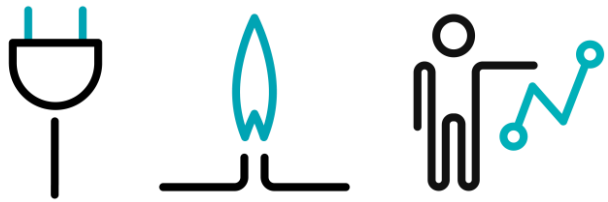
Electricity market codes – General principles

TAIEX Regional Workshops on transposition of EU electricity legislation for the Western Balkans

Thomas Kawam – thomas.kawam@creg.be

4 April 2023 - 9h30-10h15



Goal of this session

- Describe the legal framework surrounding the implementation of Network Codes & Guidelines
- Demonstrate how the regulatory framework allows for efficient adoption of harmonized rules
- Identify some challenges, both from an internal regulatory perspective as well as in the interaction with other entities (TSOs, NEMOs)

Terms, conditions and methodologies and decision-making processes (incl. regional approval, amendments)

What is a TCM?

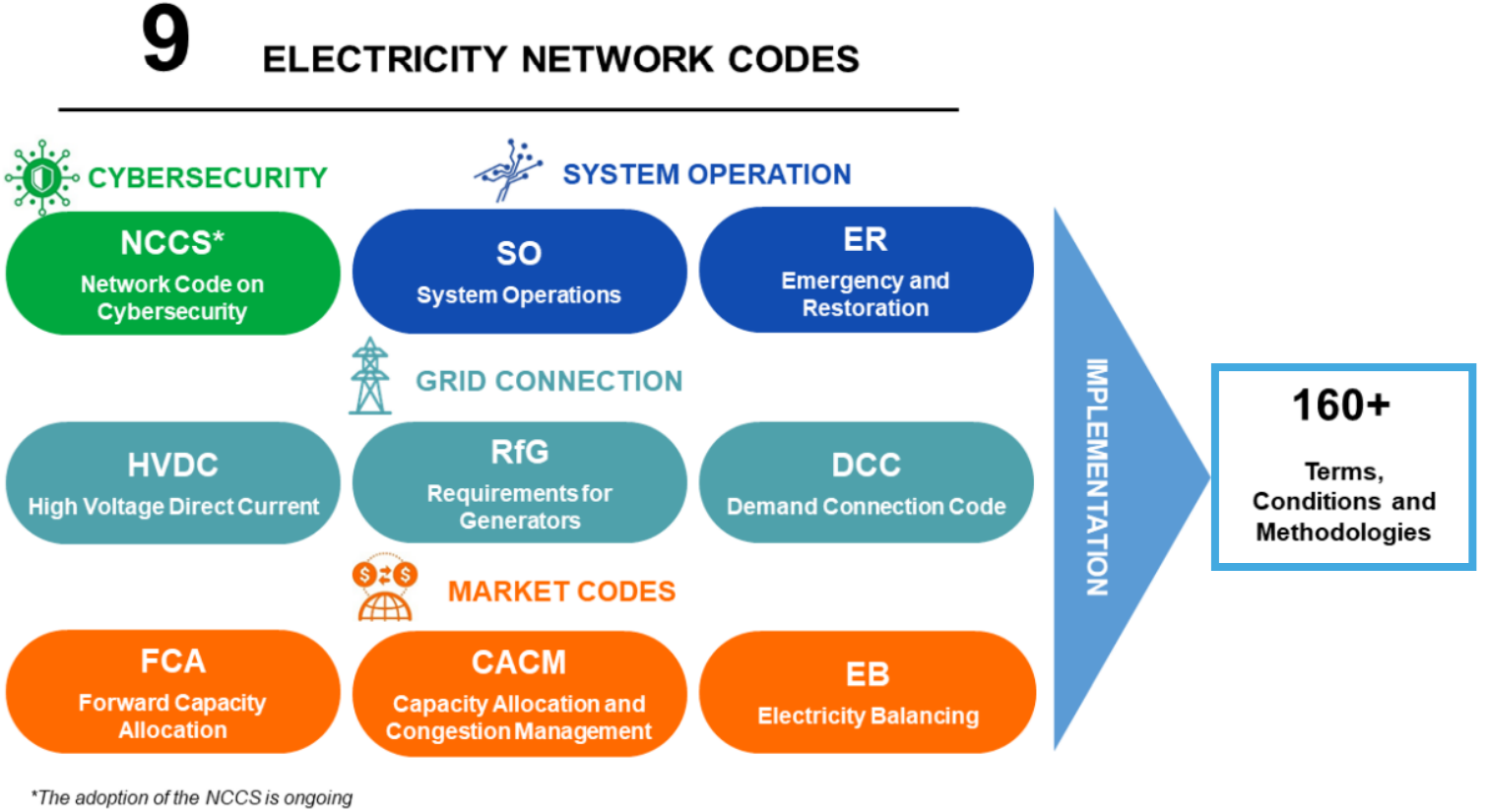
The European market rules establish obligations for Transmission System Operators (TSOs), Nominated Electricity Market Operators (NEMOs), the European Network of Transmission System Operators (ENTSO-E), regulatory authorities and ACER on the development and approval of **terms and conditions or methodologies**.

To be approved, terms and conditions or methodologies must:

- be consulted upon by relevant stakeholders
- include a timescale for implementation
- clearly address their expected impact on the objectives of the Regulations
- meet the necessary requirements as set out in the legal basis.

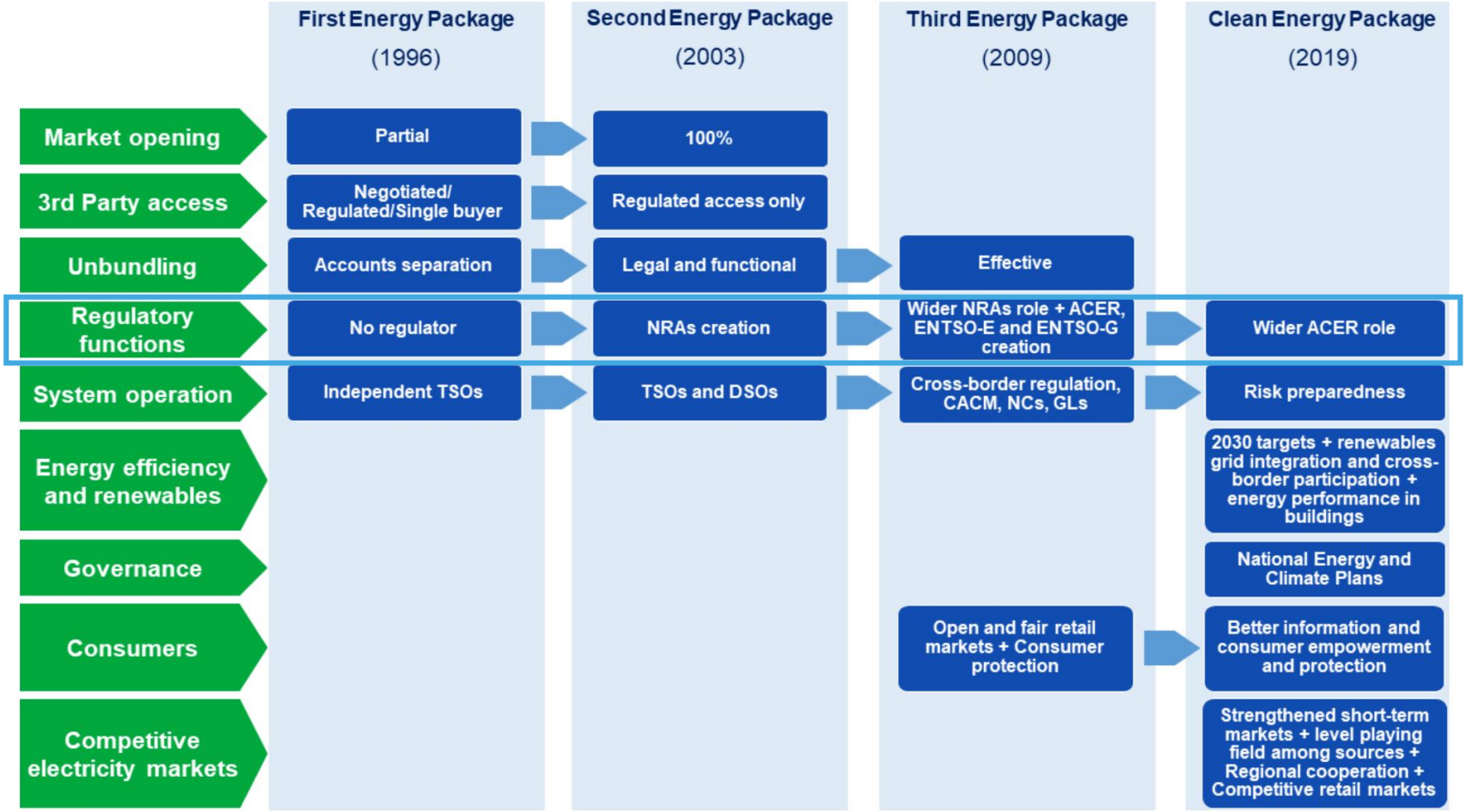
Example: The Capacity Allocation and Congestion Management Regulation, in its Article 41(1), introduces the TCM for the harmonised maximum and minimum clearing prices for the single day-ahead coupling.

The 9 electricity network codes define more than 160 TCMs!

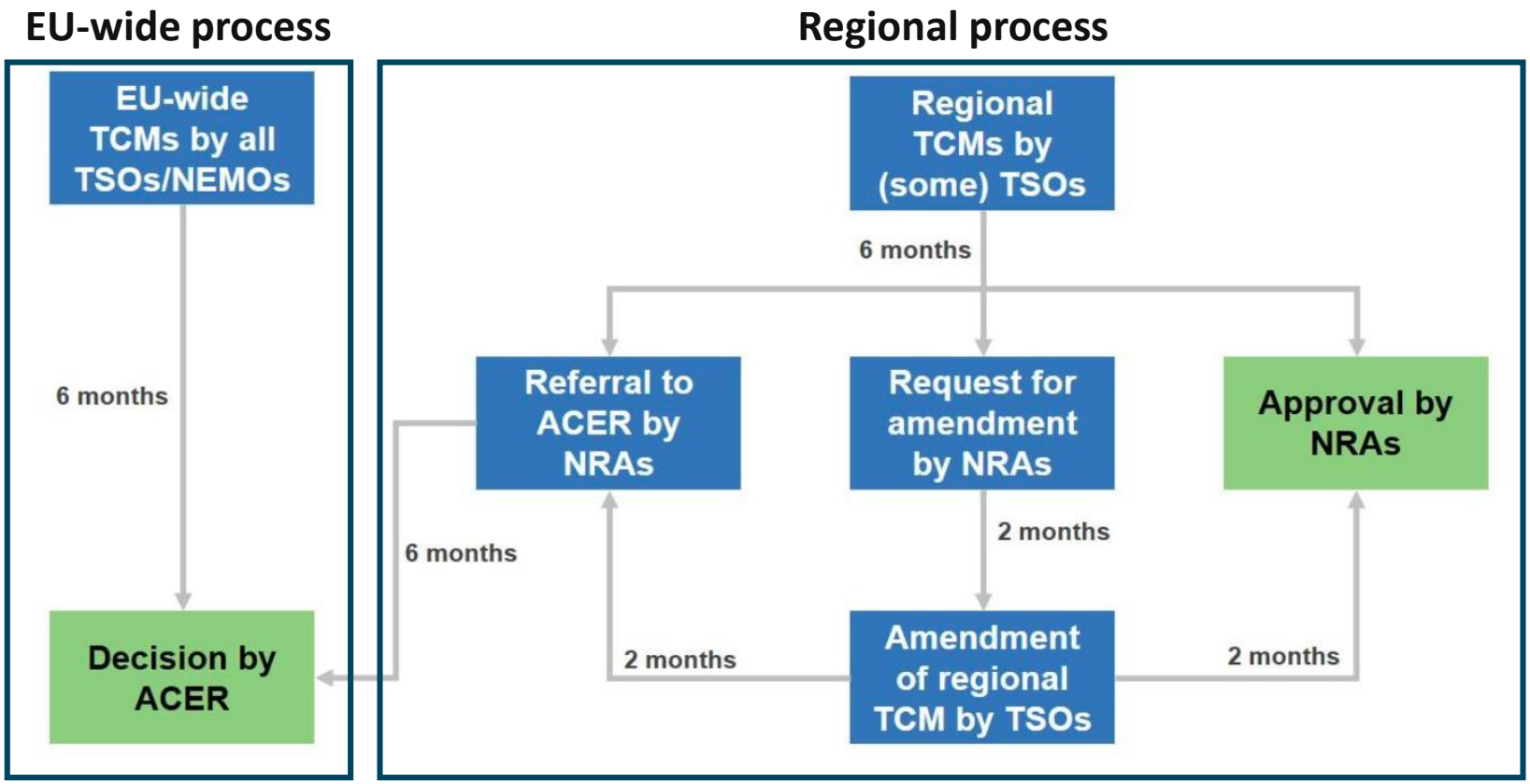


And soon a 10th on Demand Response?

The Clean Energy Package defines a wider ACER role

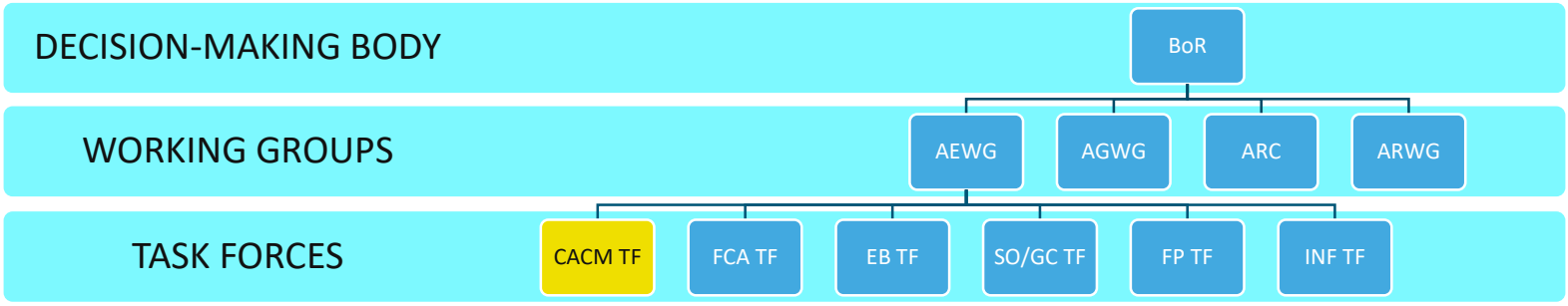


TCMs decision-making regional and EU-wide processes differ



Zoom on ACER's decision-making process: governance

- The Board of Regulators approves ACER formal decisions (2/3 majority) and consists of senior representatives of the NRAs and a non-voting representative of COM.
- The ACER Working Groups are the bodies advising the ACER Directors and the BoR on the regulatory activities of the Agency and the NRAs.
- The different Task Forces provide expert support on specific topics, including the alignment with all involved stakeholders (TSOs, NEMOs, COM,…) and propose positions to the ACER WG for endorsement.



Zoom on ACER's decision-making process: governance: the CACM TF

- The **CACM Task Force** aims to supervise and facilitate the implementation of the CACM Guidelines, including coordination of positions and timelines with ENTSO-E, the All NEMO Committee, ACER, COM and other stakeholders.
- It provides a forum for NRAs and ACER to exchange views and work out **common positions** on all CACM-related issues.
- The roles of the co-chairs, members and observers are laid out in the CACM Task Force Terms of Reference, approved by AEWG
- The work structure revolves around **dedicated project teams** (related to the TSOs' and NEMOs' proposals for TCMs) on a rotation and fair balancing principle between the participating NRAs.
- Monthly physical (1 or 2 day) meetings and ad-hoc meetings (physical or telco).
- Interaction and cooperation with TSOs foreseen through the CACM Coordination Group, with NEMOs through the NEMO Coordination Group and on a trilateral, ad-hoc basis (NRA-TSO-NEMO meetings), always including ACER and COM as observers to the process
- https://acer.europa.eu/Events/BoR/TF/E/CACMTF/Pages/default.aspx

Zoom on ACER's decision-making process: steps

3-6 months depending on decision

Phase 1: Initiation of procedure	Request for a decision, notification to the parties concerned
Phase 2: Investigation and assessment	Engagement with the parties concerned, NRAs and other stakeholders (including public consultations). Preparation of ACER's preliminary position
Phase 3: Hearing and drafting of decision	Reception of the hearing input (oral/written), preparation of draft Decision
Phase 4: AWG and BoR	Submission of Decision to AWG ➔ AWG's advice ➔ Submission to BoR ➔ Bor's opinion
Phase 5: Closure of the procedure	Adoption, communication, (correction)
Phase 6: After the procedure	Potential appeal

2 months

Zoom on ACER's decision-making process: governance: appeals and Board of Appeal

Appeals

- Complaints can be lodged against ACER decisions. Any natural or legal person can appeal against a decision taken by ACER where the Agency has actual decision-making powers (individual decisions). The Board of Appeal deals with those appeals.
- The decisions of the Board of Appeal may as well be subject to appeal before the Court of Justice of the European Communities.

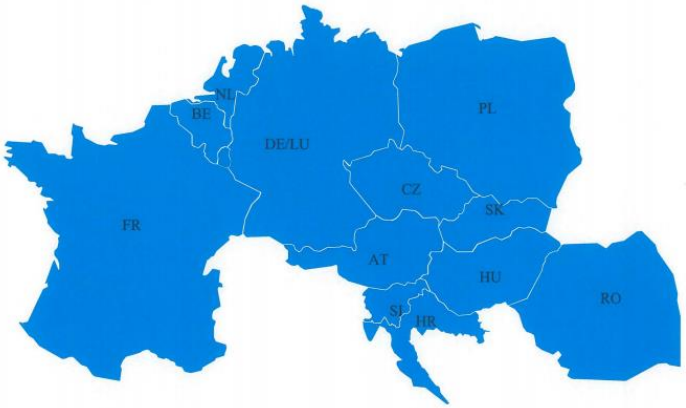
Composition and Independence of the Board of Appeal

- The Board of Appeal is part of ACER but at the same time **independent** from its administrative and regulatory structure. It is essential that members and alternates act independently and in the public interest.
- The Board of Appeal is composed by **six members** and six **alternates** for a mandate of 5 years (renewable).
- Members and alternates are selected among current or former senior staff of the national regulatory authorities, competition authorities or other national or EU institutions with relevant experience in the energy sector.

