computation

SEARCH

Information on the CNE										Information on the Contingency								
Date	TSO	CNE_Name	EIC_Code	Direction	Hub From	Hub To	Substation From	Substation To	ElementType	FmaxType	TSO	Contingency Name	BranchName	EIC_Code	Hub From	Hub To	Substation From	Substation To	ElementType
2021-11-02 00:00:00	APG	Aschach - Hausruck 203B	14T-220-0-0203BF	DIRECT	AT	AT	Aschach	Hausruck	Line	SEASONAL									
2021-11-02 00:00:00	APG	Aschach - Hausruck 203B	14T-220-0-0203BF	DIRECT	AT	AT	Aschach	Hausruck	Line	SEASONAL	CEPS	Prestice - Etzenricht Etzenricht - Prestice 442	Prestice - Etzenricht	10T-CZ-DE-00004Q	CZ	DE	Prestice	Etzenricht	Tieline
												Additional branch #2:	Etzenricht - Prestice 442	10T-CZ-DE-00004Q	DE	CZ	Etzenricht	Prestice	Tieline
2021-11-02 00:00:00	APG	Aschach - Hausruck 203B	14T-220-0-0203BF	DIRECT	AT	AT	Aschach	Hausruck	Line	SEASONAL	CEPS	Prestice - Kocin	Prestice - Kocin	27T-TLI-V432---G	CZ	CZ	Prestice	Kocin	Line
2021-11-02 00:00:00	APG	Aschach - Hausruck 203B	14T-220-0-0203BF	DIRECT	AT	AT	Aschach	Hausruck	Line	SEASONAL	CEPS	Dasny - Slavetice	Dasny - Slavetice	27T-TLI-V433---B	CZ	CZ	Dasny	Slavetice	Line

Detailed breakdown of RAM

Presolved	RAM	Imax	U	F_max	FRM	F_(ref,init)	F_nrao	F_ref	F0core	F0all	F_uaf	AMR	R_amr %	R_amr_justification	minRAM_target_Core %	ItaMargin	CVA	IVA	Ftotal_LTN	F_LTN	PTDF_ALBE	PTDF_ALDE	PTDF_AT	PTDF_BE	PTDF_CZ	PTDF_DE	PTDF_FR	PTDF_HR	PTDF_HU	PTDF_NL	PTDF_PL	PTDF_RO	PTDF_SI	PTDF_SK
×	300	1000	220	390	30	0	0	133	60	68	-8	0	18.4		76.7	0	0	0	60	0	0.01386	0.01394	-0.00179	0.01384	0.00592	0.01412	0.01361	0.00075	-0.00049	0.01382	0.00652	-0.00008	0.00078	0.0008
×	304	1000	220	390	30	0	0	128	56	65	-9	0	18.4		77.7	0	0	0	56	0	0.01442	0.01449	-0.00145	0.0144	0.00545	0.01464	0.01419	0.00084	-0.00054	0.01435	0.0065	-0.00009	0.00092	0.0007
×	302	1000	220	390	30	0	0	130	58	66	-8	0	18.4		77.2	0	0	0	58	0	0.01493	0.01503	-0.00138	0.01491	0.00482	0.01523	0.01463	0.00087	-0.00056	0.0149	0.00686	-0.00009	0.00097	0.00067
×	296	1000	220	390	30	0	0	146	63	71	-8	0	18.4		75.9	0	0	0	64	1	0.0151	0.0152	-0.00138	0.01508	0.00816	0.0154	0.01479	0.00085	-0.00055	0.01508	0.00743	-0.00009	0.00094	0.00084

Transparency & Publication

Publication Tool: DEMO

From BD Sep 15, 2021 onwards Core TSOs switched to the Extended LTA inclusion approach. The switch to Extended LTA inclusion approach entails that Core TSOs send a FB domain (without LTAs) and a set of Bilateral Exchange Restrictions (BEX) as two distinct inputs to Euphemia in order to run the market coupling.

The following pages are related in describing the long-term allocated capacities

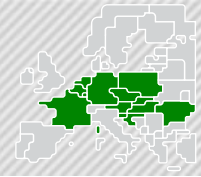
- **LTA**: displays the long term (yearly/monthly) allocated capacity in MW, per border in both directions

- **Final Bilateral Exchange Restrictions**: this represents
  - In case of normal operation (incl. spanning[1]): the LTA domain shifted with the effect of long-term nominations (LTN)[1]
  - In case of the day-ahead capacity calculation fails to provide the flow-based parameters in three or more consecutive hours: the default FB parameters[2] (in MW). As per Core CCM Art 4(4) the default FB parameters are defined based on the LTA capacity for each Core oriented bidding zone border, increased by the minimum of the two adjustments provided by the TSO(s) on each side of the bidding zone border. The adjustments reflect part of the LT capacity which is reserved for day-ahead, if such practice is applicable on the concerned bidding zone border. The values displayed represent the default FB parameters including the effect of long-term nominations (LTN).

1. Most of the borders make use of FTR (financial transmission rights) thus no capacity is nominated. The borders using PTR may have physical nominations and this can be consulted on the page ‘LTN’
2. MTUs which resulted into spanning or DFP can be traced back on the page ‘Spanning / DFP’

Transparency & Publication

Publication Tool: DEMO



Input file delivery → Merging & DQC → Initial FB Computation & CNEC selection → Remedial Action Optimization (NRAO) → Intermediate FB computation → Validations → Pre-Final FB Computation → **Final FB Computation** → Publication & DA Market Coupling

Final Bilateral Exchange Restrictions

Final Bilateral Exchange Restrictions

Date	AT▸CZ	AT▸DE	AT▸HU	AT▸SI	BE▸DE	BE▸FR	BE▸NL	CZ▸AT	CZ▸DE	CZ▸PL	CZ▸SK	DE▸AT	DE▸BE	DE▸CZ	DE▸FR	DE▸NL	DE▸PL	FR▸BE	FR▸DE	HR▸HU	HR▸SI	HU▸AT	HU▸HR	HU▸RO	HU▸SI	HU▸SK	NL▸BE	NL▸DE	PL▸CZ	PL▸DE	PL▸SK	RO▸HU	SI▸AT	SI▸HR	SI▸HU	SK▸CZ	SK▸HU	SK▸PL
2021-09-20 00:00:00	500	4816	393	547	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	653	429	0	1153	999	0
2021-09-20 01:00:00	500	4816	393	558	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	642	429	0	1153	999	0
2021-09-20 02:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1273	399	569	464	0	998	692	1364	0	0	0	635	637	426	0	1153	999	0
2021-09-20 03:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	637	429	0	1153	999	0
2021-09-20 04:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	637	429	0	1153	999	0
2021-09-20 05:00:00	500	4816	393	532	400	400	692	500	1949	0	1095	4817	400	398	999	1366	0	1600	1350	1331	1269	399	569	464	0	998	692	1364	0	0	0	635	668	430	0	1153	999	0

LTA

LTA

Date	AT▸CZ	AT▸DE	AT▸HU	AT▸SI	BE▸DE	BE▸DE	BE▸FR	BE▸NL	CZ▸AT	CZ▸DE	CZ▸PL	CZ▸SK	DE▸AT	DE▸BE	DE▸CZ	DE▸FR	DE▸NL	DE▸PL	FR▸BE	FR▸DE	HR▸HU	HR▸SI	HU▸AT	HU▸HR	HU▸RO	HU▸SI	HU▸SK	NL▸BE	NL▸DE	PL▸CZ	PL▸DE	PL▸SK	RO▸HU	SI▸AT	SI▸HR	SI▸HU	SK▸CZ	SK▸HU	SK▸PL
2021-09-20 00:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0
2021-09-20 01:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0
2021-09-20 02:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0
2021-09-20 03:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0
2021-09-20 04:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0
2021-09-20 05:00:00	500	4816	400	600	400	400	400	692	500	1949	0	1250	4817	400	398	999	1366	0	1600	1350	900	850	392	1000	469	0	998	692	1364	0	0	0	630	600	849	0	998	999	0


Q
A

Transparency & Publication

ATC capacities

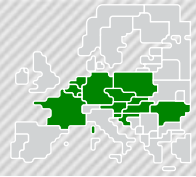
Aside from the Core cross-zonal capacities described as FB domain and BEX, the Publication Tool also contains ATC capacities

- **Page 'ATCs':** capacities available for market coupling on the HVDC borders external to Core and on ALEGrO (HVDC border internal in Core).