The Core CCR

(Capacity calculation regions are geographical areas, within which cross-border capacity calculation is coordinated)

- ACER Decision No 06/2016: merging the former CWE (Central West Europe) and CEE (Central East Europe) regions into the **Core** Capacity Calculation Region
- The decision was amended on 10 May 2021 following an NRA decision
- 19 Bidding Zone Borders
- 15 TSOs, 13 NRAs
- *CREG is also a member of a 2nd CCR: "the Channel"*



Autoriteit Consument & Markt · Agencija za energijo · ANRE · Bundesnetzagentur · COMMISSION DE RÉGULATION DE L'ÉNERGIE · CREG · E-CONTROL · Energy Regulatory Office · ERÚ · HUNGARIAN ENERGY AND PUBLIC UTILITY REGULATORY AUTHORITY · ILR INSTITUT LUXEMBOURGEOIS DE RÉGULATION · ÚRSO

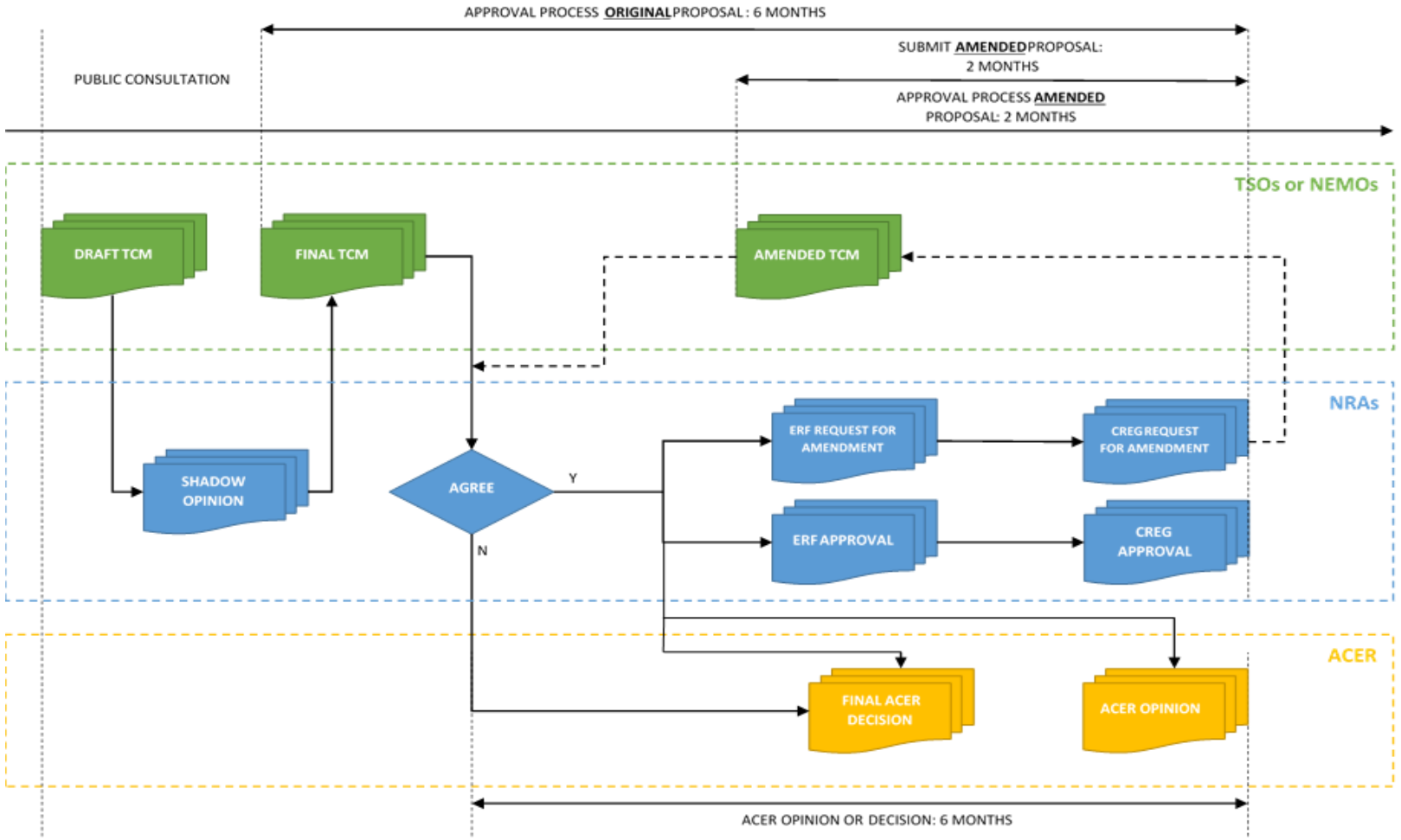
50hertz · MAVIR · amprion · PSE · APG · Rte · creos · SEPS · ČEPS, a.s. · Transelectrica · ELES · TenneT · elia · HOPS · TRANSNETBW

Governance of the Core region (1)

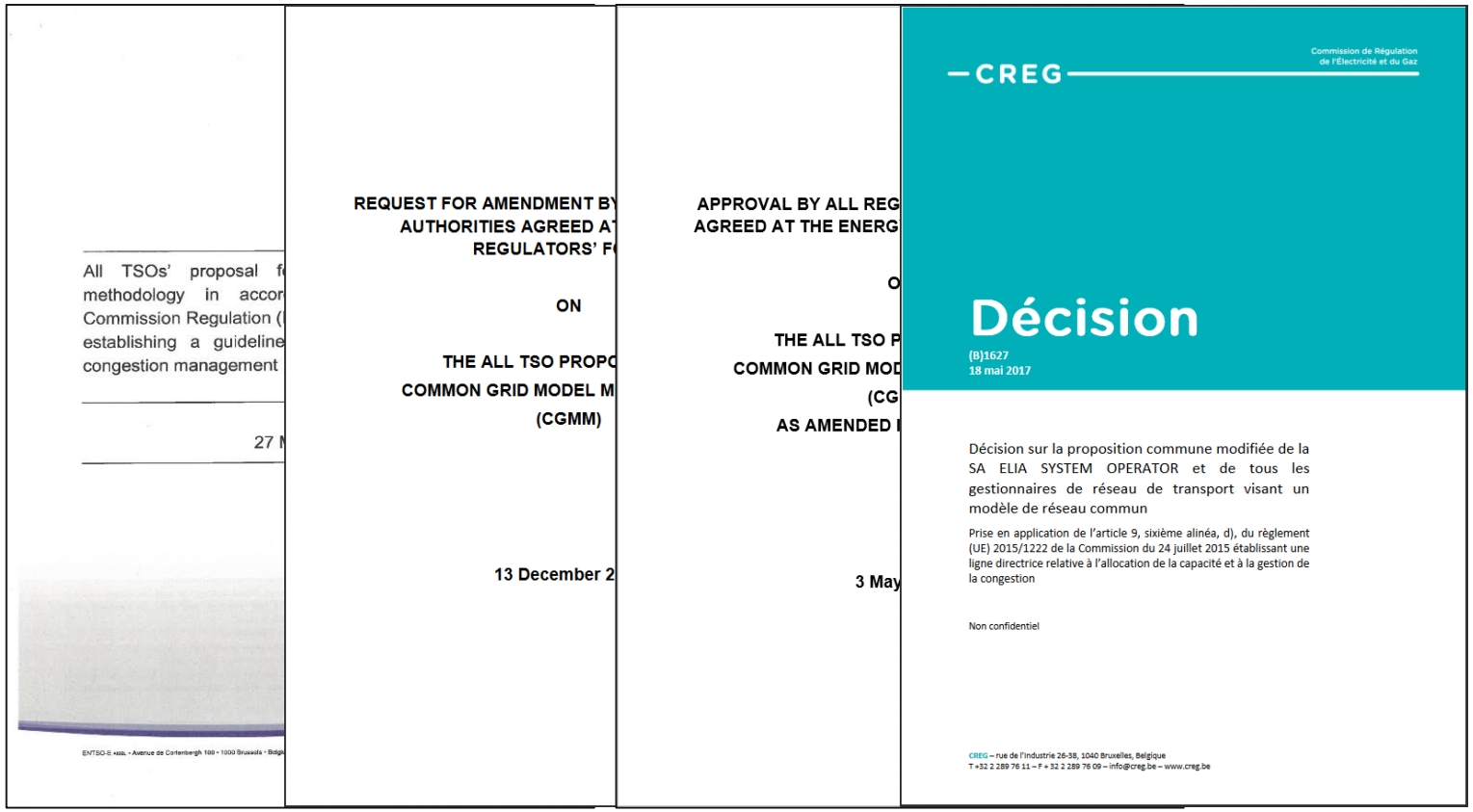
- Mimicking the pan-European approval processes, but on a (somewhat) smaller scale.

Core Implementation group (IG)	• Stakeholder interaction • TSO / NEMO involvement • "Working level"
Core Energy Regulators' Regional Forum (CERRF)	• "Gentleman's Agreement" • Decision-making body • Voting by consensus
Individual NRAs (i.e. CREG)	• Legal obligation to approve / request amendments to TSOs' / NEMOs' proposals • Responsible for implementation / enforcement

Governance of the Core region (2)



CREG approval process



EU lessons learnt

Some challenges related to the implementation of NCs and GLs

COMMON (EUROPEAN & REGIONAL)	INDIVIDUAL (CREG)
• Shift from national interests towards harmonized European approach • Divisions of responsibilities between (potentially) competing entities • Involvement of stakeholders • Practical issues	• Belgium as pivotal market in Core and Europe with very specific risks (bidding zones, capacity calculation, discrimination between internal and external exchanges) • Pioneering role of Elia and CREG in market coupling initiatives • Prioritization of issues: across different NCs/GLs, CCRs, different TSOs and NEMOs

Definition of an appropriate regulatory framework (regional level)

- How to ensure consistency in regulatory decisions?
- Appropriate decision-making framework related to the approval processes, safeguarding each individual NRAs' legitimate competences v-à-v its own TSO or NEMO (with ACER as an arbitrator)
- *"Energy Regulators' Forum"* to deal specifically with (informal) **agreements on proposed TCMs**
- Early **involvement of all NRAs** from the moment of drafting of TCMs until the final, national approvals (or ACER decision)

Challenges related to NRA governance

- Assessing and approving TCMs requires sound **technical expertise** (essentially the TSOs' or NEMOs' core business) **within an NRA**. However, this has to be complemented and constrained **by the legal interpretations of the GLs**. Specific ACER or CEER bodies may be consulted for legal advice.
- The **involvement of all actors** in adopting TCMs is essential: NRAs, TSOs, NEMOs, ACER, COM and stakeholders (through consultations and stakeholder fora).
- Whenever and wherever appropriate, NRAs need to reflect critically on (potentially) **improving some of the essential design choices in the GLs**, for example on the bidding zone review process or the governance of the MCO Functions.

Challenges related to implementing TCMs (I)

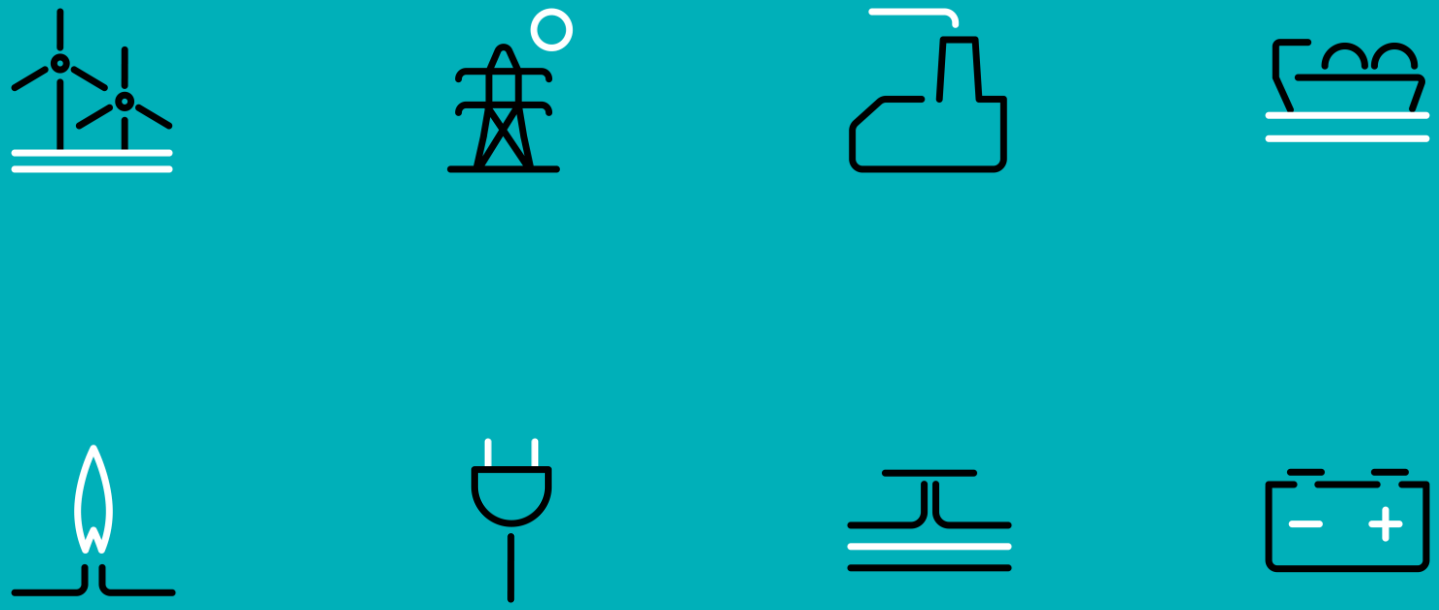
- Adoption is only a first step – **implementing TCMs is crucial** to evolve towards fully harmonized, coupled markets!
- Approvals (NRA or ACER decisions) have to be followed by **efficient monitoring** and **proper enforcement**.
- Legal basis for joint enforcement is not evident – essentially and legally speaking, this is an individual NRAs' task
- In the case of competitive NEMOs, active in multiple zones, defining an adequate enforcement framework is an extra complexity.
- How does this correspond to the **joint TSOs' and NEMOs' responsibility** to couple markets and harmonize access to transmission infrastructure?

Challenges related to implementing TCMs (II)

- From a regulators' perspective, delays in the implementation of TCMs are known when **notified by the owner or user of the process**
- Examples include: the implementation of the MCO Plan, the Common Grid Model Methodology, the MNA frameworks, Core flow-based capacity calculation,…
- No clear, common reasons for delays in these processes: varying from flawed governance structure, competing interests between involved actors, resource constraints,…
- NRAs should avoid micro-managing the processes but instead **provide appropriate incentives** and **enforce whenever necessary**

CREG

Thank you. Any questions?



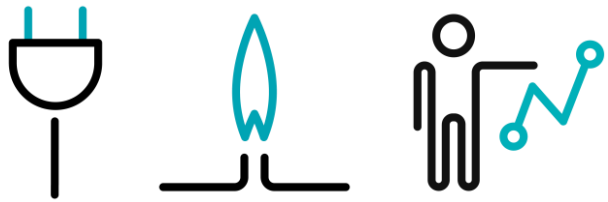
Commission for Electricity and Gas Regulation

Electricity market codes – Forward allocation of capacity

TAIEX Regional Workshops on transposition of EU electricity legislation for the Western Balkans

Thomas Kawam – thomas.kawam@creg.be

4 April 2023 – 10h15 – 10h45



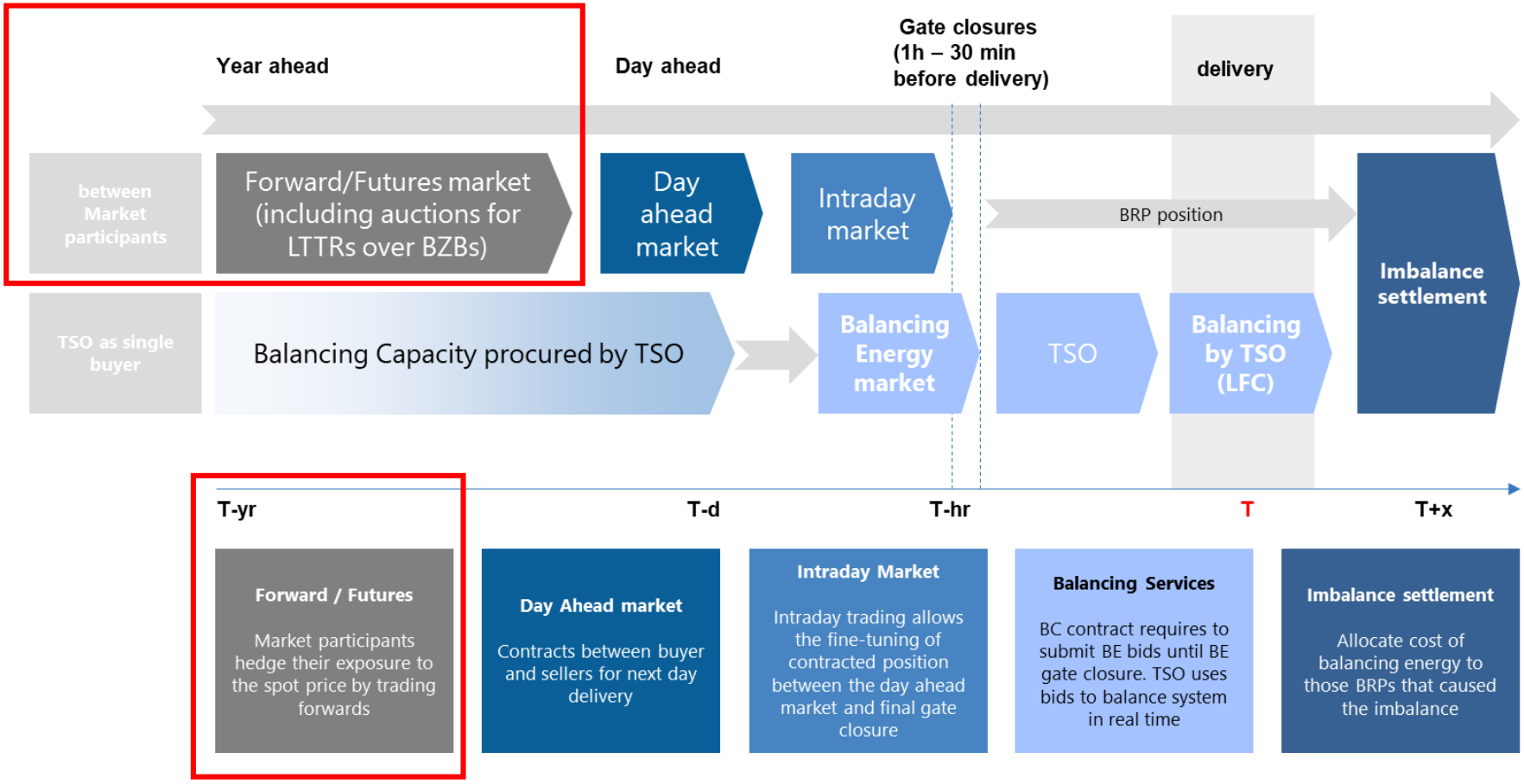
CREG
Commission for Electricity and Gas Regulation

Goal of this session

- Provide an overview of the FCA Regulation
- Dive into the pan-European terms, conditions and methodologies with a focus on the single allocation platform

The FCA Regulation

Sequence and role of the different electricity markets



Nordic and continental EU design differ regarding capacity allocation

Continental EU forward market products

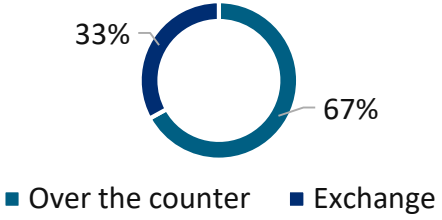
Over the counter (OTC)

Forward exchange
Zonal product

Long-term transmission rights (LTTRs)

A financial or physical capacity product allowing to « perfectly » hedge the price of a neighbouring zone.

Forward market share – EU
7.044 TWh



Nordic region forward market products

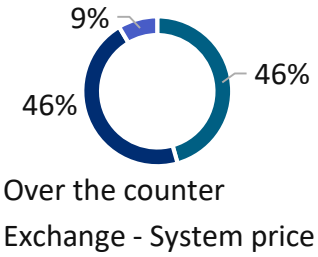
Over the counter (OTC)

Forward exchange
System price

Electricity Price Area Differentials (EPAD)

A hub-to-zone contract for difference (CfD) allowing to « perfectly » hedge the price of a zone. TSOs do not intervene.

Forward market share – Nordics
822 TWh



Source: exchanges, market sources, Prospex research, 2021 data

And what about long-term capacity allocation?