- **Page 'Shadow Auction ATC'**: the ATC that would be provided to a shadow auction mechanism in case the SDAC fallback procedure is triggered

Transparency & Publication

Publication Tool: DEMO



Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | **Final FB Computation** | Publication & DA Market Coupling

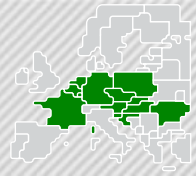
Shadow Auction ATC

Shadow Auction ATC

Date	AT▸CZ	AT▸DE	AT▸HU	AT▸SI	BE▸DE	BE▸FR	BE▸NL	CZ▸AT	CZ▸DE	CZ▸PL	CZ▸SK	DE▸AT	DE▸BE	DE▸CZ	DE▸FR	DE▸NL	DE▸PL	FR▸BE	FR▸DE	HR▸HU	HR▸SI	HU▸AT	HU▸HR	HU▸RO	HU▸SI	HU▸SK	NL▸BE	NL▸DE	PL▸CZ	PL▸DE	PL▸SK	RO▸HU	SI▸AT	SI▸HR	SI▸HU	SK▸CZ	SK▸HU	SK▸PL
2021-09-20 00:00:00	500	4816	393	547	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	653	429	0	1153	999	0
2021-09-20 01:00:00	500	4816	393	558	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	642	429	0	1153	999	0
2021-09-20 02:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1273	399	569	464	0	998	692	1364	0	0	0	635	637	426	0	1153	999	0
2021-09-20 03:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	637	429	0	1153	999	0
2021-09-20 04:00:00	500	4816	393	563	400	400	692	500	1939	0	1095	4817	400	408	999	1366	0	1600	1350	1331	1270	399	569	464	0	998	692	1364	0	0	0	635	637	429	0	1153	999	0

Transparency & Publication

Publication Tool: DEMO



Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | **Final FB Computation** | Publication & DA Market Coupling

Allocation constraints and External constraints

- **Allocation constraint:** import / export limit on the SDAC net position of Core hub
- **External constraint**: import / export limit on the Core net position of Core hub

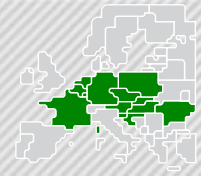
Allocation constraints are send as a separate input to Euphemia and are displayed in a separate page – used by PSE (import & export) and Elia (import)

Allocation Constraints

	BE		PL	
Date	Import	Export	Import	Export
2021-09-22 00:00:00	6500		662	5039
2021-09-22 01:00:00	6500		45	5731
2021-09-22 02:00:00	6500		0	6199
2021-09-22 03:00:00	6500		0	5987
2021-09-22 04:00:00	6500		441	5332
2021-09-22 05:00:00	6500		1084	3959
2021-09-22 06:00:00	6500		1671	1298

Transparency & Publication

Publication Tool: DEMO



Input file delivery | Merging & DQC | Initial FB Computation & CNEC selection | Remedial Action Optimization (NRAO) | Intermediate FB computation | Validations | Pre-Final FB Computation | **Final FB Computation** | Publication & DA Market Coupling

External constraints are embedded in the FB domain pages – used by TenneT NL

- These can be recognized through their name: External Constraint NL_export; External Constraint NL_import
- The RAM attribute represents the maximum export respectively import value Euphemia is allowed to obtain
- Note: there exist also 4 external constraints related to the DE-BE HVDC interconnector ALEGrO (BE_AL_import, BE_AL_export, DE_AL_import, DE_AL_export). These external constaints are of a different nature i.e. they describe the 1000 MW technical capacity of the interconnector.

Information on the CNE

CNE_Name	EIC_Code	Direction	Hub From	Hub To	Substation From	Substatic To	Presolved	RAM	Imax	U	F_max
External Constraint BE_AL_export	NA	NA	NA	NA	NA	NA	✗	1000	0	0	1000
External Constraint BE_AL_import	NA	NA	NA	NA	NA	NA	✗	1000	0	0	1000
External Constraint DE_AL_export	NA	NA	NA	NA	NA	NA	✗	1000	0	0	1000
External Constraint DE_AL_import	NA	NA	NA	NA	NA	NA	✗	1000	0	0	1000
External Constraint NL_export	NA	NA	NA	NA	NA	NA	✗	5750	0	0	5750
External Constraint NL_import	NA	NA	NA	NA	NA	NA	✗	5750	0	0	5750

Transparency & Publication

Publication Tool: DEMO

Maximum possible bilateral exchanges between each border and the minimum and maximum Core net positions of each hub can be consulted

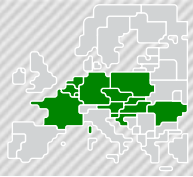
- In table format on the pages **'Max Exchanges (MaxBex)**' respectively '**Max net position**'
- Graphically on the pages '**Core Map**' and '**Core MarketG**raphs'
- Max Exchanges = maximum bilateral exchanges between two CORE hubs assuming the other NPs are zero

In addition, the Core Market View page enables market participants to evaluate the interaction between cross-zonal capacities and cross-zonal exchanges between bidding zones cf. Core DA CCM Art 25 (5)

- **Check Volume**: an interactive section where user can insert volumes of commercial trades in order to test their feasibilities.
  - Option 1: hub-to-hub exchanges
    - The tool will check whether for each CNEC in the final FB domain the condition RAM ≥SUM ([PTDF[hub-to-hub] x Entered value[hub-to-hub exchanges]) is fulfilled.
  - Option 2: hub net positions
    - The tool will check if the sum of Hub positions equals to zero (ii).
    - The tool will also check whether the specified Hub positions are feasible or not by checking for each CNEC of the final FB whether the RAM ≥ SUM([PTDF[hub] x Enteredvalue[hubpositions]).

- **Max Volume**: publication of "Max net position" and "Max exchanges (Maxbex)". Although this information is published on separate pages too, it is embedded here to facilitate the utilisation of the "check volume" part

- **Note:** the volume check is to be adapted to be in line with Extended LTA inclusion



Max Net Positions

Max Net Positions

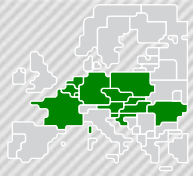
Date	Min ALBE	Min ALDE	Min AT	Min BE	Min CZ	Min DE	Min FR	Min HR	Min HU	Min NL	Min PL	Min RO	Min SI	Min SK	Max ALBE	Max ALDE	Max AT	Max BE	Max CZ	Max DE	Max FR	Max HR	Max HU	Max NL	Max PL	Max RO	Max SI	Max SK
2021-09-16 00:00:00	-1000	-1000	-7747	-4044	-8519	-16764	-8306	-2511	-6856	-4859	-4747	-2549	-4323	-5501	1000	1000	6117	5468	7849	11387	6224	4124	6764	5151	4635	1315	4612	6477
2021-09-16 01:00:00	-1000	-1000	-7985	-4264	-8483	-17171	-7490	-2568	-6826	-4061	-5066	-2600	-4266	-5532	1000	1000	6132	5433	7918	9679	6560	4231	6927	5750	3952	1248	4619	6430
2021-09-16 02:00:00	-1000	-1000	-7691	-4461	-8613	-16309	-7328	-2401	-6877	-3839	-5091	-2569	-4204	-5386	1000	1000	6139	5218	7698	9231	6381	4377	7284	5578	3819	1141	4647	6391
2021-09-16 03:00:00	-1000	-1000	-6876	-3873	-8740	-16557	-7502	-2417	-6966	-3848	-5081	-2574	-4120	-5383	1000	1000	6137	5291	7517	8722	6670	4481	7169	4975	3826	1156	4558	6344
2021-09-16 04:00:00	-1000	-1000	-7027	-4320	-8986	-16794	-7927	-2387	-6901	-3724	-5093	-2640	-4112	-5480	1000	1000	6132	5339	7666	8916	6259	4466	7145	5750	3847	1123	4561	6404
2021-09-16 05:00:00	-1000	-1000	-7937	-3833	-8268	-16226	-7598	-2625	-6647	-3634	-5091	-2718	-4138	-5613	1000	1000	6100	5262	7996	9631	6095	4226	6921	5362	3988	1350	4631	6467

Max Exchanges (Max Bex)

Max Exchanges (MaxBex)

Download

Date	AT►BE	AT►CZ	AT►DE	AT►FR	AT►HR	AT►HU	AT►NL	AT►PL	AT►RO	AT►SI	AT►SK	BE►AT	BE►CZ	BE►DE	BE►FR	BE►HR	BE►HU	BE►NL	BE►PL	BE►RO	BE►SI	BE►SK	CZ►AT	CZ►BE	CZ►DE	CZ►FR	CZ►HR	CZ►HU	CZ►NL	CZ►PL	CZ►RO	CZ►SI
2021-09-16 00:00:00	3500	4758	6117	3627	2069	2523	3249	1721	1894	1992	3185	4210	3784	4301	3692	2078	2495	3826	1544	1841	2231	2737	4982	3539	5281	5127	2240	2997	3155	2166	1808	2213
2021-09-16 01:00:00	3452	4788	6132	3582	2170	2568	2356	1700	1956	1979	3202	4391	3896	4972	3449	2177	2553	3234	1532	1902	2266	2760	5004	3501	5247	5071	2349	3049	2330	2141	1868	2179
2021-09-16 02:00:00	3669	5060	6139	3625	2290	2541	2333	1787	2068	1924	3084	4260	3659	4775	3236	2229	2525	3080	1588	1994	2167	2742	5073	3583	4985	4791	2125	3020	2304	2227	1975	2124
2021-09-16 03:00:00	3405	5222	6137	4055	1942	2548	2334	1830	1947	1884	3060	4303	3821	4385	3619	1968	2534	3015	1611	1893	2097	2731	4998	3203	4629	4431	1798	3034	2299	2261	1859	2040
2021-09-16 04:00:00	3864	5465	6132	3669	1988	2545	2318	1878	1861	1867	3170	4377	3895	4523	3955	2005	2531	2956	1647	1811	2074	2775	5127	3780	4809	4583	1830	3034	2289	2305	1779	2034
2021-09-16 05:00:00	3347	4492	6100	3341	2064	2556	2321	1597	1735	1923	3212	4130	3702	4108	3887	2316	2543	2991	1457	1692	2101	2641	5088	3534	5086	4499	2499	3057	2290	2050	1664	2139



Core Market View

Core MarketView

1 Check volume

Here you can check the simultaneous execution of trading volumes of the market involved in the Core Market Coupling

Hub-to-Hub Exchanges

Hub-to-Hub	Test 1
AT►CZ	0
AT►HU	0
AT►SI	0
BE►FR	0
CZ►PL	0
CZ►SK	0
DE►AT	0
DE►BE	0
DE►CZ	0
DE►FR	0
DE►NL	0
HR►HU	0
HR►SI	0
HU►RO	0
HU►SK	0
NL►BE	0
PL►DE	0
PL►SK	0

Click here to test.

2 Max volume

Here you can find the maximal trade volumes (MWh/h) which can be physically transported between two Hubs under the condition that no other trade is executed between other Hubs

	Direction ►	◄ Direction
AT►CZ	4657	
AT►HU	1893	
AT►SI	1874	
BE►FR	4357	
CZ►PL	2081	
CZ►SK	2239	
DE►AT	5660	
DE►BE	3347	
DE►CZ	4082	
DE►FR	5139	
DE►NL	2464	
HR►HU	2642	
HR►SI	2090	
HU►RO	2041	
HU►SK	4050	
NL►BE	2686	
PL►DE	3659	
PL►SK	2202	

Hub-to-Hub Positions

Hub positions	Test 1	Test 2
ALBE	0	
ALDE	0	
AT	0	
BE	0	
CZ	0	
DE	0	
FR	0	OK
HR	0	
HU	0	
NL	0	
PL	0	
RO	0	
SI	0	
SK	0	

Click here to test.

	Export	Import
ALBE	1000	-1000
ALDE	1000	-1000
AT	6098	-7509
BE	6885	-5596
CZ	6079	-9308
DE	9826	-14175
FR	7802	-8843
HR	3271	-4063
HU	5679	-6457
NL	4441	-4365
PL	4215	-4387
RO	1977	-2887
SI	5006	-4133
SK	6096	-5187

Transparency & Publication

Publication Tool: DEMO

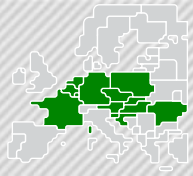
Results of market coupling and post-coupling processes are embedded in the following pages

- **Net Positions**: CORE net positions in MW
- **Price spread**: market price spread in €/MWh
- **Shadow prices**: displays the limiting constraints (CNECs).The structure of the page is the same as for the domain page except that the column ‘presolved’ is replaced with the shadow price of the limiting CNECs.
- **Congestion Income**: net congestion income per hub and per TSO for the CORE region, and the gross congestion income (without UIOSI taken into account) for the non-CORE borders in €
- **Allocated capacity**: capacities allocated per border in MW following application of SEC
- **Intraday ATC**: being the left-over capacity as initial ATC, in MW
  - The initial ATC takes into account how each Core TSO defines the parameters wrt virtual capacity. As defined in the Core ID CCM, Core TSOs are allowed to remove virtual capacity prior to extracting the left-overs.
  - The initial ATC is subject to transitional processes that can be run on a subset of Core borders, for example the increase/decrease process on the former CWE borders

Page ‘Border Data Overview’ groups border relevant information from pre-coupling, coupling and post-coupling processes: ATC, price spread, congestion income, allocated capacity, LTN, shadow auction ATC, intraday ATC

Transparency & Publication

Publication Tool: DEMO



Net Positions

Net Position

Date	ALBE	ALDE	AT	BE	CZ	DE	FR	HR	HU	NL	PL	RO	SI	SK
2021-10-31 00:00:00	0	0	739.8	-142.6	1450.9	3751.5	-4851.5	-286.8	-2441.5	1391.8	1085.1	-557.6	319.1	-458.2
2021-10-31 01:00:00	0	0	619.6	-15	2539	2472.5	-4513.6	-348	-2292.6	1302.8	1069.7	-792.4	300.1	-342.1
2021-10-31 02:00:00	0	0	743.8	275.1	3544.6	1255	-5116.4	-311	-2281.7	1383.4	1099.3	-696.5	394	-289.6
2021-10-31 02:00:00	0	0	505.1	-162.5	3401.3	1259	-3819.2	-321	-2246.5	835	1294.2	-821.8	340	-263.6
2021-10-31 03:00:00	0	0	-1420.3	-131.8	4323.5	-3104.2	1504.2	-21	-2289.2	370.9	1729.5	-461.1	-211.6	-288.9
2021-10-31 04:00:00	0	0	-1408	-247.5	4227.1	-3780.6	1743.3	-111.2	-2371.2	809.6	1609.4	-588.5	339	-221.4
2021-10-31 05:00:00	0	0	-1515.3	25.4	4285.7	-3412.4	1188.7	-127	-2536	791.2	1488.3	-297.2	316	-207.4
2021-10-31 06:00:00	0	0	-885.2	-96.7	3752.7	-2307.4	244.5	32	-2619.1	742.8	1627.7	-470.7	278	-298.6
2021-10-31 07:00:00	0	0	601.5	-264.4	1391.3	3418	-2444.5	-247	-2534.5	683.9	787	-1314.5	304.8	-381.6
2021-10-31 08:00:00	0	0	996.4	-218.6	1937.7	2260.9	-2460.9	-301	-2196.1	653.4	746.6	-1248.1	233	-403.3
2021-10-31 09:00:00	0	0	882.9	-285.5	2627.2	690.8	-1631	-371	-2155.4	658.4	839.3	-1007.9	168	-415.8
2021-10-31 10:00:00	0	0	911.1	-259	2588.7	282.6	-1323.7	-353	-1999.3	663.2	1057.9	-1249.2	154.9	-474.2
2021-10-31 11:00:00	0	0	-1012.9	106.1	3174.1	-3420.1	2207.3	-297	-1877.7	-7.4	1910.1	-537.9	157	-401.6
2021-10-31 12:00:00	0	0	-1006.2	87.2	3265.9	-3780.2	2364.9	-245	-1809.2	31.2	1970.2	-589.1	184	-473.7
2021-10-31 13:00:00	0	0	-931.1	-170.5	3423.8	-3731.2	2134.1	-191	-1868.8	722.6	1906.6	-1050.5	229.9	-473.9
2021-10-31 14:00:00	0	0	-1098.3	-57.1	3206.3	-3364.1	2079.9	-85	-2234.5	725.2	1783.6	-756.8	269	-468.2

Intraday ATC

Intraday ATC

Date	AT▸DE		BE▸DE		BE▸FR		BE▸NL		DE▸AT		DE▸BE		DE▸FR		DE▸NL		FR▸BE		FR▸DE		NL▸BE		NL▸DE	
	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease	Initial	In/Decrease
2021-10-21 00:00:00	5404	0	1066	-457	2072	0	1077	0	11521	0	1762	0	11479	0	11526	0	1181	0	6490	0	1830	0	6841	0
2021-10-21 01:00:00	6105	0	1018	-786	1690	0	1011	0	11159	0	2035	0	11415	0	11460	0	1512	0	6860	0	2131	0	7322	0
2021-10-21 02:00:00	5038	0	860	-733	1389	0	849	-849	11265	0	2105	0	11574	0	11578	0	1587	0	7031	0	2206	0	7629	0
2021-10-21 03:00:00	5879	0	856	-729	1475	0	847	-847	11270	0	2243	0	11608	0	11580	0	1609	0	6704	0	2367	0	7231	0
2021-10-21 04:00:00	5654	0	1103	0	1986	0	1090	0	11399	0	2322	0	11853	0	11797	0	1643	0	6433	0	2453	0	6993	0
2021-10-21 05:00:00	5368	0	1111	0	1965	-1965	1094	0	11773	0	2396	0	12613	0	12365	0	1710	0	6064	0	2522	0	6488	0
2021-10-21 06:00:00	5513	0	1180	-1053	2099	0	1155	0	12492	0	2283	0	13059	0	10409	0	1578	0	6266	0	2284	0	8545	0
2021-10-21 07:00:00	5375	0	1087	0	1931	0	1064	0	12822	0	2108	0	13389	0	10505	0	1458	0	6099	0	2108	0	8310	0
2021-10-21 08:00:00	5622	0	1172	0	2152	0	1158	0	12178	0	2062	0	12402	0	9754	0	1391	0	6533	-100	2062	0	9215	0
2021-10-21 09:00:00	6242	0	1225	-1098	2161	0	1196	0	11164	0	2082	0	11167	0	9156	0	1449	0	7287	-10	2084	0	10103	0
2021-10-21 10:00:00	6137	0	1285	-340	2299	0	1260	0	11161	0	2209	0	11320	0	9259	0	1533	0	7169	-4	2212	0	9976	0
2021-10-21 11:00:00	5868	0	1317	-700	2462	0	1309	0	11240	0	2444	0	11357	0	9077	0	1616	0	7026	-3000	2450	0	10105	0
2021-10-21 12:00:00	5764	0	1265	-691	2420	-1000	1238	0	11056	0	2555	0	11130	0	8837	0	1657	0	7112	0	2563	0	10580	0
2021-10-21 13:00:00	5729	0	1263	0	2434	-2000	1228	0	10858	0	2631	0	10951	0	8659	0	1699	0	7165	0	2642	0	10919	0
2021-10-21 14:00:00	5770	0	1356	0	2600	-500	1325	0	11047	0	2533	0	11159	0	8814	0	1644	0	7105	0	2540	0	10472	0