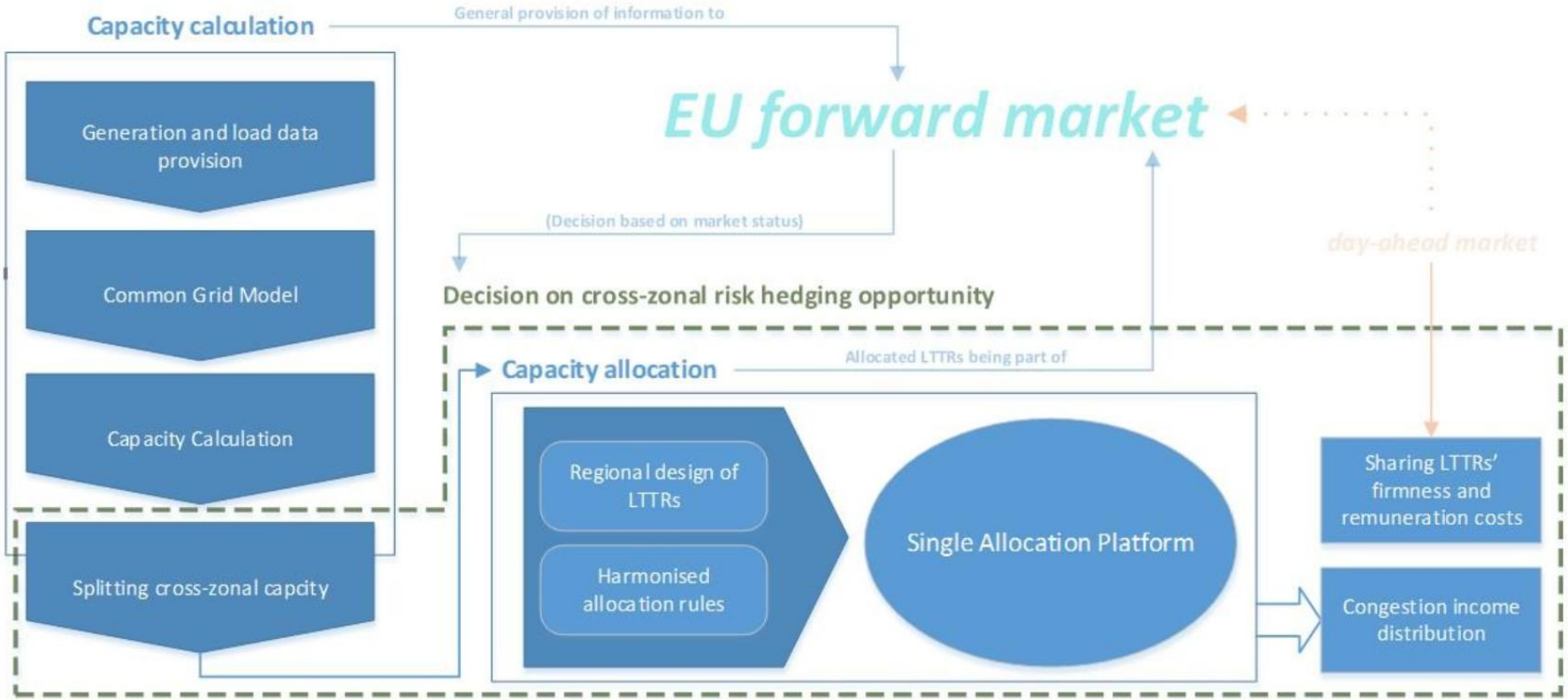
Long-term transmission rights

- In the long-term timeframe (currently monthly and yearly), TSOs issue long-term transmission rights, mostly in **financial transmission right** (FTR) **option** product.
- Those FTRs entitle their holder to receive the price differential of the two zones linked to that product, only in case of positive spread.
- **PTRs** allowing for a physical allocation of capacity under the Use-it or Sell-it (UIOSI) principle are allowed.
- All TRs are allocated for the Y+1 timeframe in a yearly auction and M+1 in a monthly auction
- The TSO, with the collected congestion income, will pay the FTR holders.
- NRAs can grant exemptions to TSOs to not support the forward market through TRs

Example:

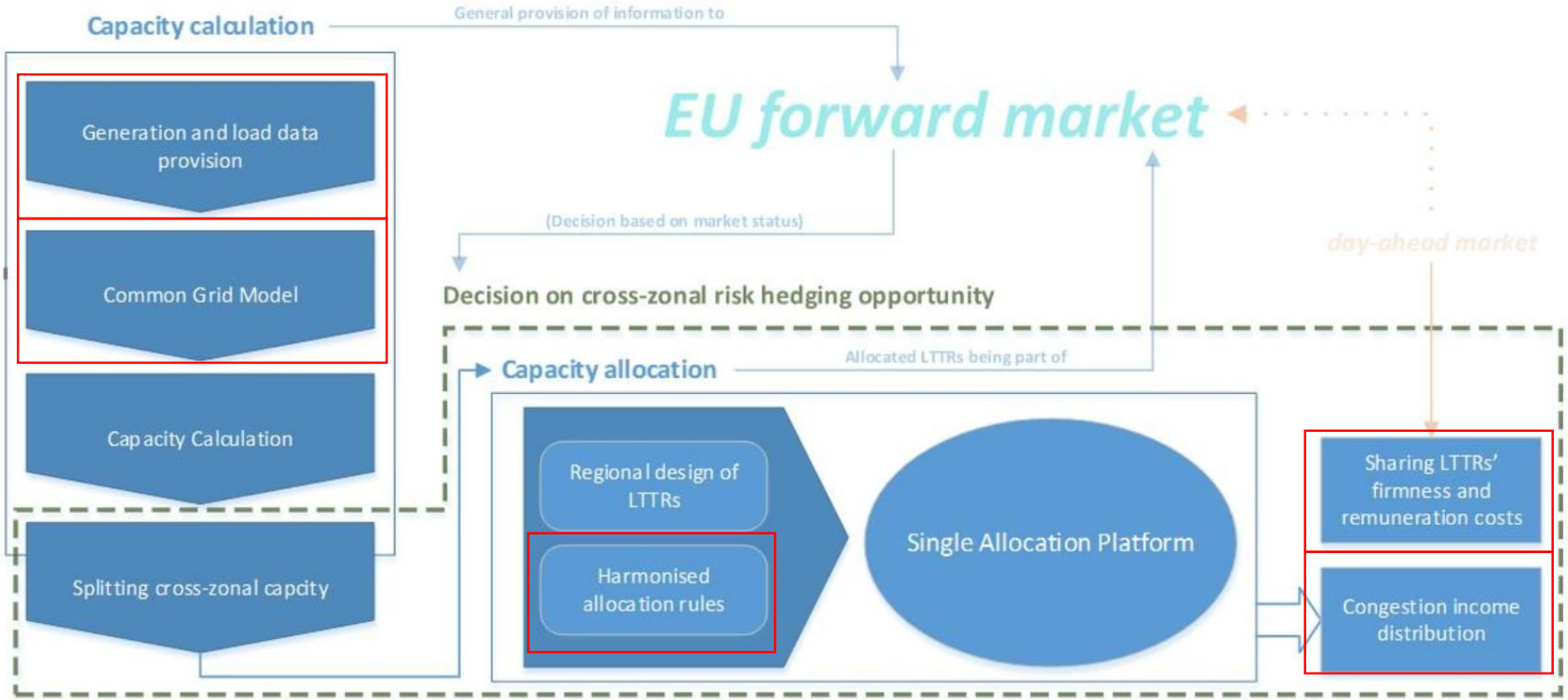
1200 MW 2021 $FTR_{A \rightarrow B}$ have been allocated. The holders are entitled to receive 1200 * 20 * 8760 = 210 240 000€ (considering a price differential of 20 € between the B and A in average in 2021).

Structure of the FCA Regulation



Pan-EU TCMs

Structure of the FCA Regulation



Generation and load data provision methodology (GLDPM)

- **What is it about?**

  The generation and load data provision methodology sets out the requirements for the delivery of generation and load data required to establish an EU-wide common grid model to facilitate the coordination and harmonisation of capacity calculation and allocation in the long-term timeframe. The methodology takes into account and complements the generation and load data provision methodology according to Article 16 of the CACM Regulation.
- **Legal basis:** Article 17 of the FCA Regulation
- **Responsibility:** all Transmission System Operators (TSOs)
- **Current status:** The generation and load data provision methodology was approved by all regulatory authorities in March 2018
- **Implementation:** The methodology is implemented.

Common Grid Model (CGM)

- **What is it about?**
  The long-term time frames provides the best forecast of perspective network states ("scenarios") used for the forward capacity calculation.
  The methodology follows the respective methodology for day-ahead and intraday pursuant to the Capacity Allocation and Congestion Management (CACM) Regulation. It provides rules and procedures for developing and merging the individual models, including the parameters of network elements, generation and load pattern, net positions of modelled areas and network topology. Since the long-term common grid model needs to simulate different forward time frames (e.g. year-ahead, month-ahead), it allows the definition of multiple sets of scenarios (such as season, peak/valley market time unit).
- **Legal basis:** Article 18 of the FCA Regulation
- **Responsibility:** all TSOs
- **Current status:** The Common Grid Model (CGM) methodology for long-term time frames was approved by all regulatory authorities in 2018.
- **Implementation:** The implementation deadline foresees an operational and available CGM for the long-term time frames by June 2018. However, its implementation is still ongoing.

Harmonised Allocation Rules

- **What is it about?**
  The harmonised allocation rules are a single set of rules which are applicable to all long-term transmission rights' allocations performed in the European Union. These rules provide specifications for the long-term transmission rights (LTTR) auction process, the use of LTTRs, provisions on collaterals, curtailment of LTTRs, invoicing and payment, as well as other relevant provisions.
- **Legal basis:** Article 51(1) of the FCA Regulation
- **Responsibility:** all TSOs
- **Current status**: The harmonised allocation rules were approved by ACER in October 2019. In March 2023, an amended proposal for harmonised allocation rules was submitted to ACER.
- **Implementation**: The harmonised allocation rules are implemented. ACER approved the latest amendment in November 2021.

The Harmonised allocation rules can be considered as the market rules of the exchanges for the allocation of long-term transmission rights by the SAP.

Congestion Income Distribution

- **What is it about?**
  The congestion income distribution methodology sets out the rules for collecting and distributing the congestion income on the bidding zone borders from forward capacity allocation and distributing it among the TSOs. It follows the requirements from the methodology for sharing congestion income developed under the CACM Regulation.
- **Legal basis:** Article 57 of the FCA Regulation
- **Responsibility:** all TSOs
- **Current status:** The methodology was approved by ACER in March 2023, addressing both NTC and Flow-Based capacity calculation and allocation mechanisms.
- **Implementation:** The implementation is connected with the implementation of the capacity calculation methodology within the respective capacity calculation region (Article 10 of the FCA Regulation). As a result, different regions had different implementation timelines

Sharing of LTTRs' firmness and remuneration costs

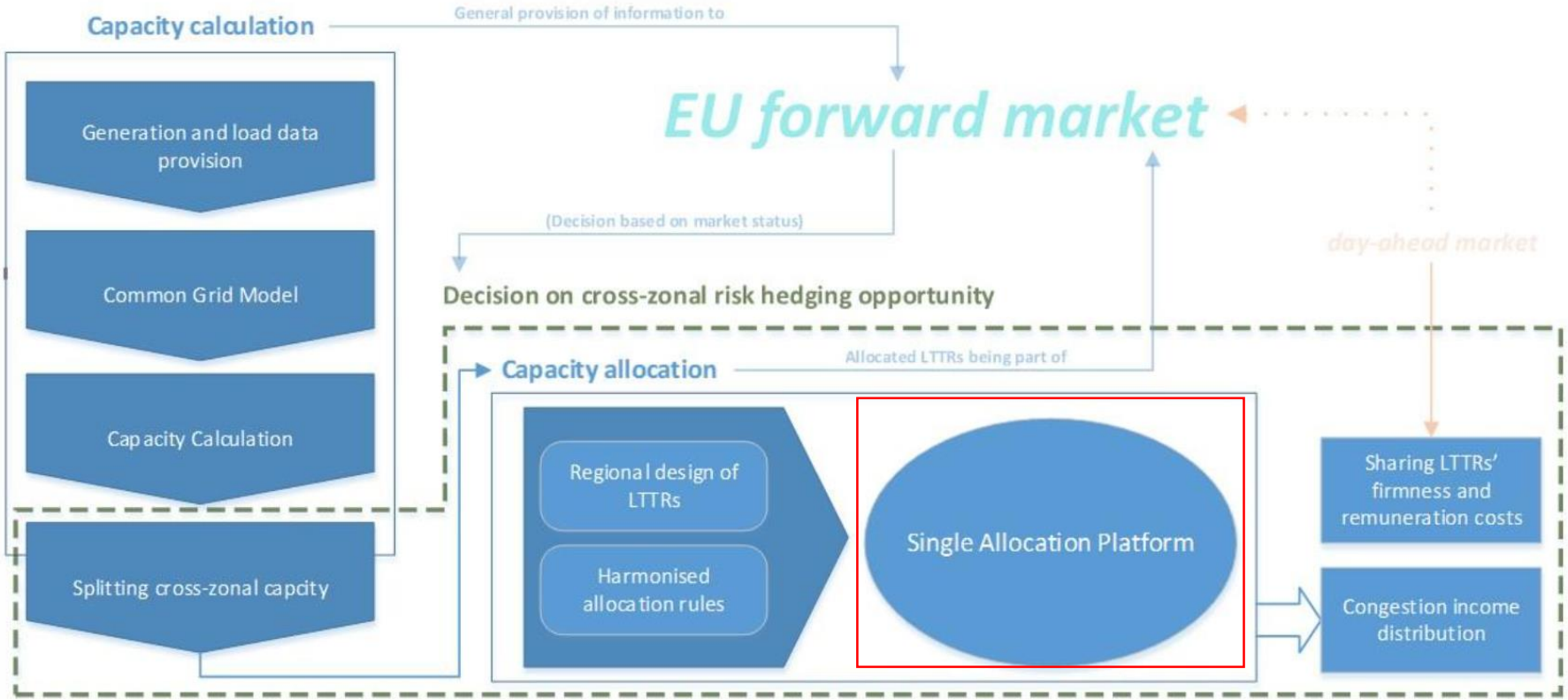
- **What is it about?**

  The methodology for sharing costs incurred to ensure firmness and remuneration of the long-term transmission rights (LTTRs) describes how TSOs spend their congestion income to remunerate the eligible long-term transmission rights 'holders.

  Moreover, it describes the sharing of compensation costs in case of long- term transmission rights' curtailment prior the day-ahead firmness deadline (due to operational security) and after the same deadline (due to force majeure or an emergency situation).
- **Legal basis:** Article 61(3) of the FCA Regulation
- **Responsibility:** all TSOs
- **Current status:** The methodology was approved by ACER in March 2023, addressing both NTC and Flow-Based capacity calculation and allocation mechanisms.
- **Implementation**: The implementation of this methodology is linked to the implementation of the capacity calculation methodology within the respective capacity calculation region (Article 10 of the FCA Regulation).

Single Allocation platform

Structure of the FCA Regulation



Single allocation platform: set of requirements and methodology for sharing costs related to its establishment and operation

- **What is it about?**

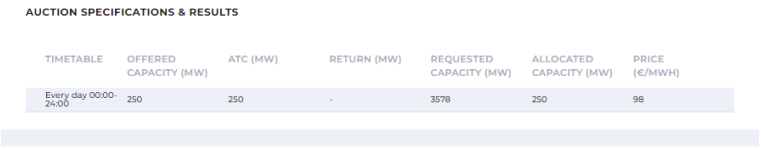
  These rules and procedures address the single allocation platform's functional requirements, governance, liabilities and cost sharing. The single allocation platform performs the execution of the long-term auctions in accordance with the harmonised allocation rules and any additional tasks required for the provision of long term transmission rights. All TSOs appointed the Joint Allocation Office (**JAO**) as the single allocation platform.
- **Legal basis:** Article 49(1) and Article 59 of the FCA Regulation
- **Responsibility:** all Transmission System Operators (TSOs)
- **Current status**: The set of requirements and the methodology for sharing the costs of establishing, developing and operating the single allocation platform were approved by all regulatory authorities in September 2017.
- **Implementation**: The single allocation platform is established and operating. The cost sharing methodology is implemented.

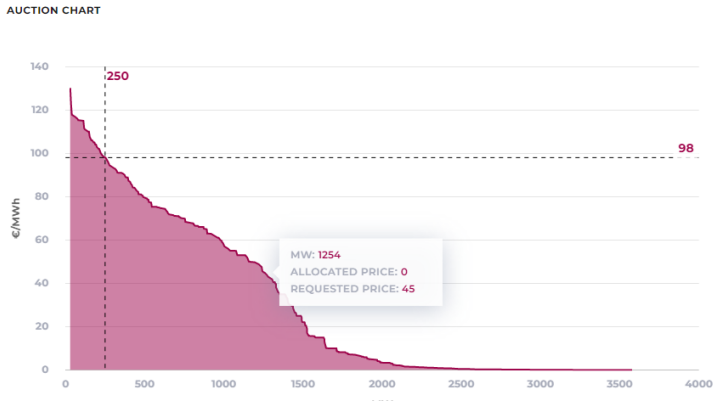
JAO – the Single Allocation Platform

- Since the 1 October 2018, JAO, established in Luxembourg, is the Single Allocation Platform for all TSOs

- JAO is owned by 25 TSOs

- **Key numbers**:
  - >18.000 auctions per year
  - 378 market participants
  - 41 bidding zones
  - 84 products
  - 700.000.000 MWh of cross-border capacity traded yearly

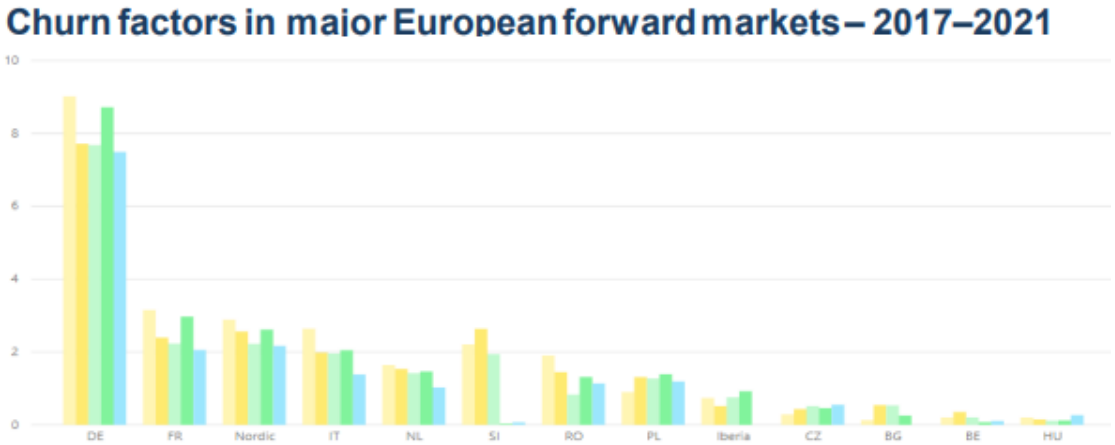


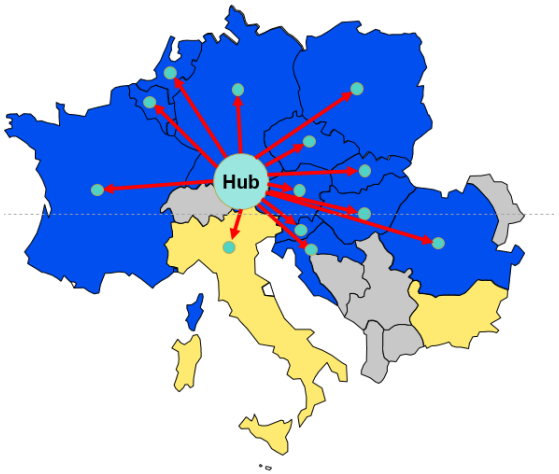


Evolution: FCA 2.0

Future of the forward market

Extract from ACER policy paper on the further development of the forward electricity markets: Although the existing long-term cross-zonal capacity allocation does integrate forward markets to some degree, we find that there is much room for improvement in the way these capacities are used to further integrate forward markets.