Transparency & Publication

Publication Tool: DEMO

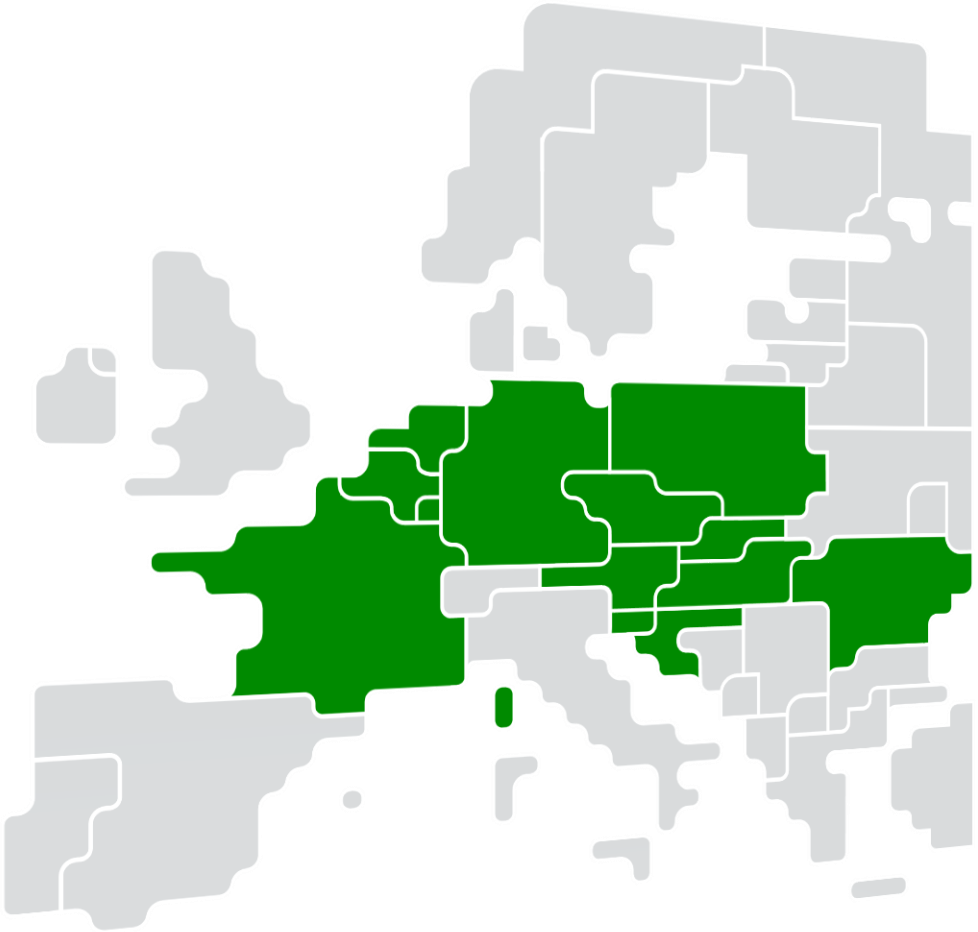
In case a critical issue occurs with the Core Capacity Calculation Tool, a Backup Tool is used to generate the capacity calculation outputs for the Market Coupling. In such case, a more limited set of information is published on the Publication Tool, namely for the concerned business day data is published on the following pages whilst the other pages will remain empty:

- Spanning/DFP – indicating the concerned Business Day consists of Default FB parameters
- Final Bilateral Exchange Restrictions – in this case representing the Default FB parameters
- Allocation Constraints
- LTA
- LTN

PART 2: Monthly KPI reports

KPI reports | JAO

KPI reading guide



Parallel Run KPI report

Introduction

Context

- According to Article 28(4) of the Core FB DA CCM, Core TSOs
  - shall continuously monitor the effects and the performance of the application of this methodology during the parallel run
  - shall develop, in coordination with the Core regulatory authorities, the Agency and stakeholders, the monitoring and performance criteria and report on the outcome of this monitoring on quarterly basis in a report

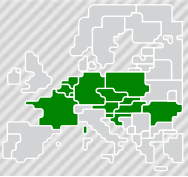
- Core TSOs & NEMOs have aligned on the
  - Specific KPIs with NRAs and this alignment resulted in the format of this KPI report
  - Frequency of provision of the report, which was increased to monthly, going beyond formal requirements

These KPIs are shared with Core MPs since end of March on the JAO Website, supporting TSOs/NRAs/MPs to understand

- How the capacity calculation methodology works
- What can be expected in terms of available capacities
- What can be expected as market coupling outcome based on these available capacities (assumption: using existing order books)

Parallel Run KPI report

Overview of Core FB MC Parallel Run KPIs



Adjustment for minimum RAM and LTA Inclusion

1. Average maximum AMR per CNE per BD
2. Average maximum AMR per TSO per BD
3. Average maximum AMR+LTAmargin per CNE per BD
4. Average maximum AMR+LTAmargin per TSO per BD

TSOs' adjustment after validation

5. Share of MTUs with intervention per TSO
6. Total IVA applied per BD for each CNE affected by TSO intervention

Power System Impact Analysis

13. Min & max Net Position per BZ hub
14. Virtual margins at MCP per TSO, per BD
15. Flow deviation on non-Core borders

Non-costly Remedial Action Optimization Analysis

16. Relative Time Share of Applied RAs, by TSO, Type and Mode
17. RAM before and after RAO per TSO
18. Average sensitivity of RAs per TSO

Market Impact Assessment (FB Plain)

7. Most often presolved CNEs (top 20)

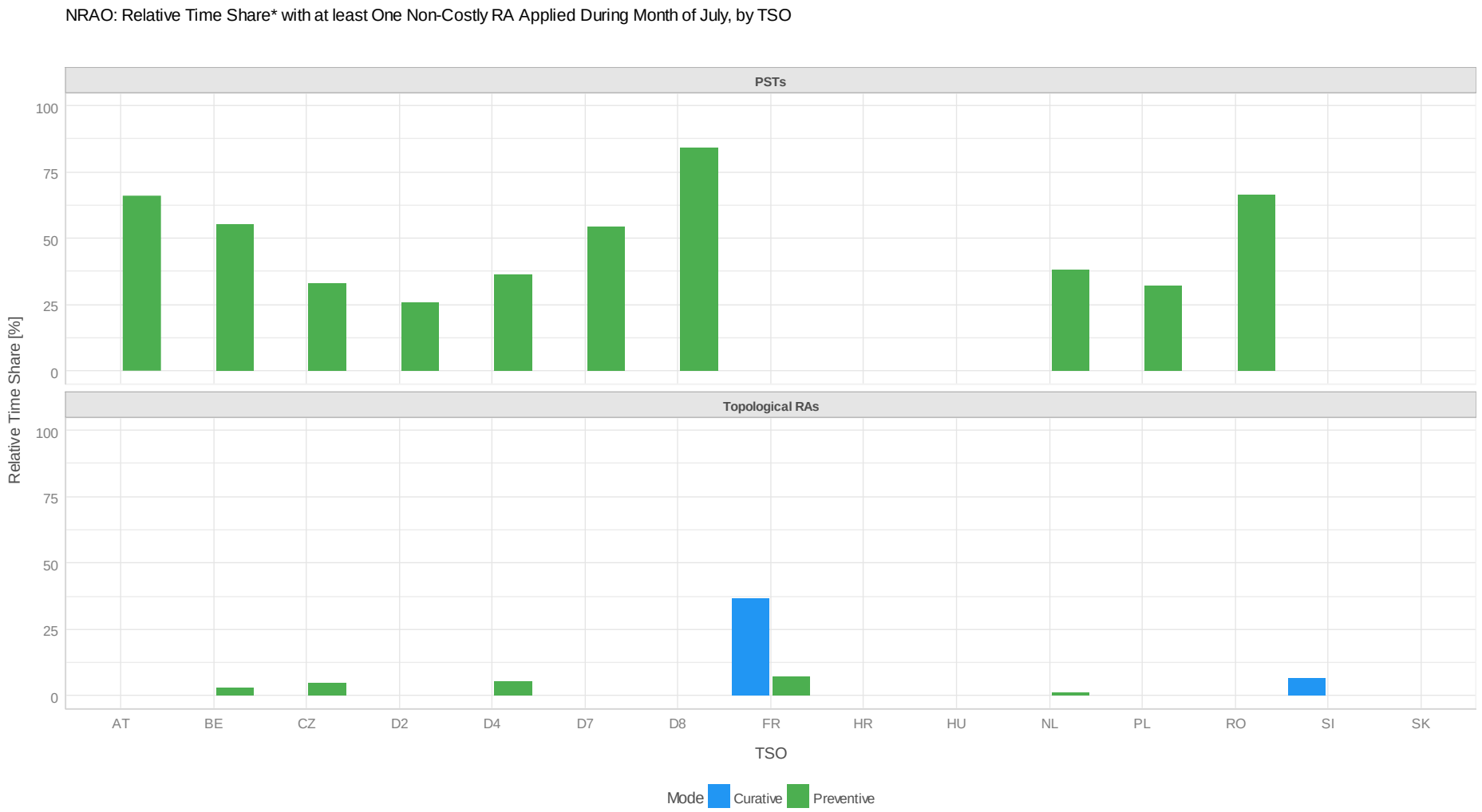
8a. Most limiting CNEs (top 20)

8b. Allocation Constraints

9. Clearing prices, price spread and price convergence
10. CNECs with highest non-zero shadow price in each hour per day
11. Core Social Welfare
12. Paradoxically Rejected Block orders (PRB)

Example: application of NRAO

KPI 16 illustrates how frequently NRAO applied RAs



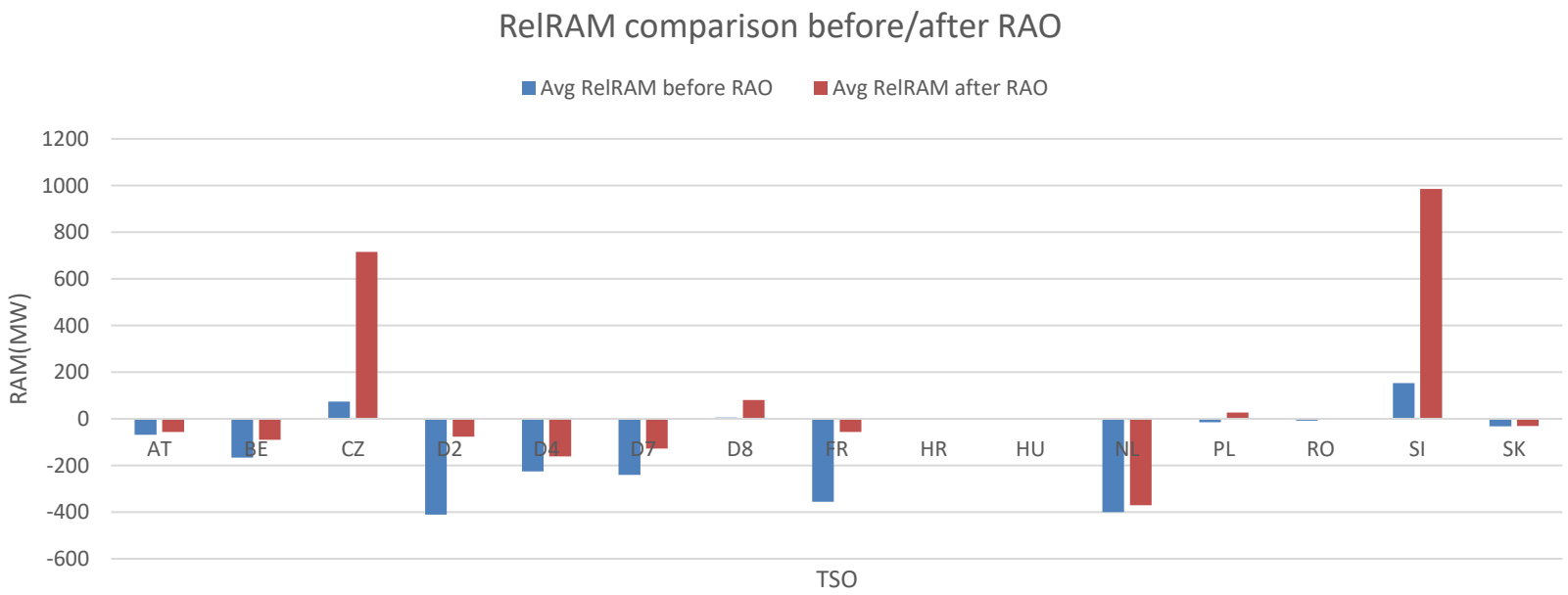
* Number of occurance of RAs applied relative to time stamps with NRAO results(

Example: application of NRAO

KPI 17 illustrates how the application of RAs increased the RAM

The graph shows average values of relative RAM before and after NRAO from Jul 2021, per TSO on the most limiting CNECs from NRAO perspective. Selected CNECs before RAO are the same as after RAO, and average computed for MTUs when NRAO was used further in the process.

A negative value implies that – prior to virtually increasing the capacity - there is no capacity available



Example: use of virtual capacity

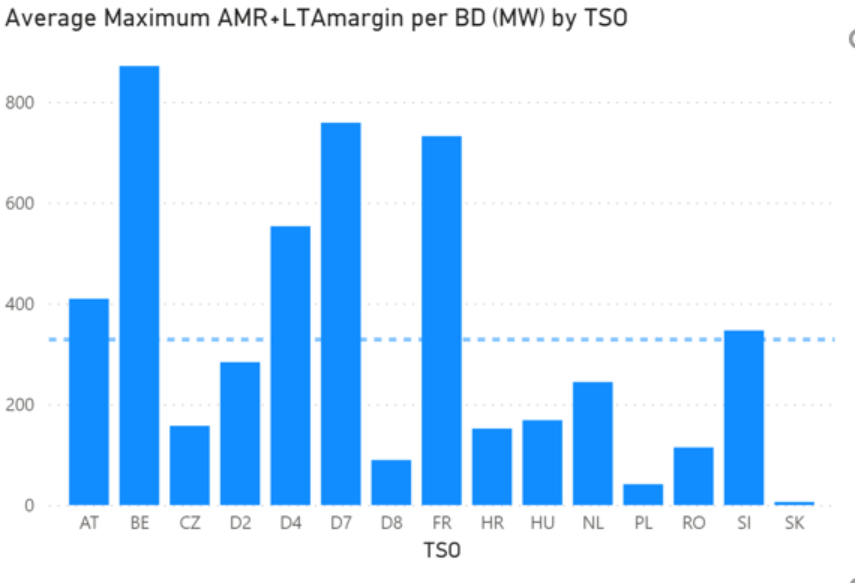
TSO	Average Maximum AMR+LTAmargin per BD (MW)
AT	409.42
BE	871.17
CZ	157.17
D2	283.63
D4	553.42
D7	758.67
D8	89.46
FR	732.21

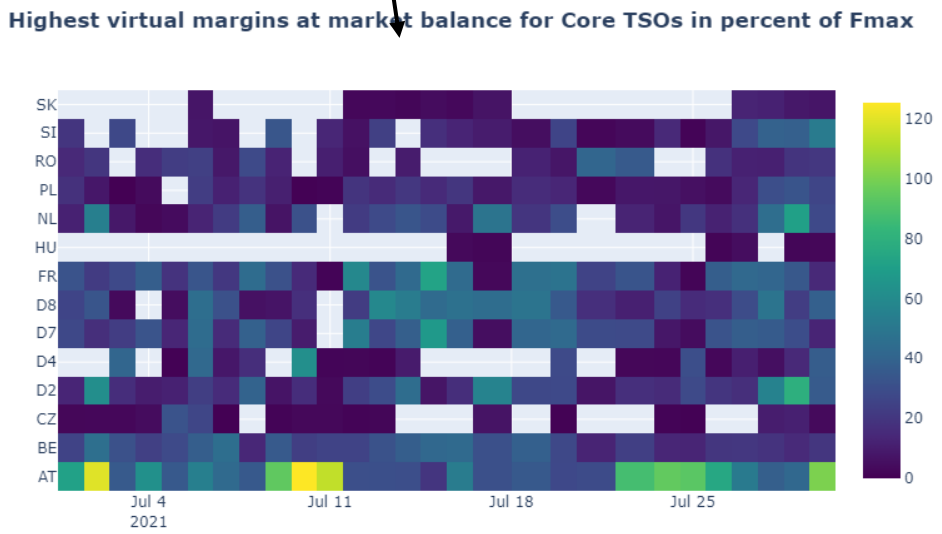
TSO	Average Maximum AMR+LTAmargin per BD (MW)
HR	151.79
HU	168.42
NL	244.25
PL	41.46
RO	114.42
SI	346.50
SK	6.25