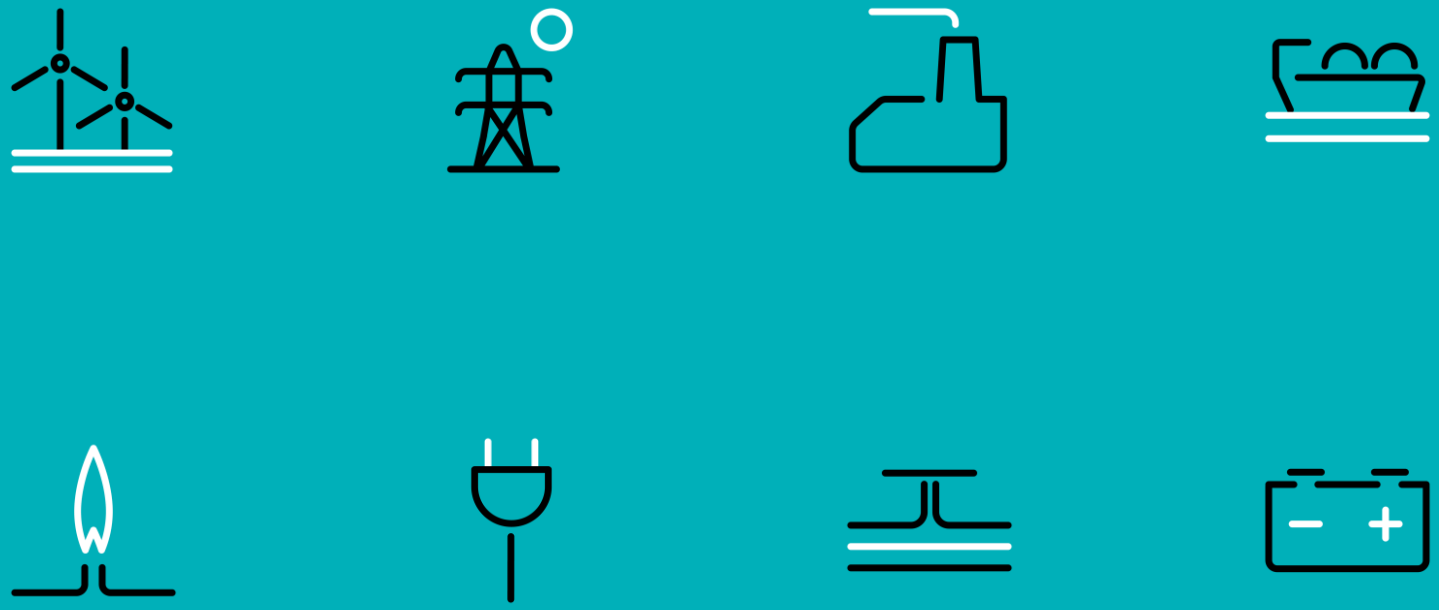
All zones to the exception of DE present a (very) low liquidity, which is an essential parameter for an efficiently functioning forward market

ACER proposed to introduce hubs to pool the liquidity of zones into a single hub

Source: ACER market monitoring report

CREG

Thank you. Any questions?



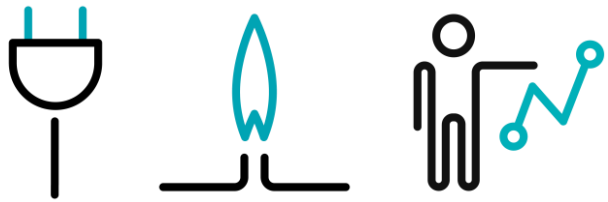
Commission for Electricity and Gas Regulation

Electricity market codes – Capacity allocation and congestion management (Block 1)

TAIEX Regional Workshops on transposition of EU electricity legislation for the Western Balkans

Thomas Kawam – thomas.kawam@creg.be

4 April 2023 – 11h-12h



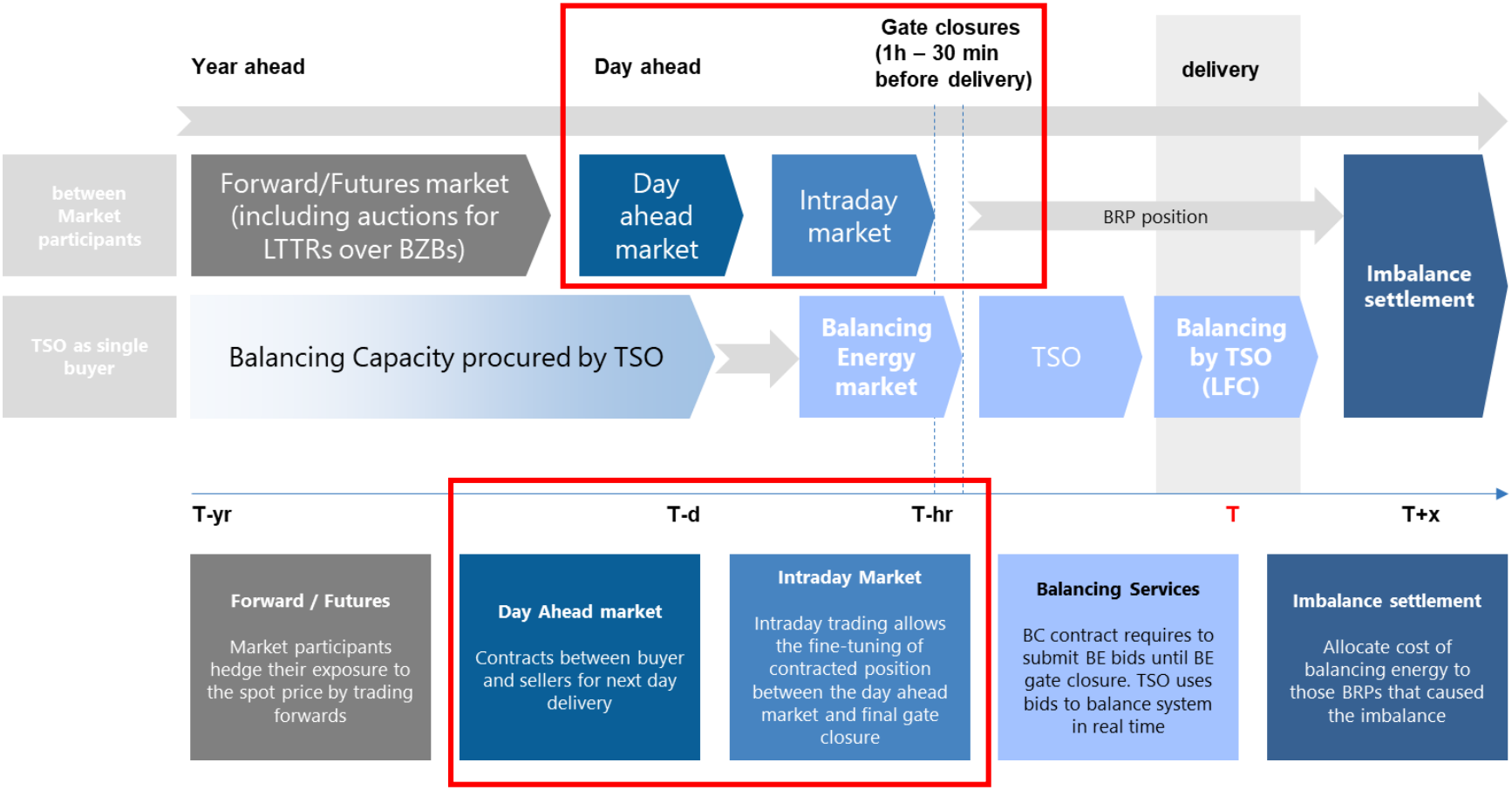
CREG
Commission for Electricity and Gas Regulation

Goal of this session

- Provide an overview of the CACM Regulation
- Discover the role of nominated electricity market operators (NEMOs) in the operation of the market coupling
- Zoom on the two initiatives for the coupling of the day-ahead and intraday markets
- Describe the functioning of the costs of developing and operating the EU market coupling
- Present the all-NEMO terms, conditions and methodologies

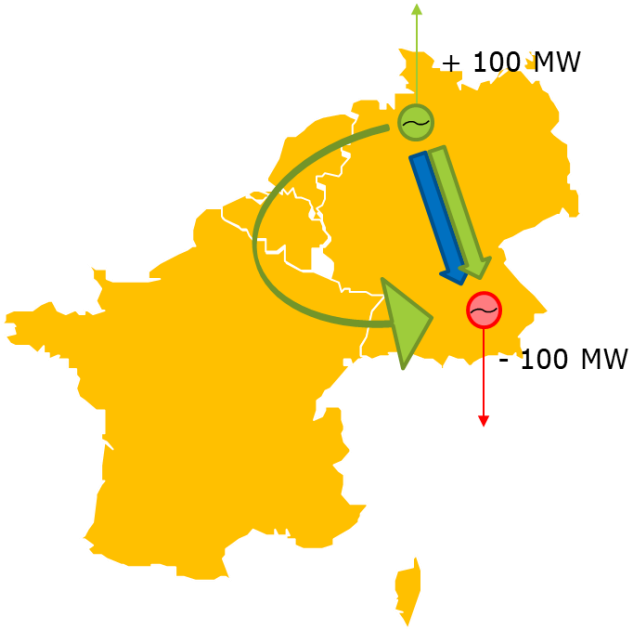
The CACM Regulation

Sequence and role of the different electricity markets



Problem statement: how to manage the difference between physical and commercial exchanges…

Load
Generation
Market Exchange
Physical flow (2/3)
Physical "loop" flow (1/3)



Overview of EU electricity bidding zones

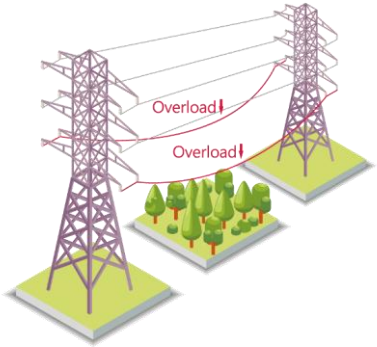
EU electricity markets rely on bidding zones, which are assumed to be « copper plates » in which there are no structural congestions.

… while considering the physical limitations of electricity grids?

Constraint 1: Max electricity per cable

Electricity is carried by cables, made of copper. Cables can only contain up to a certain amount of electricity.

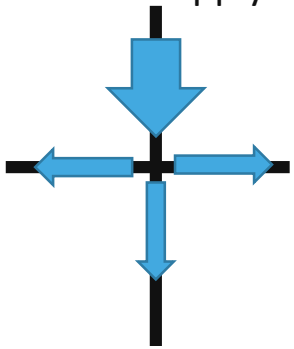
Physical capacity of a cable [MW] ≈ amount of copper.



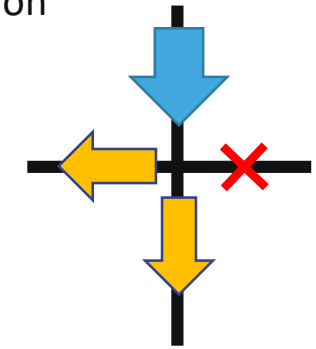
Constraint 2 : Ability to withstand an outage

In case a line gets out of service, the electricity that it was carrying will be transfer to the remaining lines.

The grid must be able to sustain an outage. TSOs apply the “N-1 criterion”

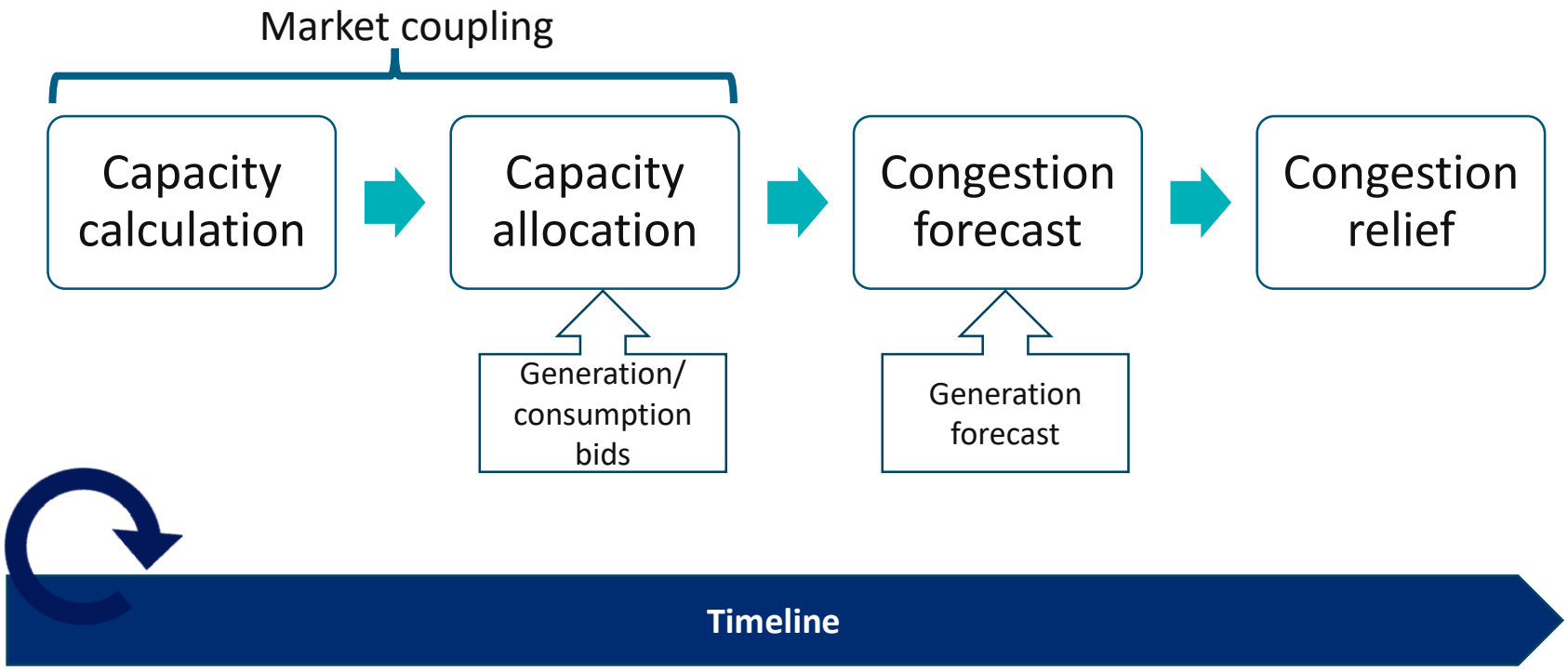


Before outage



Outage

Congestion management processes have been defined to manage differences and consider those physical limitations

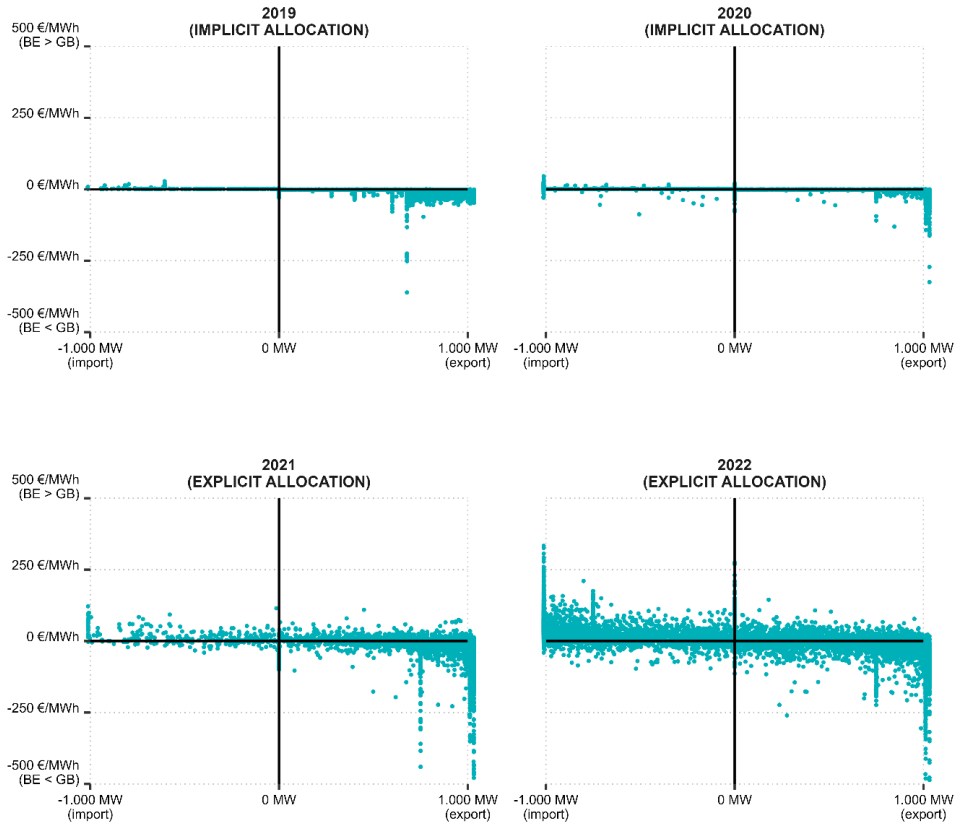


Source: E-bridge presentation on Flow-Based concept and Methodology

Benefits of implicit allocation: the case of NEMOlink

Day-ahead exchanges over Nemo Link

Hourly day-ahead schedules (horizontal, in MW) and price spreads (vertical, in €/MWh) between Belgium and Great-Britain



Source: calculations CREG based on data EPEX SPOT and Entso-E Transparency Platform
Note 1: Positive values for exchanges indicate export flows from Belgium to Great-Britain and vice versa
Note 2: Outliers with absolute price spreads exceeding 500 €/MWh are excluded to increase the readability of the figure

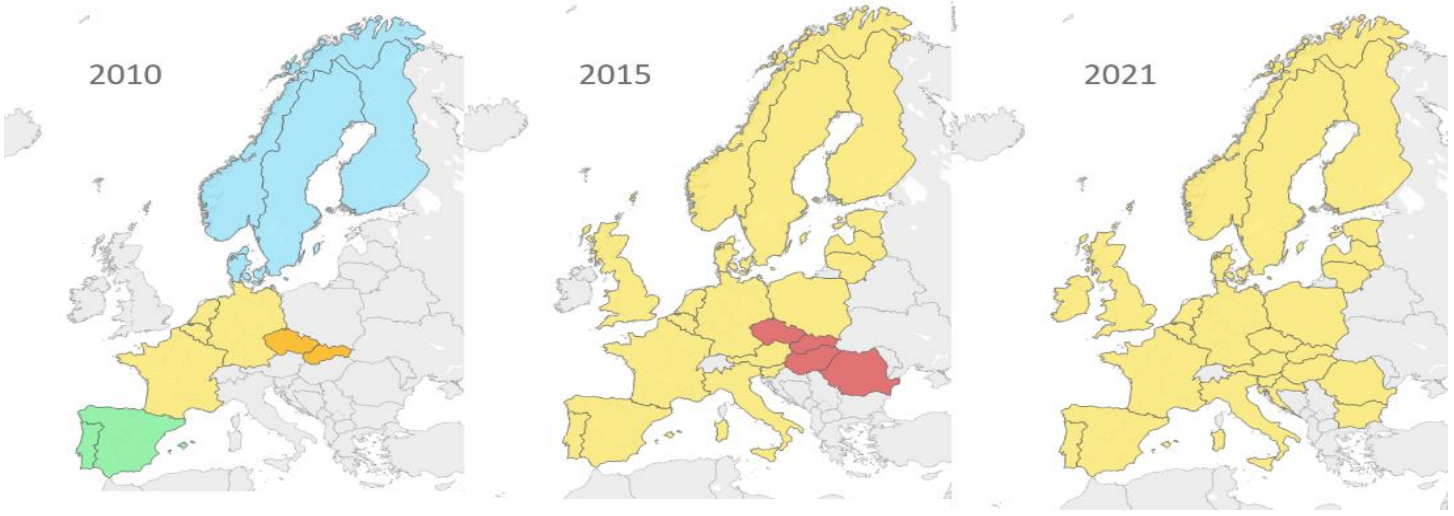
	2019	2020	2021	2022
% of hours with exchanges against the market spread	0,0%	0,5%	11,2%	20,1%

Market coupling in a nutshell

Pre coupling – up to 12h
- CZC calculation by RCC
- Order collection by NEMOs

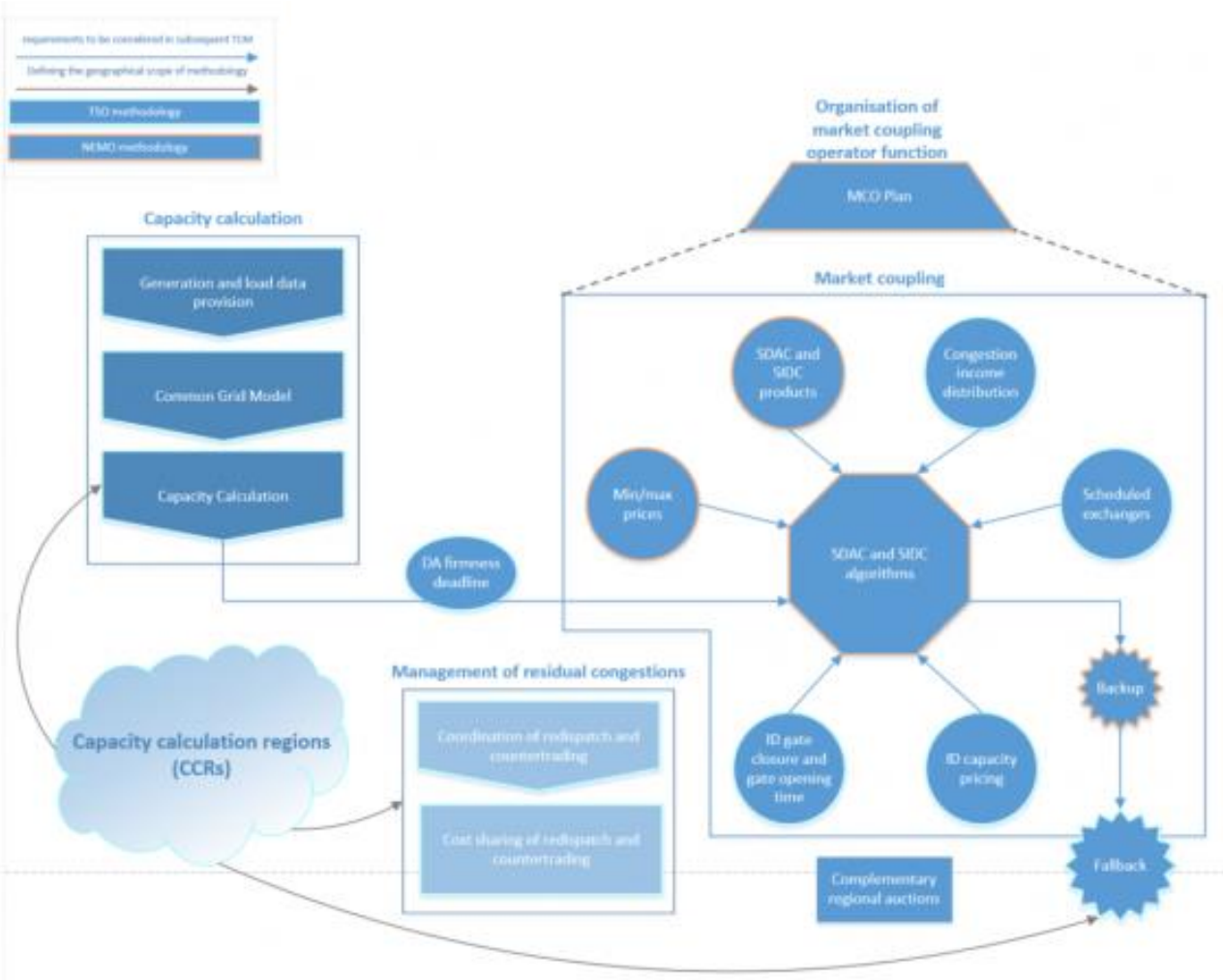
Coupling – up to 12h57
- Running algorithm by MCO
- Clearing, settlement, scheduling by MCO2NEMOs

Post coupling – up to 14h*
- Order processing
- Clearing, settlement, scheduling by NEMO2Market participants



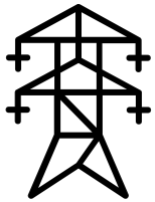
Evolution of Day-Ahead Market Coupling

TCMs of the CACM Regulation

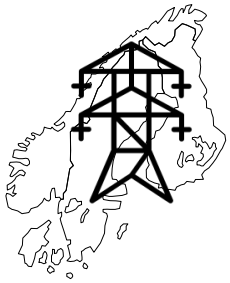


NEMO Designation and MCO function

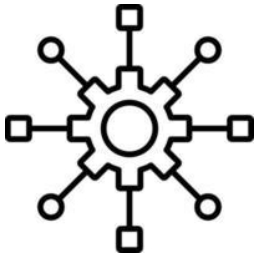
Zoom on the different stakeholders



Transmission system Operators (TSOs)

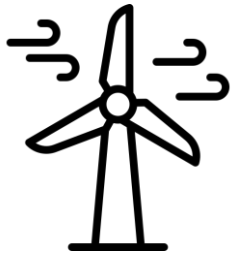


Regional Coordination Centers (RCCs)



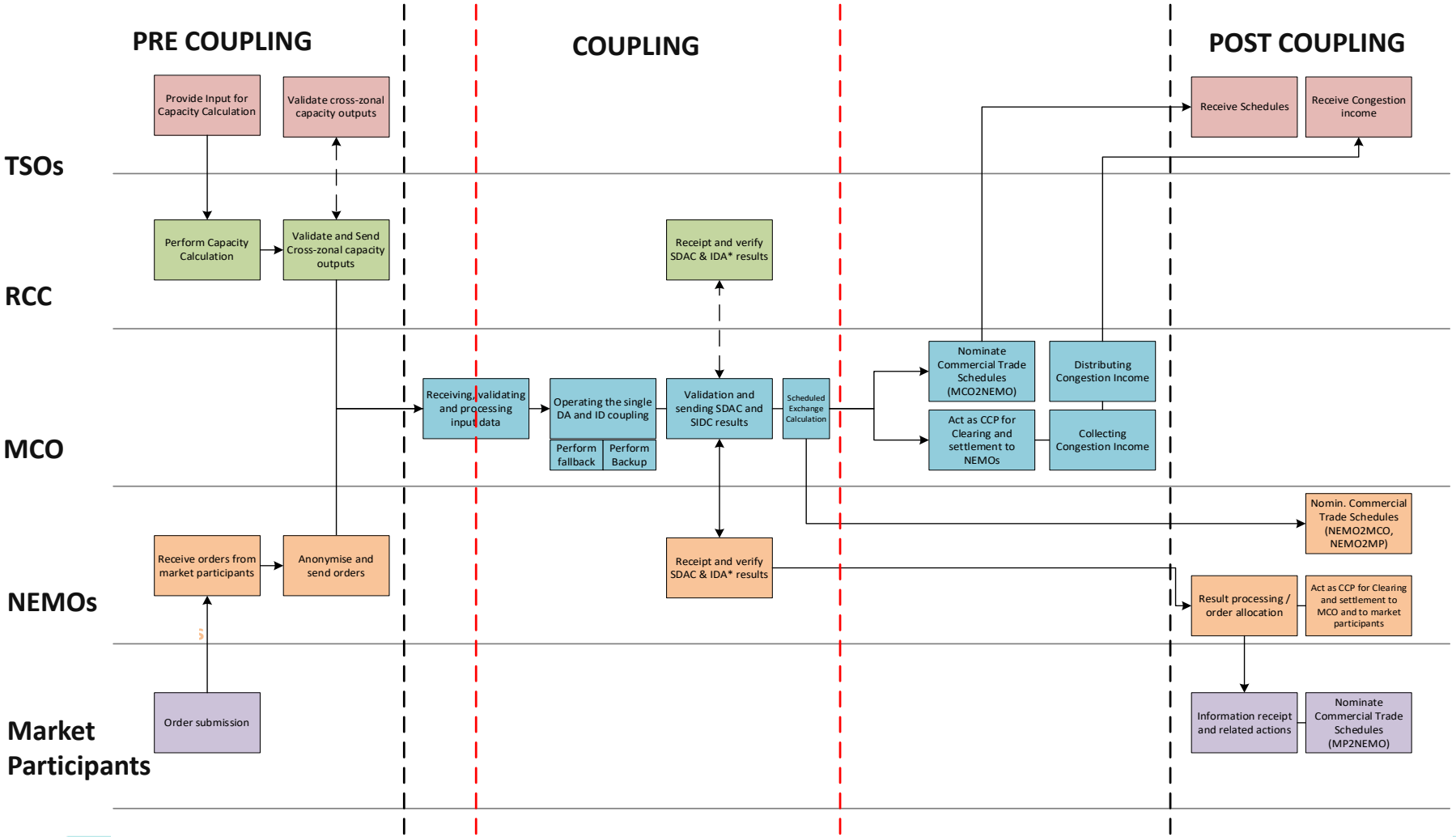
Market Coupling Operator (MCO)

Nominated Electricity Market Operator (NEMO)

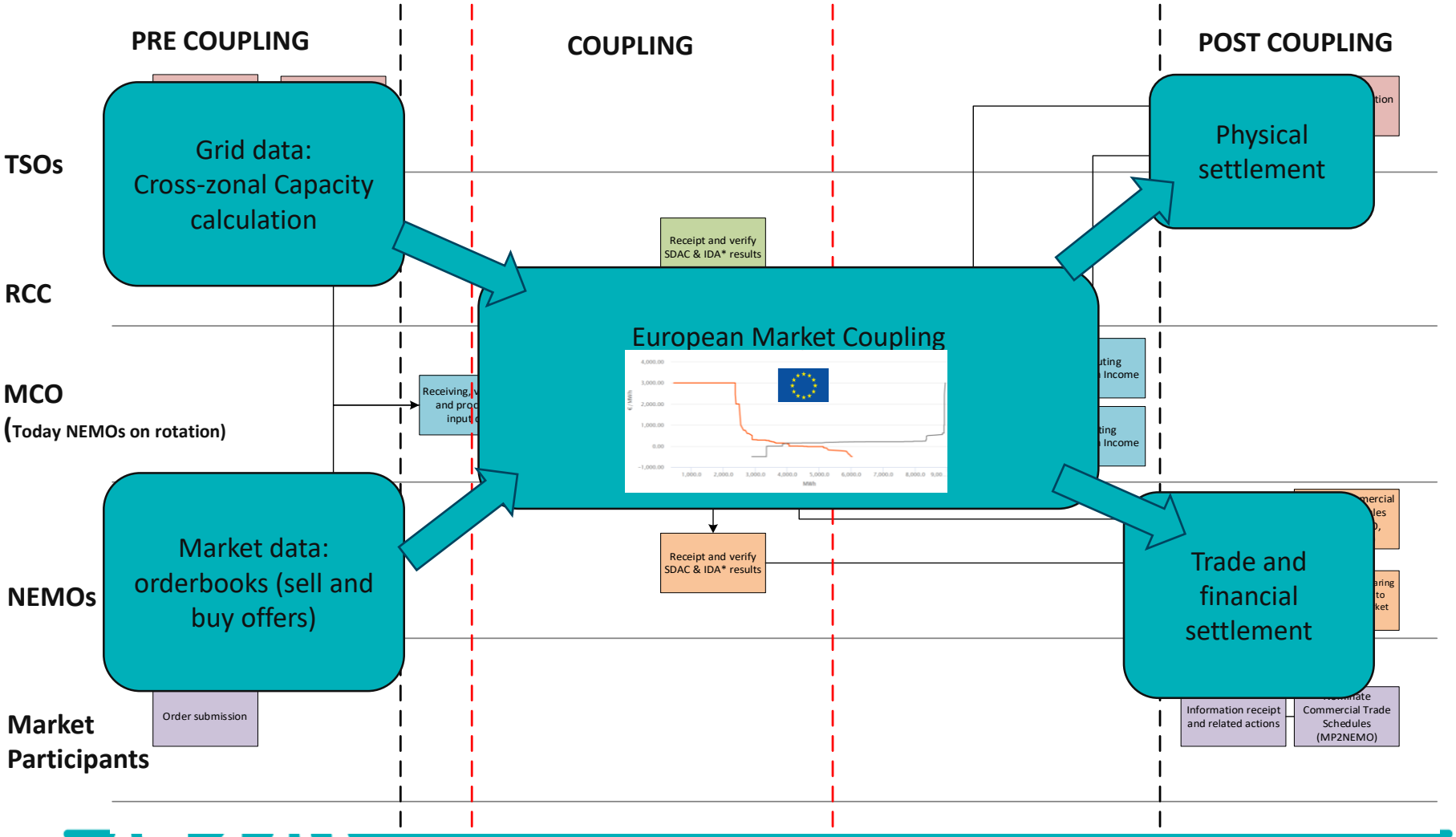


Market Participant (MP)

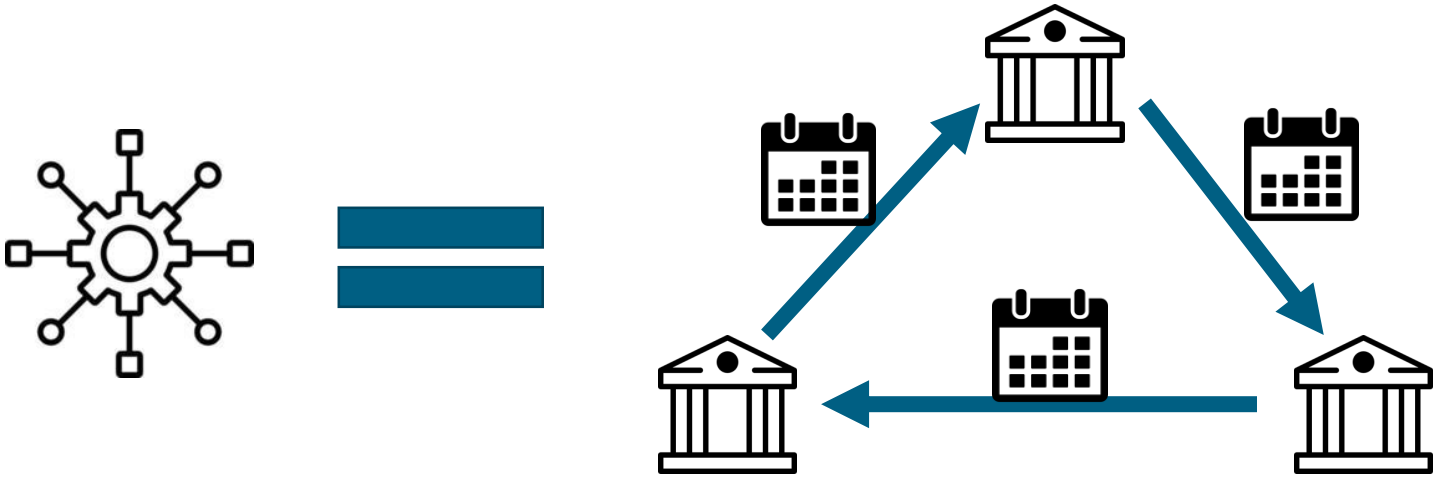
Market coupling processes



Market coupling processes



Operation of market coupling



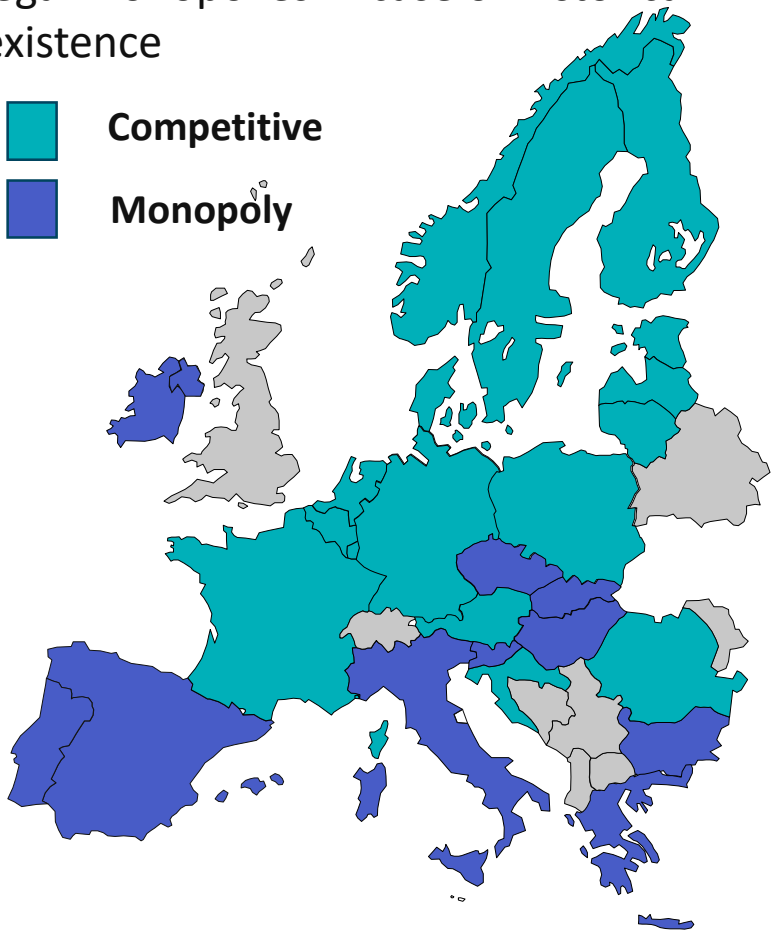
- Originally only a few NEMOs operated the market on rotational basis.
- Each NEMO needs a dedicated team and hardware for this task.
- Operational costs can be recovered from TSO tariffs or other means.

NEMO designation

- Articles 4, 5 and 6 of CACM Regulation determine the designation of Nominated Electricity Market Operators (NEMOs).
- Each Member State needs ensure that at least one NEMO is designated in their Member State to perform the single day-ahead and single intraday coupling.
- Each NEMO designated in a territory of one Member State has the right to provide its services in other Member States (i.e. by way of so called “passporting").
- Exceptionally Member States may refuse the trading services by a NEMO designated in another Member State only in specific, well-defined cases, as stated in Article 4(6) of the CACM Regulation (e.g. in case of national monopoly).
- Moreover, the Member States have the right to revoke the designation of a NEMO, in case the NEMO fails to maintain compliance with the criteria set in Article 6 of the CACM Regulation.
- EnC CPs should inform the EnC Secretariat about the NEMO monopolies set-up by 15 February 2023

Overview of NEMOs

Article 5 of CACM allows for national legal monopolies in case of historical existence



ALL NEMO COMMITTEE

- The All NEMO Committee facilitates the cooperation among NEMOs
- The All NEMO Committee is formed by the appointed representatives of each NEMO.

List of SDAC/SIDC NEMOs

CROPEX, epexspot, ETPA, EXAA, GME, HEnEx, hupx, IBEX, Nasdaq, NORD POOL, OKTE, omie, opcom, OTE, semopx, SEEPEX SOUTH POOL, TGE

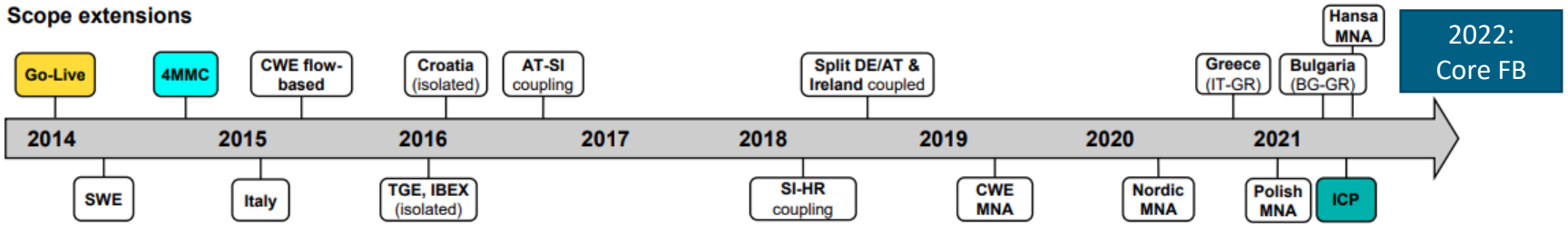
Introduction to SDAC/SIDC

SDAC - overview

SDAC parties are all the EU TSOs and NEMOs.

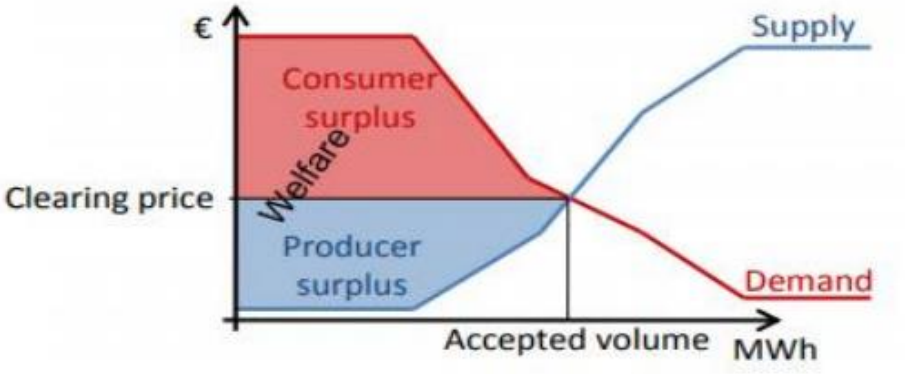
Statistics

- 98,6% of EU consumption is coupled
- 1.530 TWh / year coupled in one market solution
- 200 M€ average daily value of matched trades
- 17 minutes to solve a large and complex optimization problem (auction)



SDAC - algorithm

- The SDAC makes use of a common price coupling algorithm, called EUPHEMIA, to calculate electricity prices across Europe and to implicitly allocate auction-based cross-border capacity.
- EUPHEMIA matches energy demand and supply for 24 hours simultaneously. The algorithm runs a combinatorial optimization process based on a branch and cut optimization strategy.
- PCR, a cooperation of a sub-set of NEMOs owns and operates the algorithm.
- This process maximises social welfare (consumer surplus, supplier surplus and congestion rent) and takes into account price limits of orders and network constraints. The algorithm is designed to regard a large variety of orders and network features as well as local market rules.