Virtual capacity is added after NRAO

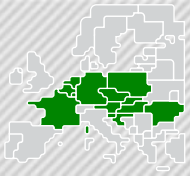
Results of KPIs 1-4 show that virtual capacity is structurally added to fulfil minimum capacity targets

KPI 14 illustrates that the virtual capacity is frequently used during the market coupling





Example: most limiting CNEs (TOP 20) & Allocation Constraints for period 20210301-20210813



Total BDs: 143
Total # hours: 3257 hours, this is excluding 175 DFP hours

CNE	Distinct Hours	Hours CNE has ShadowPrice	Max of Shadow Price	Average of RAM	Min of RAM	Max of RAM	Max of z2zPTDF	Max of sum z2z PTDF
DE_AL_import	858	858	1224,985	82%	0%	100%	0	0
BE_AL_import	457	457	1224,985	66%	0%	100%	0	0
[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	231	232	341,029	37%	21%	64%	0,13425	0,5949
[D8-D8] Pasewalk - Vierraden 306 [DIR]	208	208	1344,795	40%	31%	68%	0,10619	0,38644
[BE-BE] Lixhe - Gramme 380.11 [OPP]	179	180	109,001	40%	21%	70%	0,2072	0,47949
[D7-D7] Buerstadt - Lambsheim BUERST W [DIR]	178	179	543,836	36%	20%	64%	0,18419	0,63919
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	151	151	721,289	61%	35%	79%	0,12519	1,11256
[CZ-PL] Nosovice - Wielopole [DIR] [PL]	144	150	194,172	38%	20%	73%	0,05928	1,4318
[SK-PL] Lemesany - Krosno Iskrz 2 [DIR] [PL]	133	133	200,531	52%	38%	72%	0,11801	1,2406
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	124	124	32,181	49%	23%	89%	0,15518	0,60159
[D8-D8] Neuenhagen - Vierraden 304 [DIR]	119	119	1007,608	35%	14%	49%	0,11568	0,41224
[BE-FR] Aubange - Mont St Martin 220.514 [DIR] [BE]	110	113	1083,852	53%	20%	84%	0,10676	0,25356
[PL-PL] Mikulowa PST1 [OPP]	109	109	382,467	47%	30%	61%	0,40962	1,44399
[D8-PL] Krajnik - Vierraden 1 [OPP] [PL]	109	109	975,003	34%	24%	45%	0,26529	0,94404
[BE-BE] Achene - Gramme 380.10 [OPP]	106	106	211,029	65%	26%	88%	0,32415	0,74007
[D8-PL] Vierraden - Krajnik 2 [OPP] [PL]	85	85	250,227	35%	24%	41%	0,19712	0,72038
[PL-PL] Mikulowa AT1 [OPP]	80	80	251,549	49%	28%	95%	0,20558	0,73413
[D2-NL] Diele - Meeden SCHWARZ [DIR] [D2]	78	78	547,250	39%	21%	69%	0,23723	0,54584
[AT-D4] Werben - Dellmensingen 404A [OPP] [AT]	77	77	459,323	31%	25%	46%	0,05843	0,22453
[BE-BE] PST Zandvliet 1 [DIR]	68	68	77,847	64%	50%	83%	0,13256	0,94453

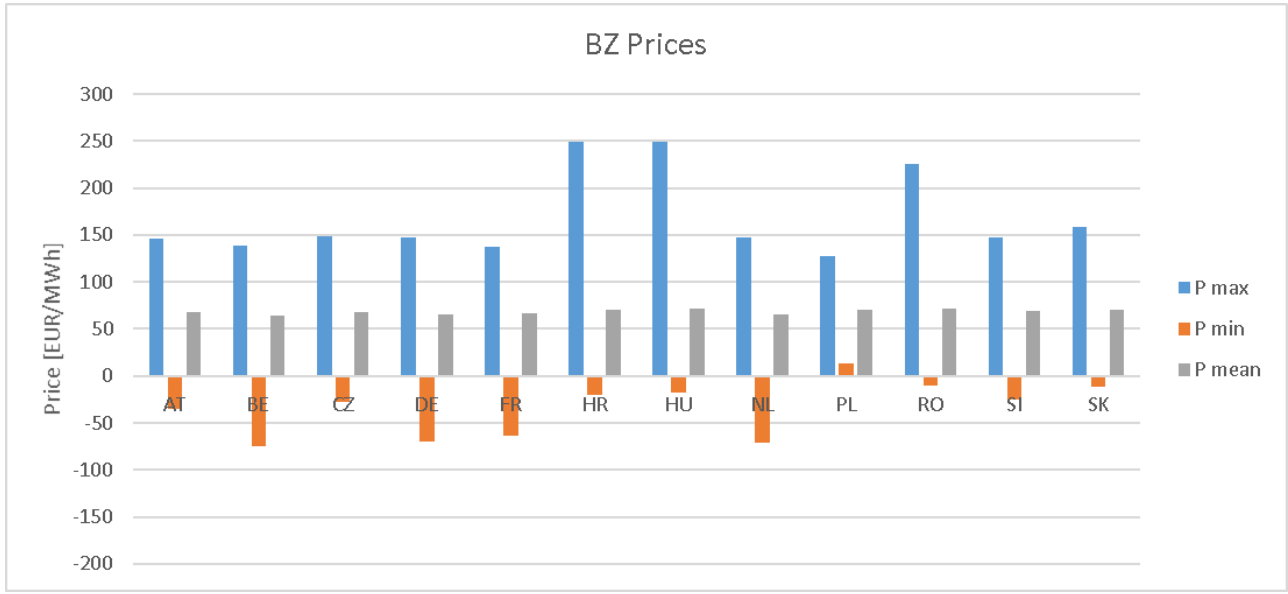
Information on Allocation Constraints

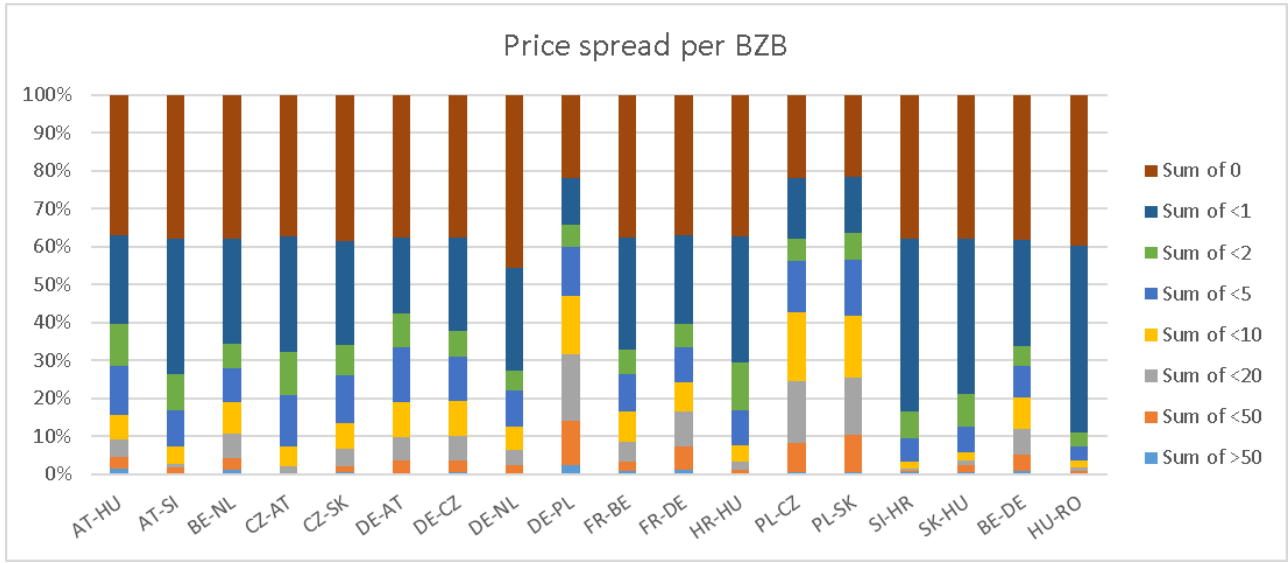
Allocation Constraint	Distinct Hours	Average AC (MW)	Max of AC (MW)	Min of AC (MW)
PL_AC_import	563	455.3	2553	0
PL_AC_export	545	210,1	3657	0
BE_AC_export	-	-	-	-

The appearance of the ALEGrO virtual hubs (DE_AL_import & BE_AL_import) reflects how frequently the full capacity of the ALEGrO interconnector is used to optimize the exchanges during the market allocation. Indeed, ALEGrO is to be understood as a *'market optimization variable'* and not as a *'CNE limiting the FB domain'.*

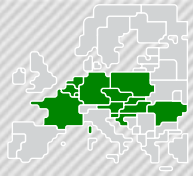
*Please note that the z2zPTDF values do **not** correspond to the maximum zone-to-zone PTDFs according to equation 5 of the Day-ahead CCM and hence are not the ones used for the CNEC Selection. The z2zPTDFs are calculated only between neighbouring BZs by the scripts used for external parallel run reporting. See KPI reading guide on JAO.