SDAC – future developments

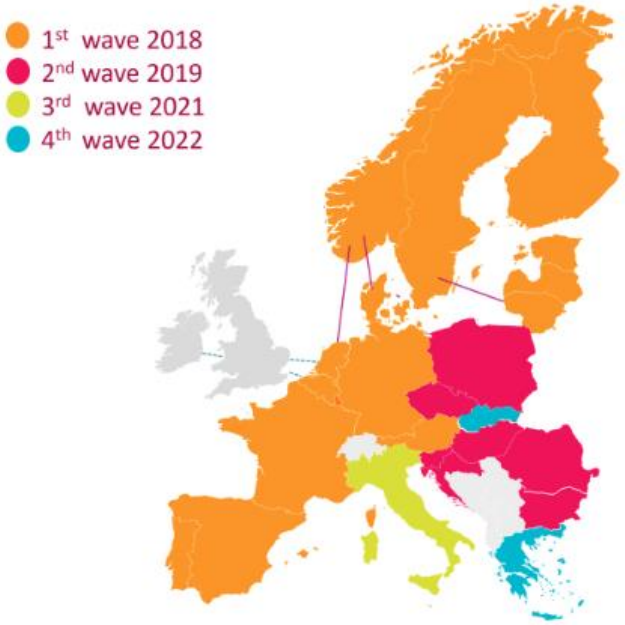
EUPHEMIA is largely compliant with CACM requirements and the final target is to complete SDAC and ensure full CACM compliance.

However, market integration projects as well as projects aiming at improving the performance of the algorithm are still planned for the future:

- Geographical extensions and market growth
- Co-optimisation of balancing reserves and energy
- Switch from NTC to flow based capacity calculation
- 15 min Market Time Unit and cross matching
- CACM requirements to the Algorithm (adequate performance, scalability and repeatability)
- New NEMOs' and new TSOs' requirements
- Topology changes

SIDC - overview

SIDC parties are all the EU TSOs and NEMOs operating in ID.

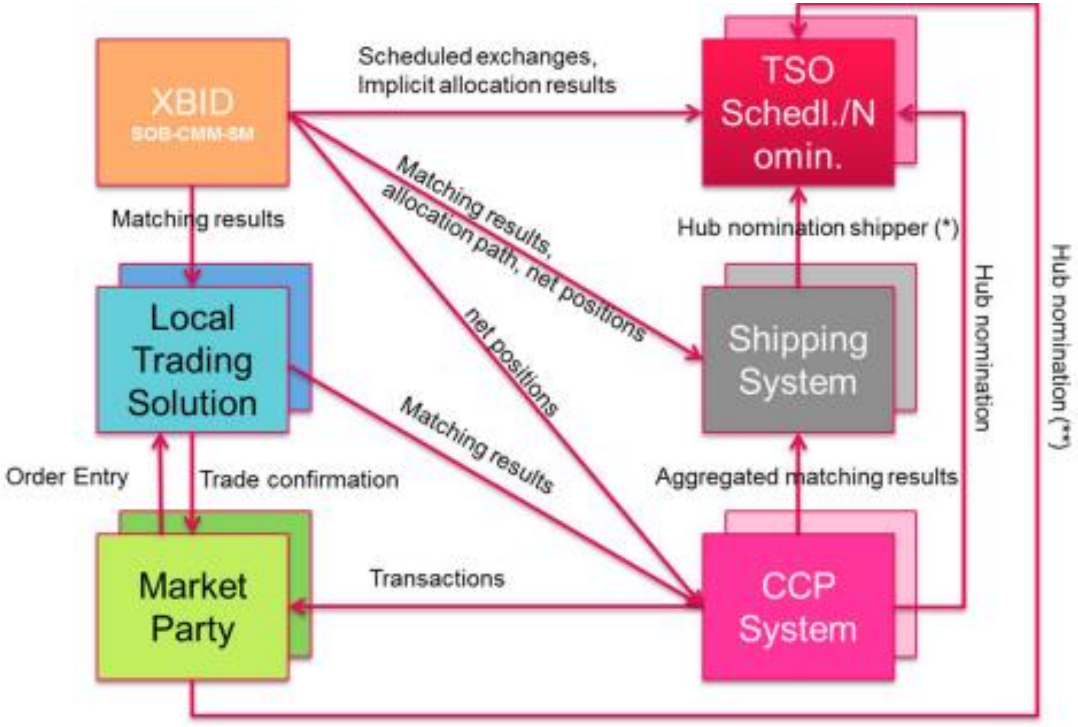


Main figures

- Around 80 millions of trade matched in 2022 (continuous matching)
- Supports trading both :
  - Explicit (capacity only. Note: only provided where requested by National Regulatory Authorities (NRAs), and
  - Implicit (capacity and energy together)

- 3 main IT modules:
  - A Shared Order Book (SOB)
  - A Capacity Management Module (CMM)
  - A Shipping Module (SM)

SIDC - algorithm



XBID high-level architecture

When a market participant submits an order for a different market area, it can be matched (i.e. met) as long as there is enough capacity available.

To match an order simply means that the market participant can meet and supply the energy demand.

Trade is done on a first-come first-served principle where the highest buy price and the lowest sell price get served first.

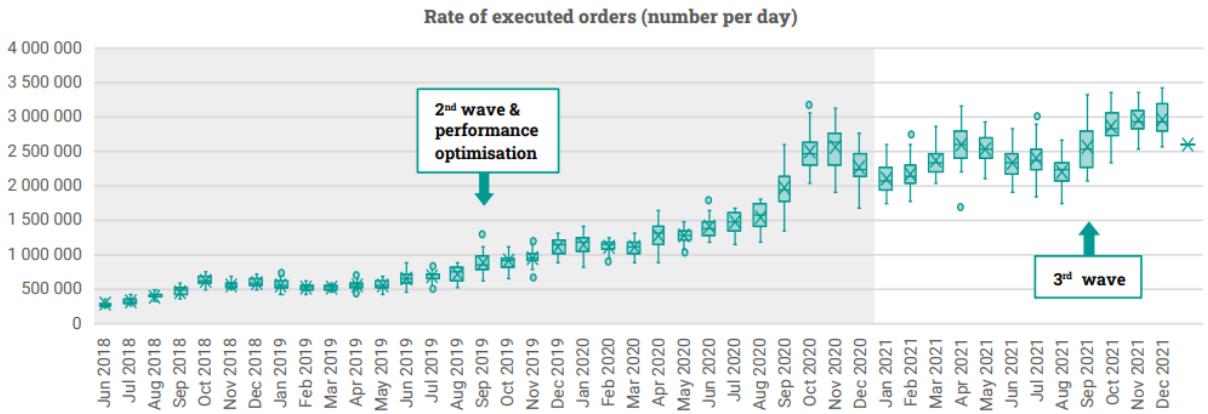
SIDC – future developments

1. Integration of cross-zonal capacity pricing through intraday auction in line with ACER's decision on establishing a single methodology for pricing intraday cross-zonal capacity (go-live scheduled in Q2 2024).

2. Implementation of the functionality to address losses on HVDC cables.

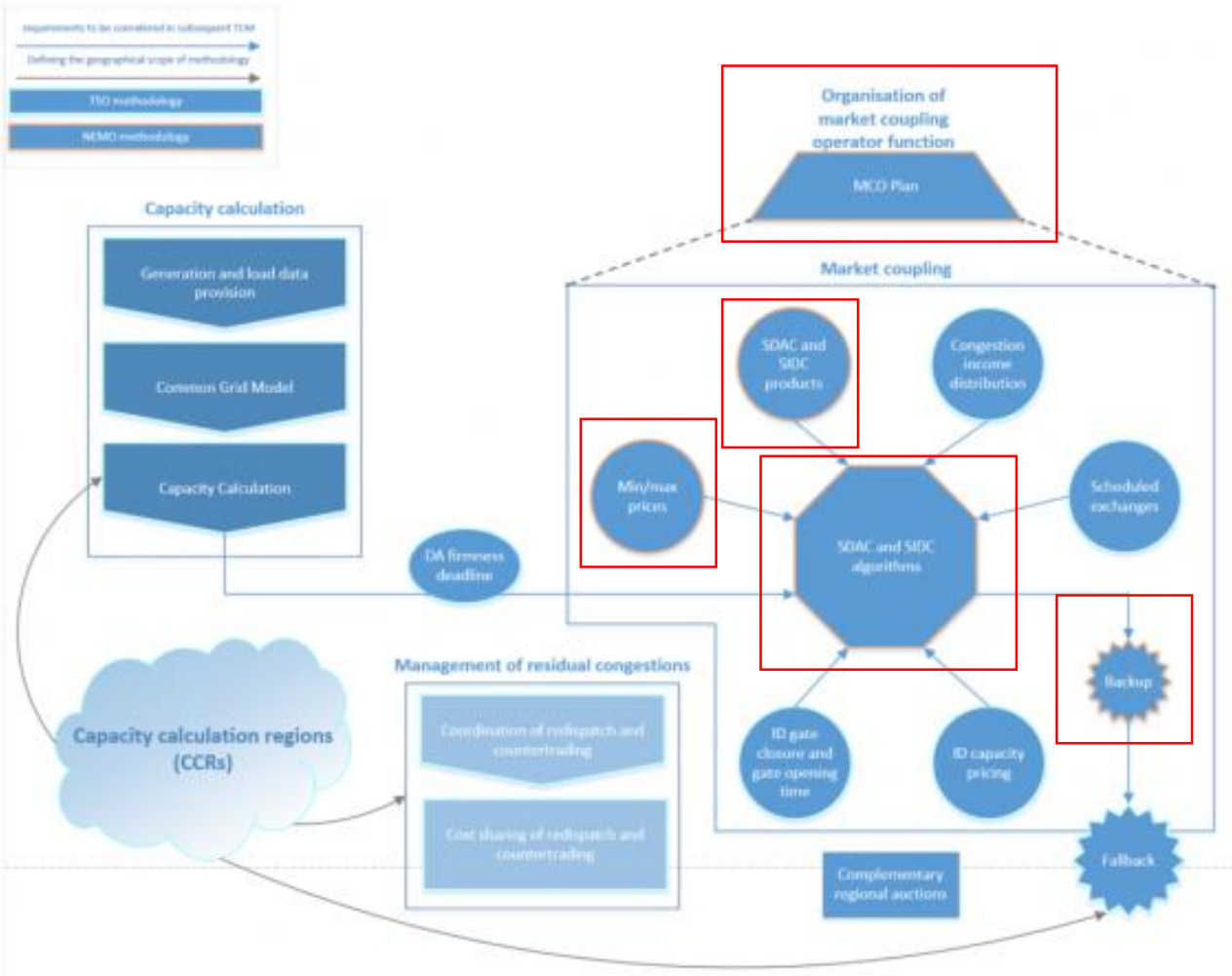
3.Implementation of flow-based allocation in continuous trading

Rate of executed orders (number per day)



Pan-EU TCMs of all NEMOs

TCMs of the CACM Regulation



MCO Plan

- **What is it about?**

  The Market Coupling Operation (MCO) plan sets out how all NEMOs jointly establish and perform the market coupling operator functions which include:

  - developing and maintaining the algorithms, systems and procedures for single day-ahead and single intraday coupling
  - processing input data on cross-zonal capacity and allocation constraints provided by coordinated capacity calculators
  - operating the price coupling and continuous trading algorithms
  - validating and sending single day-ahead and intraday coupling results to NEMOs.

  The plan also covers the governance principles for performing the market coupling operator functions.
- **Legal basis:** Article 7(3) of the CACM Regulation
- **Responsibility:** all NEMOs
- **Current status:** The MCO Plan was approved by all regulatory authorities in July 2017.
- **Implementation:** The MCO Plan is implemented once all bidding zone borders in the internal energy market are participating in the single day-ahead coupling and single intraday coupling.

SDAC/SIDC algorithms

- **What is it about?**
  The methodology establishes the requirements for the algorithms used in the day-ahead (price coupling algorithm) and intraday coupling (continuous trading matching algorithm and intraday auction algorithm). The algorithms need to be scalable, repeatable and aim for maximum economic surplus. The methodology sets the criteria to fulfil these requirements. It also ensures that any development and related changes, as well as its operation, ensure the:
    - efficient and timely implementation of the single European electricity market
    - close monitoring of the development and operations.
- **Legal basis:** Article 37 of the CACM Regulation
- **Responsibility:** all NEMOs
- **Current status:** The algorithm methodology was approved by ACER in July 2018 and amended in January 2020.
- **Implementation**: The methodology has been largely implemented. Nevertheless, some functionalities are still pending and should become operational by 2023.

Harmonised maximum and minimum prices for SDAC/SIDC

- **What is it about?**
  The terms and conditions set out the harmonised maximum and minimum clearing prices to be applied in the market coupling. They are subject to the application of an automatic adjustment mechanism. This mechanism ensures that an increment to the original maximum price is added if the clearing prices in the day-ahead or intraday coupling nearly reach its maximum limit.
- **Legal basis:** Article 41 (day-ahead) and Article 54 (intraday) of the CACM Regulation
- **Responsibility:** all NEMOs
- **Current status:** The terms and conditions on minimum and maximum prices were approved by ACER in January 2023.
- **Implementation:** The terms and conditions are implemented.

Example of the 4 April 2022 - France

On 4 April 2022, the FR BZ reached prices of 2720€/MWh and 2990€/MWh for hour 7 and 8 respectively. It was estimated by CRE, that those prices would have been halved with a shift in the supply/demand balance between 500 and 1000MW.

This event led to an increase of the SDAC maximum price limit from 3.000€/MWh to 4.000€/MWh

SDAC/SIDC products

- **What is it about?**
  The terms and conditions list all products that can be used in the day-ahead and intraday coupling and splits them into two categories: mandatory and optional.
- **Legal basis:** Article 40 (day-ahead) and Article 53 (intraday) of the CACM Regulation
- **Responsibility:** all NEMOs
- **Current status**: The terms and conditions were approved by all regulatory authorities in 2018 and their amendment were approved by ACER in January 2020.
- **Implementation**: The terms and conditions are implemented.

Back-up

- **What is it about?**
  All NEMOs are responsible for establishing, together with the relevant TSOs, the backup procedures for national or regional market operation in case no results are available from the market coupling operation functions.
  The methodology ensures a back-up in operating the MCO functions, in case the responsible NEMO is unable to do so. This methodology takes into account the fallback methodology under the CACM Regulation**.**
- **Legal basis:** Article 36 of the CACM Regulation
- **Responsibility:** all NEMOs (in cooperation with all TSOs)
- **Current status:** The back-up methodology was approved by all regulatory authorities in March 2019.
- **Implementation:** The methodology is implemented.

Costs

Costs - principles

- CACM Article 75:
  - Costs assessed as reasonable, efficient and proportionate shall be recovered in a timely manner through network tariffs or other appropriate mechanisms as determined by the competent NRAs
  - A share of the common costs is determined for each Member States

- CACM Article 76:
  - All NEMOs shall bear the common, regional and national costs for establishing and operating the SDAC and SIDC
  - TSOs may contribute to the costs, subject to approval by the NRAs
  - NEMOs are entitled to recover costs

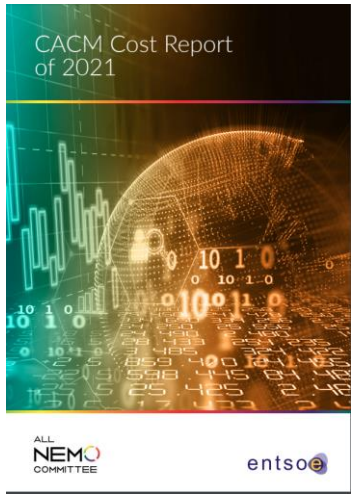
- CACM Article 77:
  - Clearing and settlement costs are to be recovered through fees or other appropriate mechanisms

Costs - problems

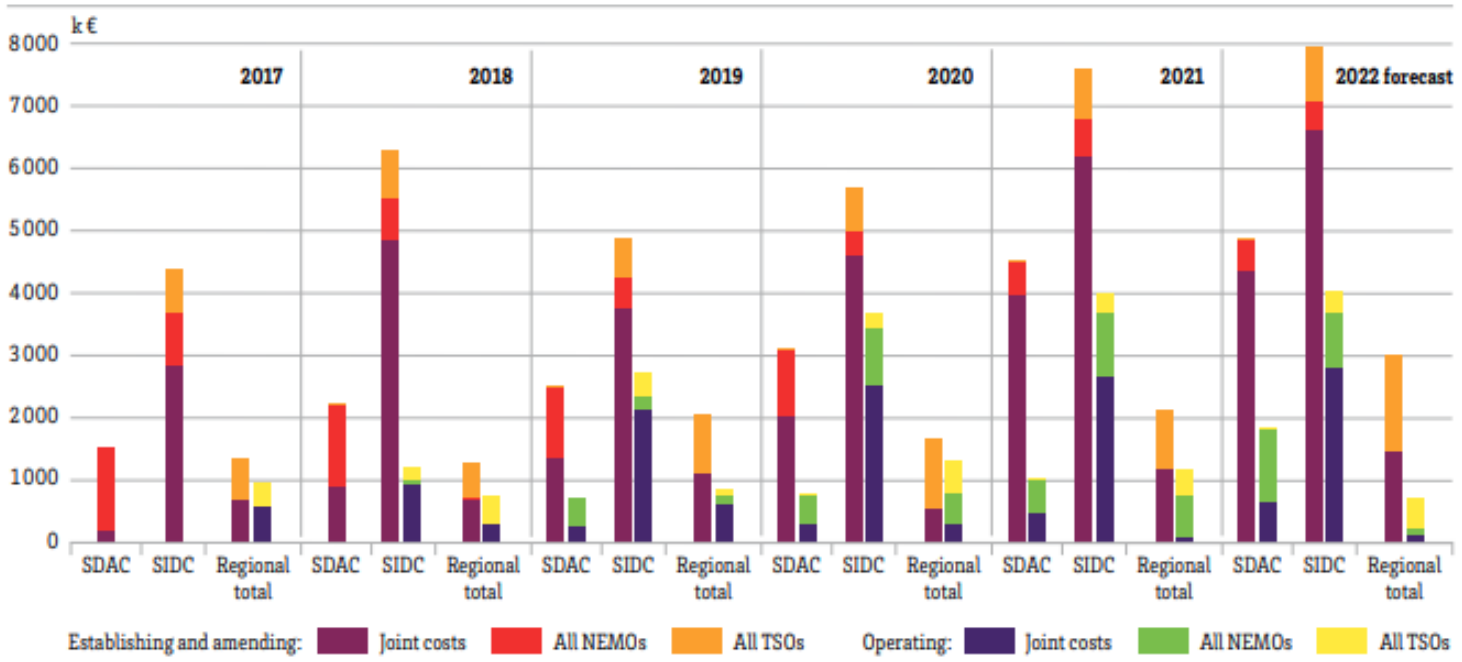
- Difficult for NRAs to decide whether a cost is “reasonable and proportionate”
- NEMOs don’t know before incurring in a cost if they will recover it → reduced incentive to invest in the project
- Different cost-recovery rules in different countries might create unlevel playing field for NEMOs
- Unclear rules on cost sharing

Costs - reporting

All NEMOs and all TSOs report to the regulatory authorities on the costs of establishing, amending and operating SDAC and SIDC according to Article 80 of CACM Regulation.

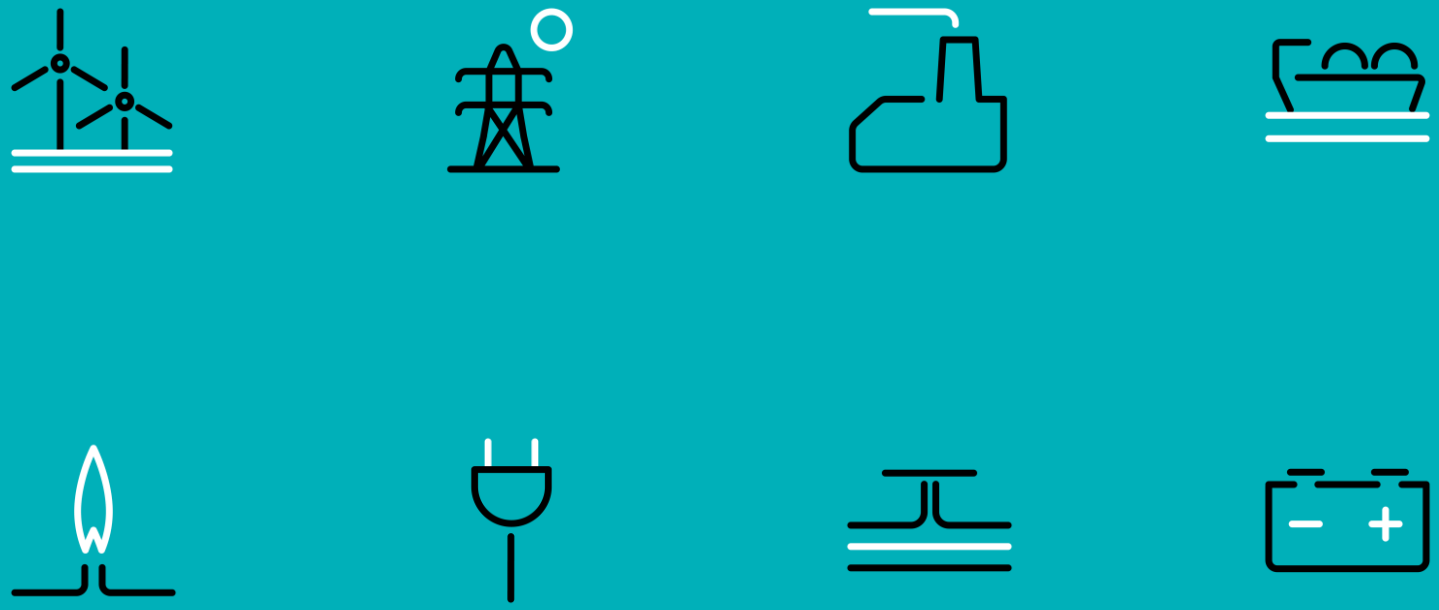


2021 common costs overview



CREG

Thank you. Any questions?



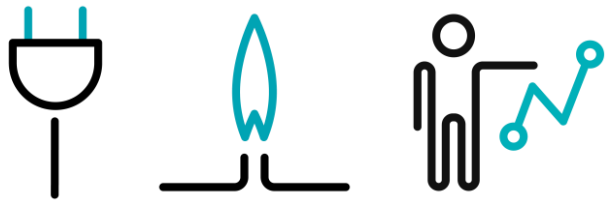
Commission for Electricity and Gas Regulation

Electricity market codes – Capacity allocation and congestion management (Block 2)

TAIEX Regional Workshops on transposition of EU electricity legislation for the Western Balkans

Thomas Kawam – thomas.kawam@creg.be

4 April 2023 – 12h15-13h15



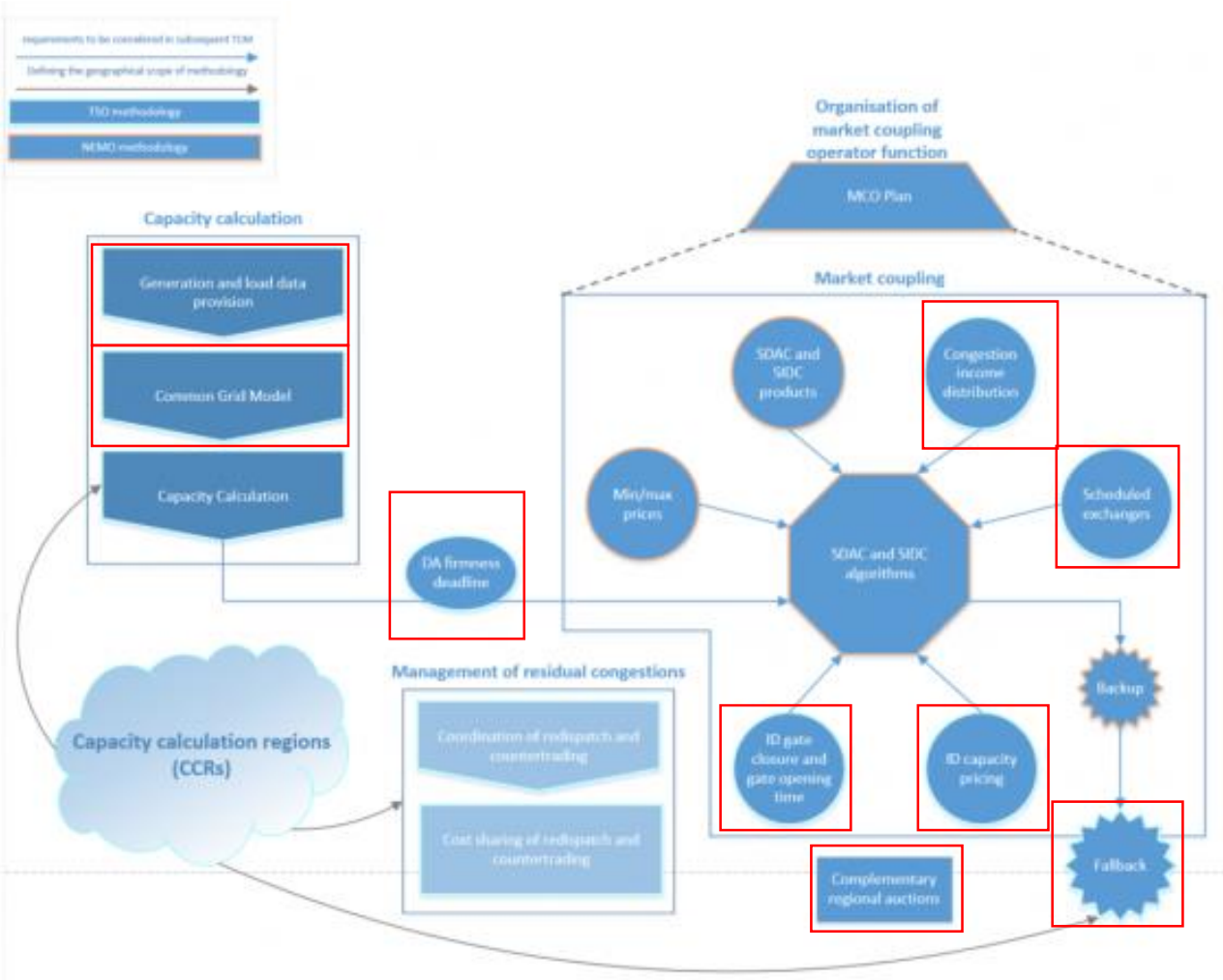
CREG
Commission for Electricity and Gas Regulation

Goal of this session

- Present the all-TSO terms, conditions and methodologies
- Present the regional TSO terms, conditions and methodologies
- Wrap-up with an view on the potential future of CACM
- List of resources

Pan-EU TCMs of all TSOs

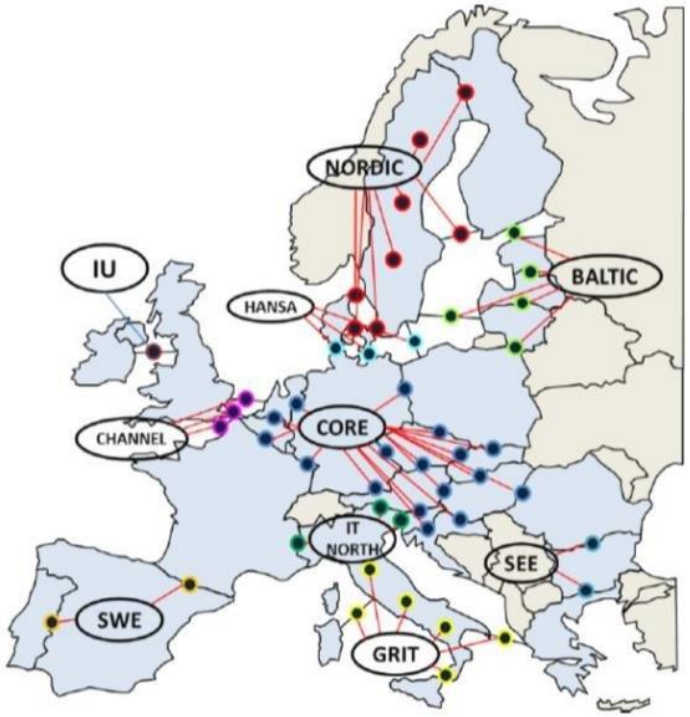
TCMs of the CACM Regulation



Definition of capacity calculation regions (1)

- **What is it about?**

  This methodology groups all European Union's bidding zone borders into the different capacity calculation regions (CCRs). This is relevant for the functioning of the internal energy market, as it simplifies processes by forming such regional sub-groups. The approach needs to consider for which bidding zone borders the need of coordination is the highest (e.g. taking into account the interdependencies) and where it is most efficient to apply cross regional coordination. Different regional methodologies (such as capacity calculation, re-dispatching and countertrading) will be applied on the various capacity calculation regions.



Source: ACER.

CCR map

Definition of capacity calculation regions (2)

- **Legal basis:** Article 15(1) of the CACM Regulation
- **Responsibility:** all Transmission System Operators (TSOs)
- **Current status**: The determination of capacity calculation regions was approved by ACER in May 2021 and, more recently, in March 2023**.**
- **Implementation**: The determination of capacity calculation regions is implemented. A future assessment is foreseen to assess the efficiency of the current CCR determination based on information from newly implemented regional methodologies.

Generation and load data provision

- **What is it about?**
  The generation and load data provision methodology sets out requirements related to the delivery of the generation and load data needed to establish the common grid model. It specifies what units and which information need to be submitted to their respective TSOs, as well as their deadlines.
- **Legal basis:** Article 16 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status:** The generation and load data provision methodology was approved by all regulatory authorities in July 2017.
- **Implementation:** The methodology is implemented.

Common Grid Model (CGM)

- **What is it about?**
  The common grid model (created by merging all individual grid models of TSOs) provides the best forecast of perspective network states in the relevant market time units used for the day-ahead and intraday capacity calculation. The methodology defines the rules and procedures for developing and merging the models, including the relevant parameters of network elements, generation and load patterns, net positions of modelled areas and network topology.
- **Legal basis:** Article 17 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status:** The methodology was approved by all regulatory authorities in May 2017.
- **Implementation:** The implementation deadline foresees the common grid model to become perational and available for the day-ahead and intraday time frames by June 2018. However, implementation is still ongoing.

Intraday cross-zonal gate opening and closure time

- **What is it about?**
  The terms and conditions determine the intraday cross-zonal gate opening (point in time when cross-zonal capacity between bidding zones is released) and closure time (where cross-zonal capacity allocation is no longer permitted).
  The intraday cross-zonal gate opening time has been set to 15:00 market time day-ahead.
  The intraday cross-zonal gate closure time has been set to 60 minutes before the start of the relevant intraday market time unit on a bidding zone border.
- **Legal basis:** Article 59 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status**: The terms and conditions were approved by ACER in April 2018.
- **Implementation**: The terms and conditions are implemented in all capacity calculation regions.

Intraday capacity pricing

- **What is it about?**
  The pricing mechanism for cross-zonal capacity in the intraday timeframe should be based on intraday auctions. These auctions are part of the single intraday coupling and complement continuous trading, where the available cross-zonal capacity is allocated at a zero price on a first come first serve basis.
  The methodology ensures cross-zonal capacity is not allocated to the intraday auctions and the continuous trading at the same time.
- **Legal basis:** Article 55 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status**: The methodology was approved by ACER in January 2019.
- **Implementation**: The methodology is implemented through the amendments of the algorithm methodology, which introduces intraday auctions as the tool for pricing intraday capacity. The algorithm methodology sets out the implementation of the intraday auctions to the beginning of 2023.

Day-ahead firmness deadline

- **What is it about?**
  The day-ahead firmness deadline methodology defines the deadline after which cross-zonal capacity for the day-ahead allocation becomes firm. The day-ahead firmness deadline is set to 60 minutes before the day-ahead market gate closure time.
- **Legal basis:** Article 69 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status:** The methodology was approved by all regulatory authorities in July 2017.
- **Implementation:** The methodology is implemented.

Complementary regional auctions

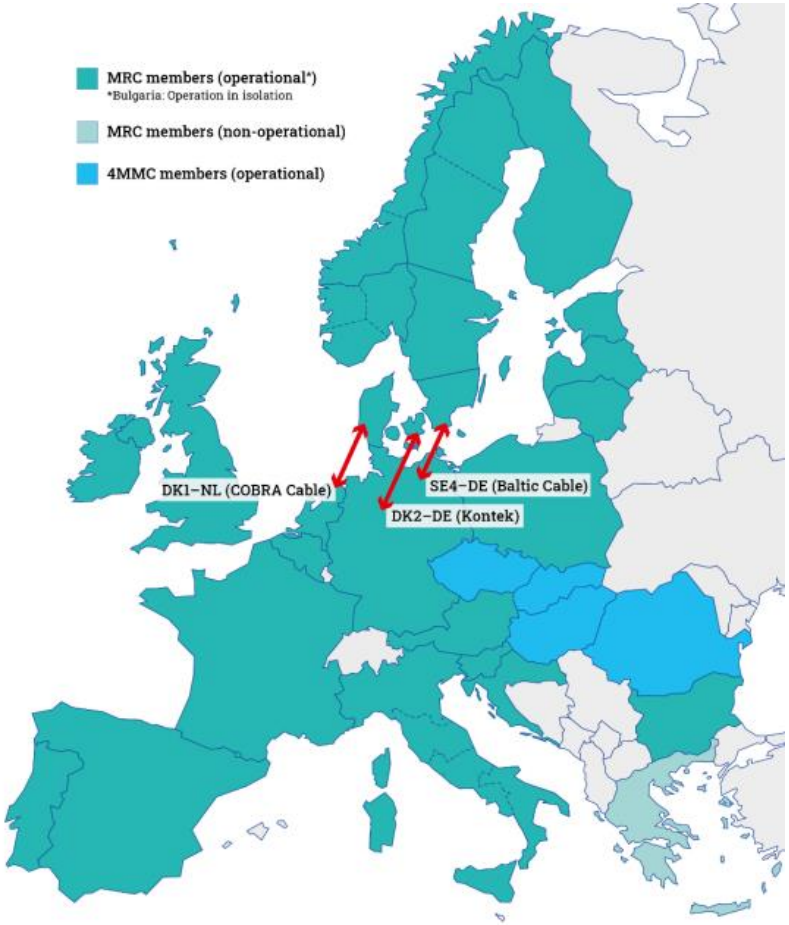
- **What is it about?**
  These provisions allow for the implementation of complementary regional intraday auctions within or between bidding zones in addition to the single intraday coupling solution if they do not have an adverse impact on the single intraday coupling. TSOs and NEMOs need to establish the methodology to be approved by the relevant regulatory authorities. Their application shall be reviewed at least every two years.
- **Legal basis:** Article 63 of the CACM Regulation
- **Responsibility:** relevant NEMOs and TSOs
- **Current status:** The complementary regional intraday auctions were approved for the bidding zone border between Spain and Portugal and Italy North and Italy-Greece biding zone borders.
- **Implementation:** The complementary regional intraday auctions are partially implemented (see above).

Fallback procedures

- **What is it about?**
  The fallback procedures ensure efficient, transparent and non-discriminatory capacity allocation in case the single day-ahead coupling process is unable to produce results. Different regions have different fallback solutions in place.
- **Legal basis:** Article 44 of the CACM Regulation
- **Responsibility:** all TSOs in each capacity calculation region
- **Current status:** The fallback procedures were approved in all regions. Some regions also approved amendments.
- **Implementation:** The fallback procedures are implemented in all regions.

Partial decoupling: the example of 4 February 2020

- During the market coupling process on 4 February 2020 a technical issue was experienced that led to a partial decoupling of Nord Pool's CWE order book
- The incident was caused by a technical issue at Nord Pool and was not caused by the common market coupling algorithm.
- The issue could not be fixed within the time allocated by the procedures and at 12:43 CET the partial decoupling was declared and shadow auctions were triggered for the impacted interconnectors.
- The final market coupling results were published at 13:55 CET. The common coupling system worked as expected and ensured the coupling



Calculation of scheduled exchanges

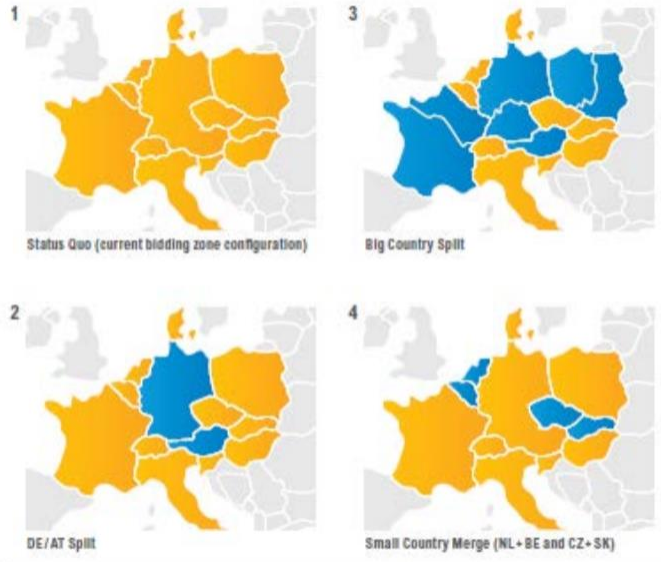
- **What is it about?**
  Scheduled exchanges are electricity transfers scheduled between geographic areas for each market time unit and for a given direction. The scheduled exchanges between bidding zones, scheduling areas and NEMO trading hubs are calculated by using the net positions and clearing prices of bidding zones (as outputs of the day-ahead and intraday algorithms)
- **Legal basis:** Article 43 (day-ahead) and Article 56 (intraday) of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status:** The methodology for the day-ahead timeframe was approved by all regulatory authorities in March 2019. The methodology for the intraday timeframe was approved by all regulatory authorities in June 2019. A new proposal was submitted by NEMOs in March 2023.
- **Implementation**: The scheduled exchange methodologies are implemented.

Congestion income distribution

- **What is it about?**
  The congestion income distribution methodology establishes the rules for collecting and distributing the congestion income on the bidding zone borders within capacity calculation regions from the day-ahead market and for distributing it among the TSOs having interconnectors on that border.
  Main pricinples:
    - In NTC, CI is distributed between the two TSOs operating a BZB
    - In FB, CI is mutualized between all TSOs of a CCR and then redistributed.
- **Legal basis:** Article 73 of the CACM Regulation
- **Responsibility:** all TSOs
- **Current status:** The latest amendments to the methodology were approved by ACER in 2022.
- **Implementation:** The implementation is linked to the implementation of the capacity calculation methodology within their respective capacity calculation region, so different regions have different implementation timelines.