Example: Clearing prices, price spreads and price convergence for period 20210301-20210813





Example: price comparison after ICP Go-live (18/06/2021) thus for period 20210619-20210813



A comparison between Core MC simulation prices and real BZ prices for the period after ICP (excluding hours with DFP):

- Average of price difference (P_Core – P_Real) over 1131 MTUs (hours with price convergence are included)

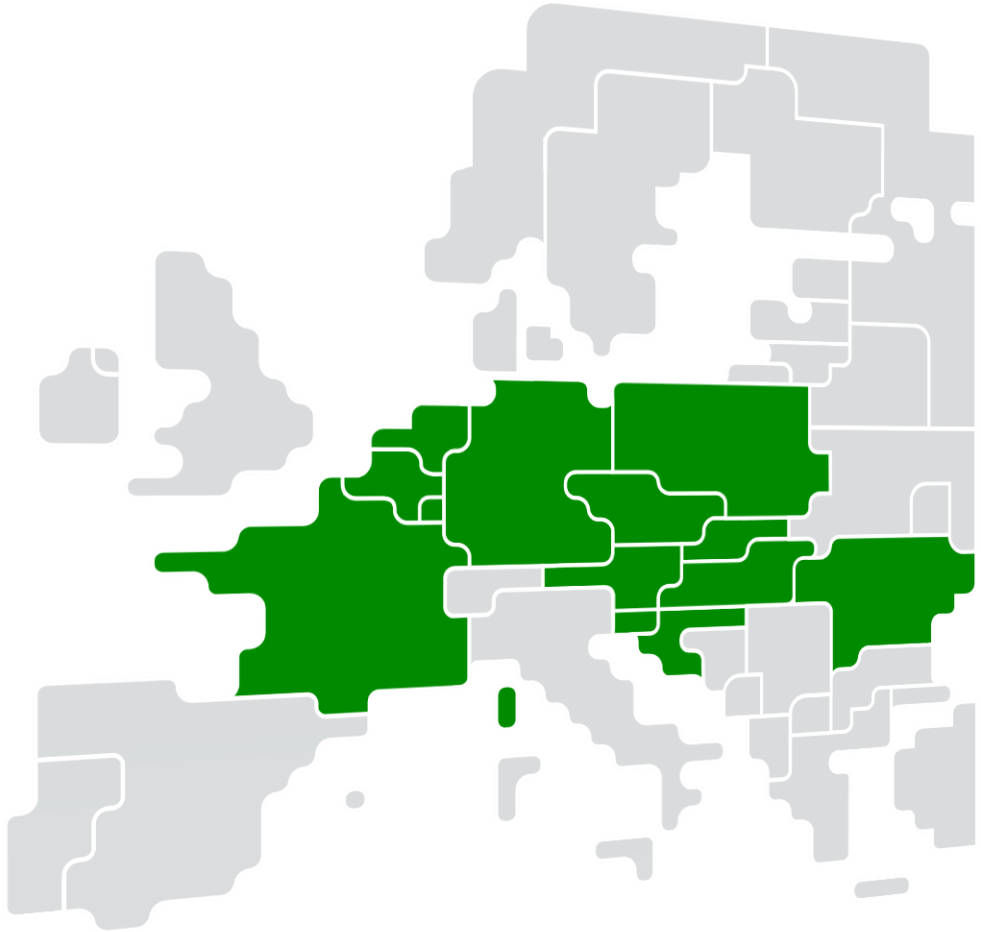
AT	BE	CZ	DE/LU	FR	HR	HU	NL	PL	RO	SI	SK
0.58	-0.11	0.02	-0.08	1.12	-5.65	-5.36	-0.89	0.27	-6.55	-8.60	2.23

- Full price convergence in across Core BZs in real production data after ICP go live: 15.48%.
- Full Core FB MC price convergence, after ICP go live: 23.7% ➔ higher price convergence enabled by Core


Q
A

Summary and closing remarks

22 November 2021



Agenda

MONDAY NOVEMBER 22nd 2021 – morning session
09.00-12.00

09.00 INTRODUCTION
Ruud Otter & Gertjan Meutgeert

- General background and objectives
- Capacity calculation (Michael Němý)
- Capacity allocation (Adèle Roy)

10.15 Q&A SESSION

10.30 CORE DA CAPACITY CALCULATION METHODOLOGY
Michael Němý

- Core DA high level business process
- Detailed explanation Core DA FB capacity calculation methodology

11.45 Q&A SESSION

12.00 *Closure*

Goal:
Facilitate sustainable European energy market, by making optimal use of the network

Key Flow Based features:
- Regional optimisation of the system
- Combining physics and market
- Better use of the network

MONDAY NOVEMBER 22nd 2021 – afternoon session
13.00-16.00

13.00 INTRODUCTION
Ruud Otter & Gertjan Meutgeert

13.10 CORE STAKEHOLDER GOVERNANCE FRAMEWORK
Steve van Campenhout

13.30 CORE PUBLICATION OF DATA
Steve van Campenhout / Syed Rahman / Marius Schrade

- Explanation Core Publication
- Explanation Monthly KPI reports

15.30 Q&A SESSION

16.00 *Closure*

Transparency
Provision of a wide range of data for analyses
- Input
- Network data
- Market data

General information on Core communication channels

Existing Core communication channels

- **Core Consultative Group mailing list**
  - Register by sending an email to CoreCG@magnus.nl

- **Core section on ENTSO-E website** (e.g. upload of methodologies and reports on public consultations, current status of the Core CCR program, CG minutes, …):
  - Link: https://www.entsoe.eu/network_codes/ccr-regions/#core
  - Today's workshop recording and Supporting material will be published on this page

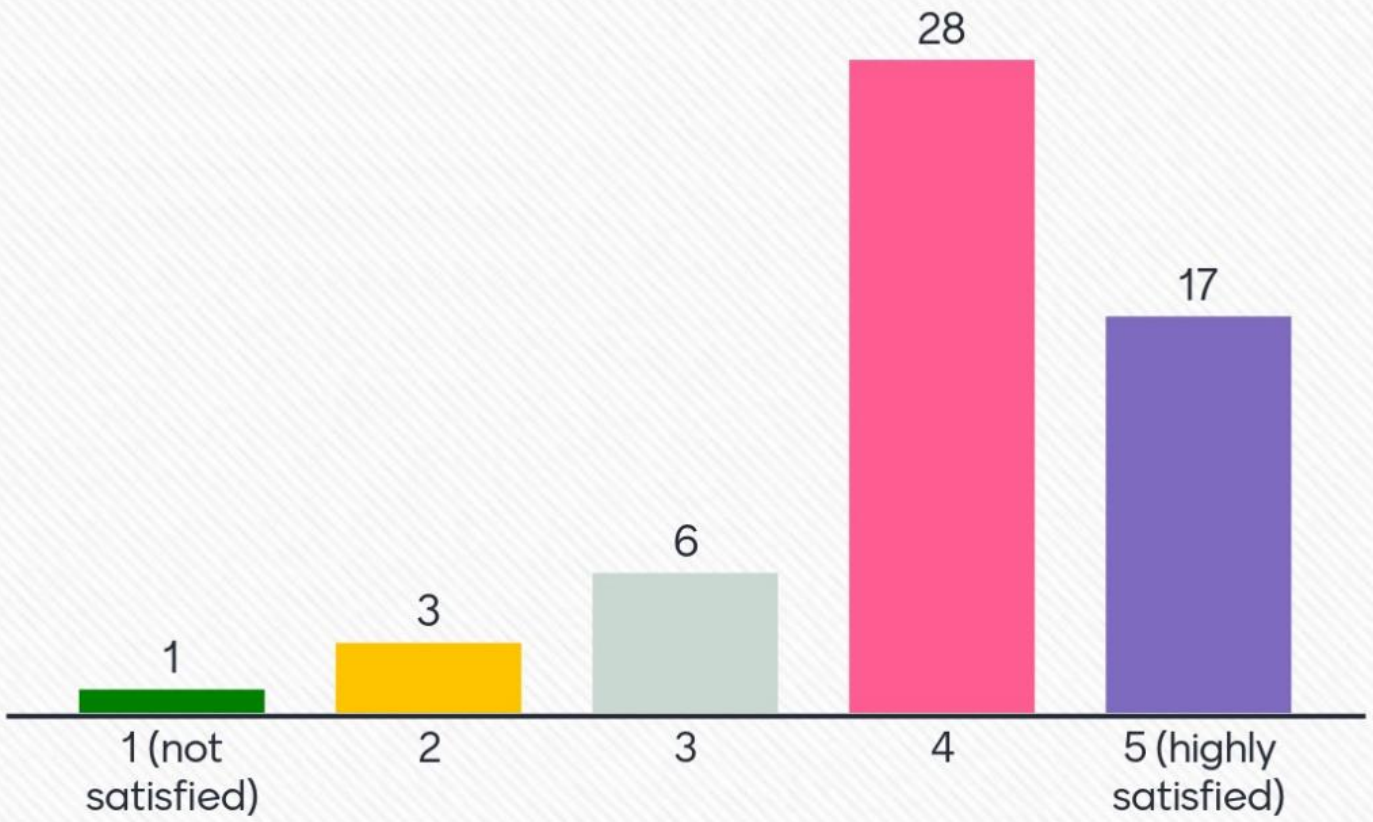
- **ENTSO-E newsletter** informs regularly about updates in the different CCRs (e.g. submitted methodologies, launch of public consultations, …)
  - Subscription via https://www.entsoe.eu/contact/

Q&A forum on JAO website

- **Q&A forum on the JAO website** which gives space to Market Participants to ask questions about the External Parallel Run and other relevant topics:
  - Link: http://coreforum.my-ems.net/


go to
menti.com
code
4699 1149
Mentimeter
Or
scan

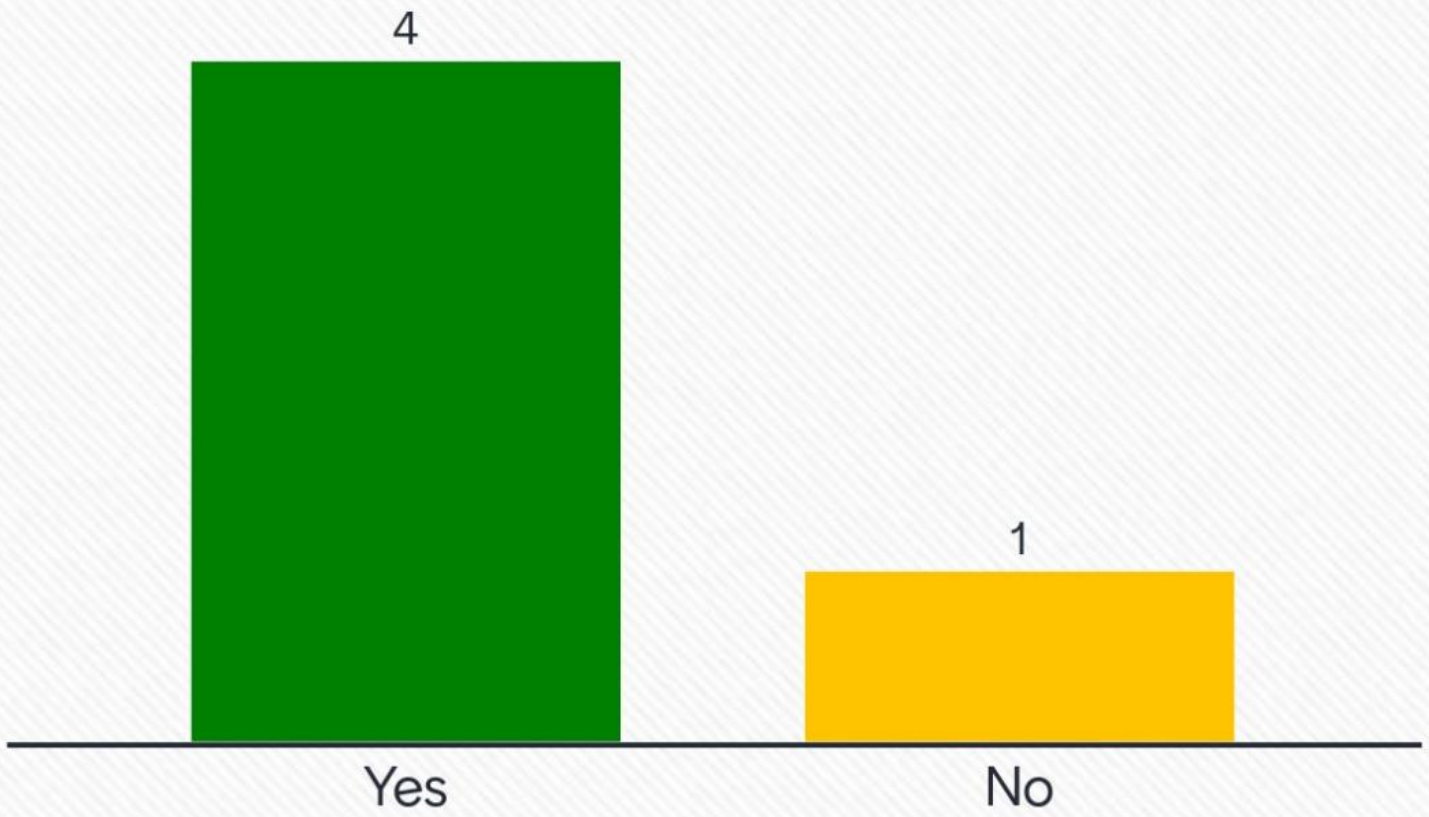
Evaluation - How satisfied are you with today's webinar?



Mentimeter results

As run during the workshop

Evaluation - Would you be interested in follow up workshops?



Evaluation - What topics should be addressed in a follow up session?

More breaks

-

KPIs again

Practical effects in market

Grid model, GSKs

price formation and it's dependency on FB

Comparison of current stare of market and prospective state after fbmc

Evaluation - Any other feedback towards the organizers:

menti is slow

Very well done. Thank you for the great overview.

no

drinks

thanks, great initiative

Good job!

drinks

It was a good presentation.

Slides in advance pls

Thank you !

Great job, especially by Michael.Incorporate more breaks

Complete abbreviation list, some used abbr. by presenters not in the list

Thank you very much for your attention

MODERATORS

Ruud OTTER
Core Consultative Group's co-Chair, TenneT BV

Gertjan MEUTGEERT
Core DA FB Project Manager, Magnus

SPEAKERS

Michael NEMY
Core FB expert, CEPS

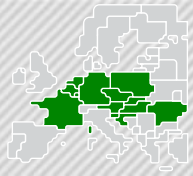
Adele ROY
Core MC expert, EPEX-SPOT

Steve VAN CAMPENHOUT
Core FB expert, Elia

Syed RAHMAN
JAO Publication Platform

Marius SCHRADE
Core FB expert, 50Hertz

List of Abbreviations



- ACER – European Union Agency for the Cooperation of Energy Regulators
- AC – Allocation Constraints
- AMR – Adjustment for the Minimum Remaining available margin
- CACM – Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on Capacity Allocation and Congestion Management
- CBCORA – list of CNECs and RAs
- CCC – Coordinated Capacity Calculator
- CCCt – Core Capacity Calculation Tool
- CCP – Central Counterparty for transactions (CCP) - Clearing House
- CGM – Common Grid Model
- CNEC – Critical Network Element associated with a Contingency
- Core CCR (Core) – Core Capacity Calculation Region
- Core CCM – Core Capacity Calculation Methodology
- Core FBMC – Flow Based day-ahead market coupling
- Core NRAs – The National Regulatory Authorities from the Core Capacity Calculation Region
- CVA –Coordinated Validation Adjustment
- CWE – Central Western Europe
- CZC – Cross Zonal Capacities
- D2CF – Congestion Forecast 2 days in advance
- DFP – Default FB Parameters
- EC – External Constraints
- ELI – Extended LTA Inclusion
- FB – Flow-based
- FTR – Financial Transmission Rights
- GLSK – Generation Load Shift Key
- ICP – Interim Coupling Project
- IGM – Individual Grid Model
- IVA – Individual Validation Adjustment
- JAO – Joint Allocation Office
- KPI – Key Performance Indicators
- LTA – Long Term Allocation
- LTTR – Long Term Transmission Rights
- LTNom – Long Term Nominations
- MinRAM – minimum Remaining Available Margin (imposed)
- MCP – Market Clearing Point
- MNEC – Monitored Network Element associated with a Contingency
- MTU – Market Time Unit
- NEMO – Nominated Electricity Market Operator
- NP – Net Position
- nRAO – non-costly Remedial Actions Optimization
- NTC – Net Transfer Capacity
- PST – Phase Shift Transformer
- PTDF – Power Transfer Distribution Factor
- PTR – Physical Transmission Rights
- RA – Remedial Actions
- RAM – Remaining Available Margin
- RAO – Remedial Actions Optimization
- RSCs – Regional Security Coordinators
- SDAC – Single Day-ahead Coupling (SDAC)
- TSOs – Transmission System Operators (grid operators)