Bidding zone review (1)

- EU TSOs are obliged to conduct a common study **into alternative bidding zone configurations**, in order to assess whether these alternative configurations **increase the economic efficiency and cross-border trade opportunities** while **respecting operational security**
- Borders between bidding zones should reflect **long-term, structural congestions** in the EU transmission grid (evidenced through a 3-yearly ENTSO-E report)
- While originally only CACM GL Art. 32 applied, the CEP introduces a link to the minimum margin (70% or linear trajectory) for cross-zonal trade, as well as an "arbitrating" role for:
  - ACER to decide on methodology, assumptions and configurations; and
  - European Commission to decide on alternative configurations

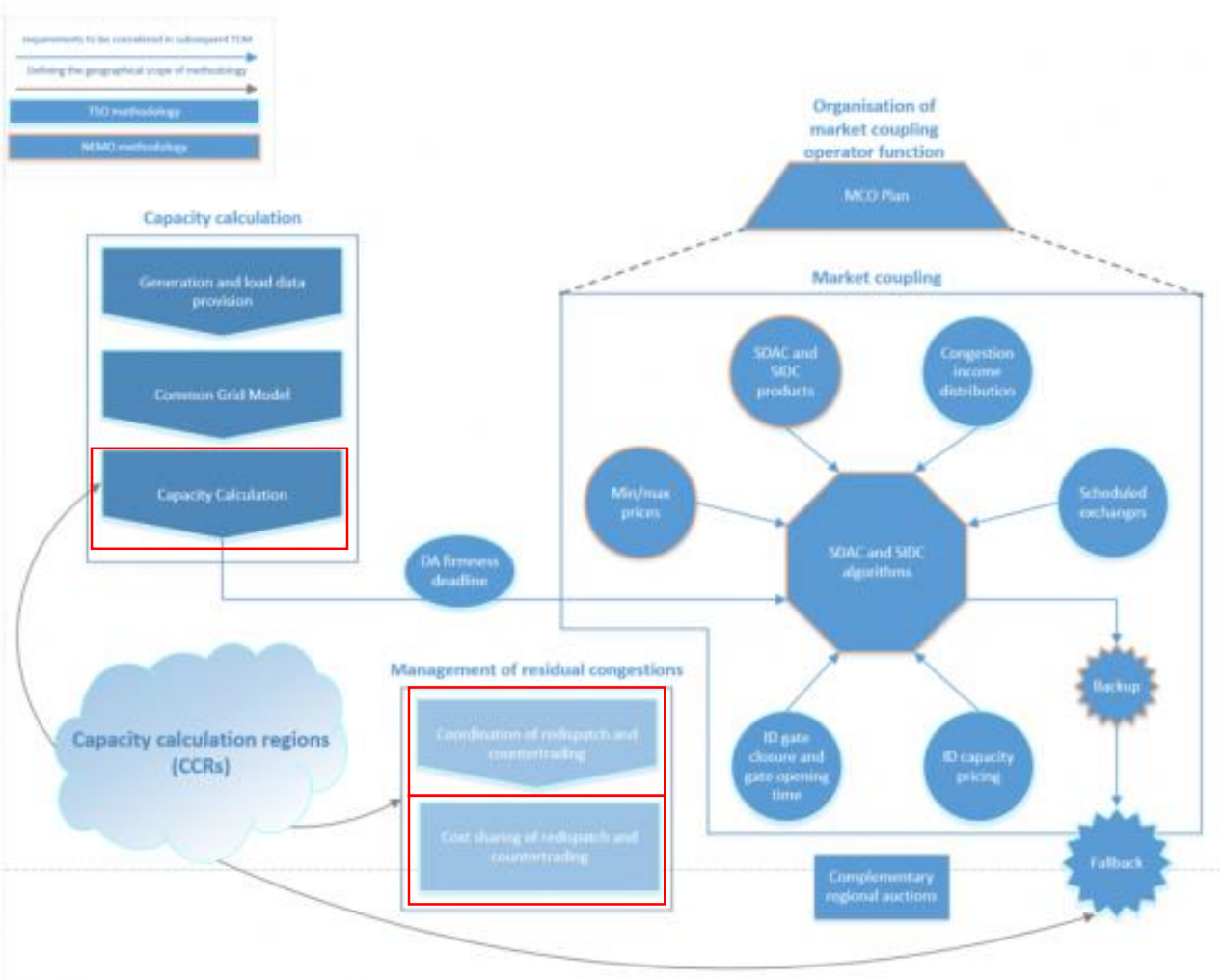


Bidding zone review (2)

- By 5 October 2019, all EU TSOs were obliged to **submit a proposal for the methodology, assumptions and configurations** for the bidding zone review study to NRAs. NRAs requested, in June 2020, that **ACER takes a decision** related to the proposal.
- Based on ACER's decision (foreseen in November 2020), all TSOs shall perform the **assessment of the current and alternative configurations** (i.e. "the bidding zone review") and submit a proposal **to maintain or amend the current configuration** to the Member States
- Member states shall **decide via unanimity** on the TSOs' proposal related to the bidding zone configuration. In case of disagreement, the **EC may decide** (after consulting ACER) within 6 months.

Regional TCMs of TSOs (CCMs, RD&CT)

TCMs of the CACM Regulation



Two mechanisms currently coexist: ATC vs Flow Based

Available Transfer Capacities (or ATCs):

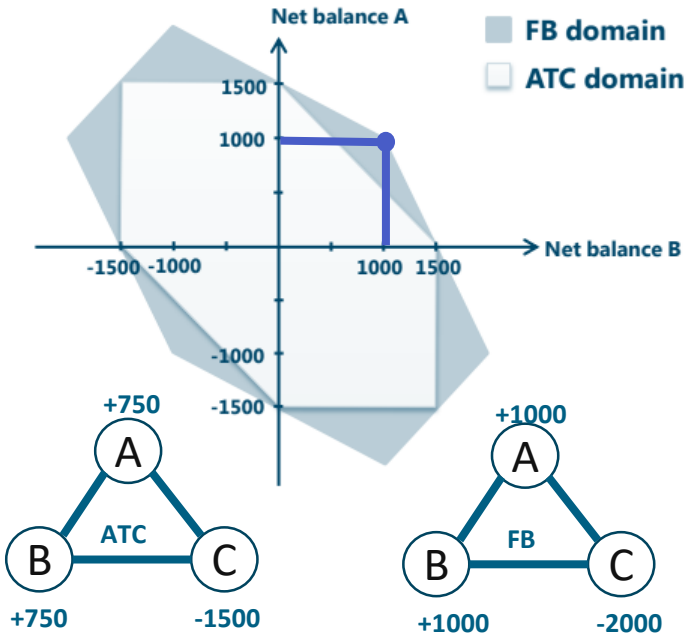
Capacities are determined by the Transmission System Operators (TSOs) to facilitate the market while safeguarding the grid:

- An ATC limits a commercial exchange between two bidding areas
- ATCs are simultaneously feasible

Flow-Based (or FB):

- Capacity split is not a choice of the TSO, but is market driven (at the time of allocation)
- Provides an allocation mechanism in which all exchanges that are subject to the allocation mechanism compete with one another for the use of the scarce capacity
- Offers more trading opportunities with the same level of security of supply

Example:



FB allows to increase the exchanges to C by +500 MW compared to ATC.

Source: E-bridge presentation on Flow-Based concept and Methodology

Where are we currently?

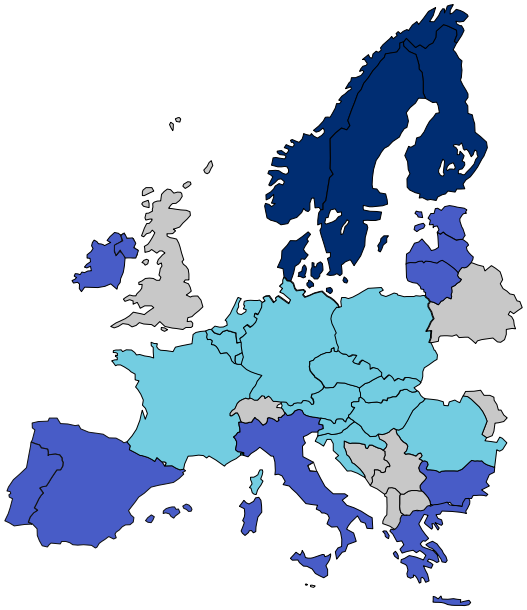
Flow-based allocation

ATC - Transition to flow-based allocation

ATC

Not applicable

Forward timeframe



Day-Ahead timeframe

Capacity calculation methodology (1)

- **What is it about?**

The day-ahead and intraday capacity calculation methodology describes the rules of each capacity calculation region on how to calculate the amount of capacity available for trading between bidding zones at day-ahead and intraday market time frames. The methodology also complies with the network security standards.

- **The process**

TSOs define capacity calculation inputs, such as hourly common grid models. The inputs are used by regional coordination centres to calculate the available amount of cross-zonal capacities either by using a flow-based or coordinated Net Transmission Capacity (NTC) approach, depending on the respective region.

The final cross-zonal capacities are then made available to the market coupling were they are allocated, enabling trading among bidding zones.

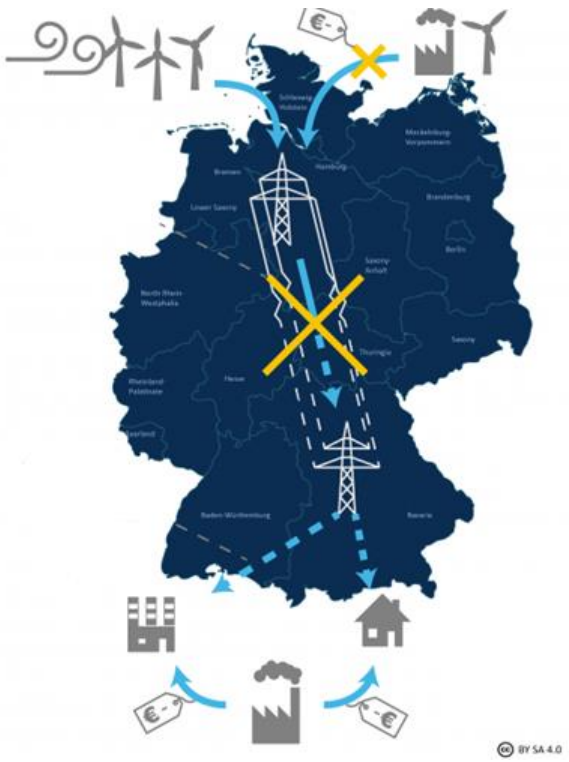
Capacity calculation methodology (2)

- **Legal basis:** Article 20 of the CACM Regulation
- **Responsibility:** all TSOs in each capacity calculation region
- **Current status:** The methodology was approved in all regions. Some regions also approved amendments, or they are currently under approval.
- **Implementation:** Different regions have different implementation timelines. Some regions have already implemented the methodology, whereas some other are expected to do so by 2024.

What happens if the zonal copper plate assumption is not respected?

Example:

1. Heavy winds increase the power production in the North German wind farms
2. Internal transmission lines from windy North to industrial South are congested
3. Industrials that bought power might not receive it due to the congestion
4. Grid operators have to reduce production in the North while financially compensating the redispatched producers
5. Grid operators have to increase production in the South tc compensate the reduced production in the North while financially compensate them



Redispatching and countertrading actions in Germany have costed 1904 M€ in 2020.

Source: Clean Energy Wire, ACER market monitoring report

Coordination of redispatching and countertrading (1)

- **What is it about?**

  The methodology describes how TSOs and regional coordination centres of capacity calculation regions manage network congestions at the day-ahead and intraday level. This is done with regionally coordinated application of costly remedial actions, in the so-called ROSC (Regional Operational Security Coordination) process.

  This coordination process involves the remedial actions optimisation and coordination in a single day-ahead and multiple intraday operational security assessment rounds.

  The methodology is closely related with the Regional Operation Security Coordination (ROSC) methodology (Article 76 of the **Guideline on Electricity Transmission System Operation**).

Coordination of redispatching and countertrading (2)

- **Legal basis:** Article 35 of the CACM Regulation
- **Responsibility:** all Transmission System Operators (TSOs) in each capacity calculation region
- **Current status:** The methodology was approved in all capacity calculation regions.
- **Implementation:** The methodology is currently being implemented in most of the regions and expected to be fully implemented by the end of 2024.

Cost sharing for coordinated redispatching and countertrading (1)

- **What is it about?**

  The methodology establishes the rules TSOs need to follow to determine the different categories of flows (loop, internal, phase shifting transformers, allocated flows) which created network congestions for each capacity calculation region and how the respective costs are shared among TSOs.

- **The process**

  Once resolved in the Regional Operation Security Coordination (ROSC) process by engaging the remedial actions, the polluting flows are mapped accordingly.

  The costs of engaging the costly remedial actions are appointed to the specific TSOs which create the polluting flows

Cost sharing for coordinated redispatching and countertrading (2)

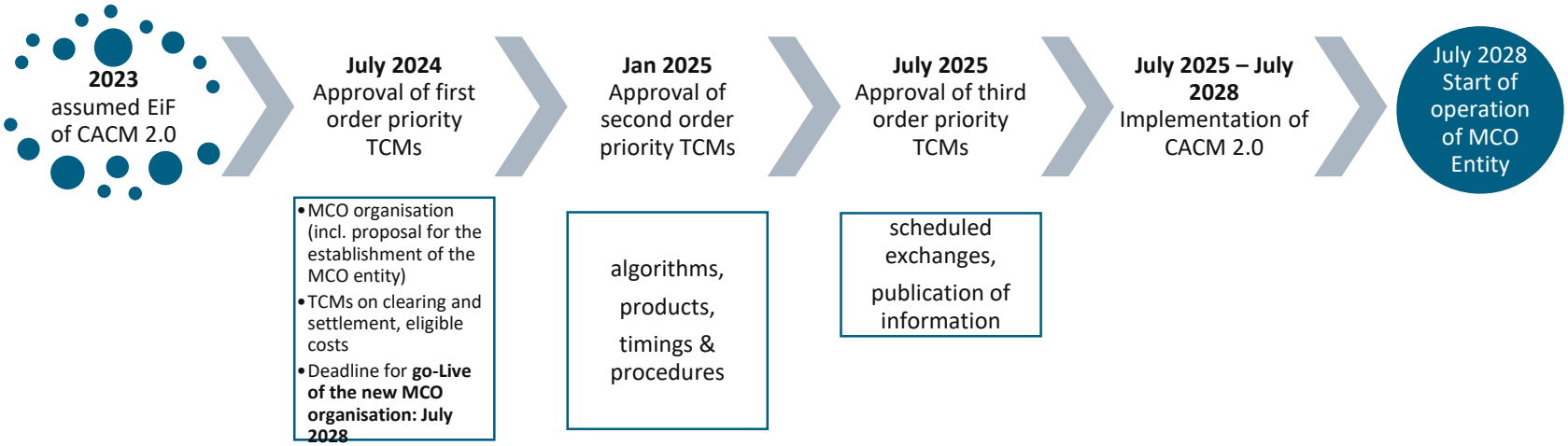
- **Legal basis:** Article 74 of the CACM Regulation
- **Responsibility:** all TSOs in each capacity calculation region
- **Current status:** The methodology was approved in all capacity calculation regions except of Italy North.
- **Implementation:** The methodology is currently being implemented in most of the regions along with the redispatching and countertrading methodology. The implementation in all regions is expected by the end of 2024.

CACM 2.0

Problem identification & proposed solutions – ACER recommendation

Slow, complex and delayed implementation	• *Integrate most implementation tasks as part of MCO to be performed by MCO entity(-ies)* • *Better governance and decision making on MCO tasks* • *From NEMO2NEMO model to NEMO2MCO model*
Current organisation does not support parallel implementation projects	• *Make the integration simpler with NEMO2MCO model* • *Integration of pre-coupling and post-coupling arrangements within the MCO* • *Put most implementation burden on MCO(s) rather than individual NEMOs*
Market coupling too complex and risky	• *Centralise MCO operation with sufficient backups (one or several entities)* • *Prevent interoperability and data flow problems* • *Increase security and backups*
Market coupling collapses if no NEMO's operates in one bidding zone	• *Introduce the last resort NEMO service* • *MCO would be suited to provide quickly and temporally such a service to a MS*
Competing NEMOs are not able to cooperate to perform MCO tasks	• *Introduce qualified majority voting on MCO design issues involving both TSOs and NEMOs* • *No individual NEMO should be able to gain competitive advantage through MCO decisions* • *Strict separation between competitive NEMOs and regulated MCO operations*
Market coupling algorithms are not transparent and accessible	• *Market coupling infrastructure should be a public good financed from public funds* • *Market coupling algorithm code should be accessible to regulators and interested parties* • *The question of ownership is still open*
Difficult regulatory oversight and cost regulation	• *Common EU methodology to determine the scope for common EU-wide MCO costs* • *All non-MCO costs are competitive costs (or local regulated NEMO costs in case of monopoly)* • *Allocating MCO tasks to concrete regulated legal entity-ies enables direct oversight*
Market coupling not fit for future changes	• *Centralise MCO tasks to one or several entities specialized only on MCO tasks* • *Improve the governance of MCO organisation to solve the MCO problems internally*
Allow for a straightforward Bidding Zone Review	• *Ensure consistency between Article 14 of the Electricity Regulation and CACM regulation.* • *Need to streamline criteria used for the BZR study without introducing fundamental changes.* • *Need to enhance transparency and consultation during the BZR*
Capacity calculation and remedial action cost sharing need further clarification	• *Describe the same or are part of larger processes in a single regulation (SO)* • *Merge provisions on data, common grid model and redispatching and countertrading in SO regulation* • *Clarify unclear provision in the Electricity regulation that could delay RDCT cost sharing implementation*

Transition towards CACM 2.0 – ACER recommendation



- Mimic implementation of CACM 1.0: CACM 2.0 provisions apply directly after Entry into Force (EiF), but they are implemented only after specific TCMs are implemented

- Each TCM will specify two categories of requirements
  - Requirements which can be implemented with existing MCO organisation with shorter deadlines allowing for quick improvements
  - Requirements which can only be implemented with new MCO organisation in July 2028 or after

Resources

Key resources to navigate through network codes (and also vastly used to prepare this presentation):

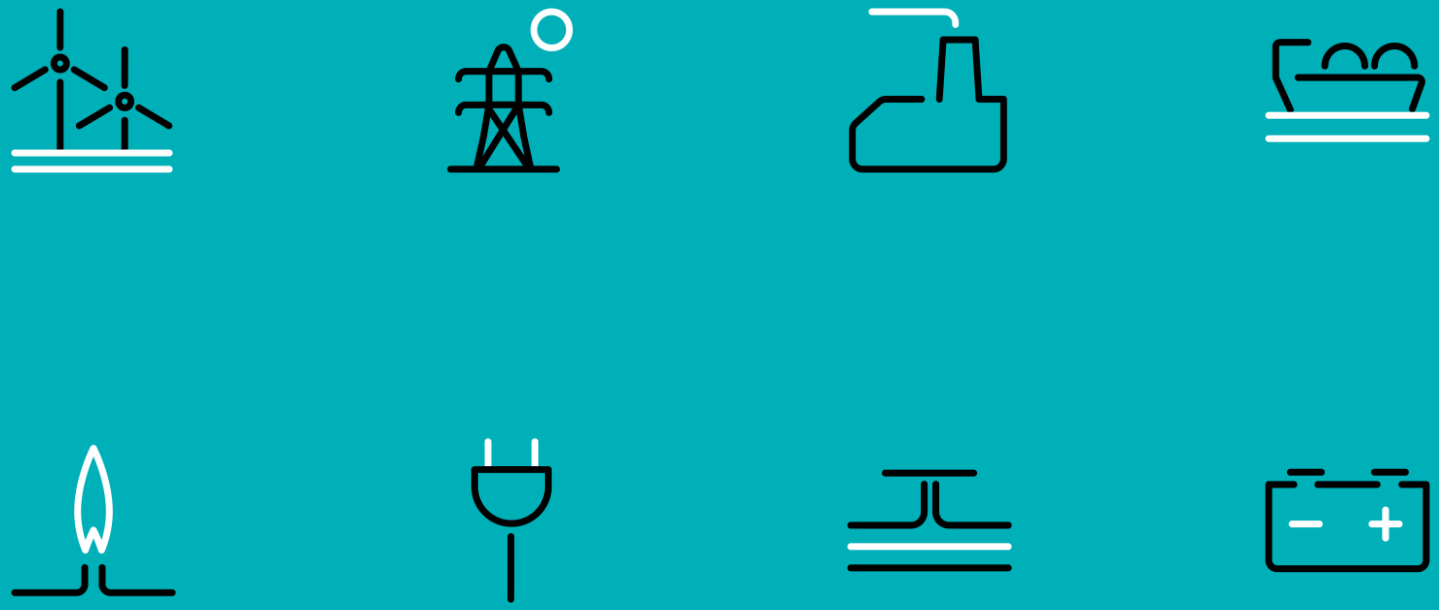
- ACER's website, containing the high level description of every methodologies as well as links to all the decisions as well as monitoring reports providing insights on the functioning of the EU energy market

- ENTSO-E's website allowing to clearly access the different methodologies for the different scopes

- The NEMO committee's website providing high-level information on the functioning of the SDAC and SIDC as well as reports with key data(costs, CACM reports)

CREG

Thank you. Any questions?



Commission for Electricity and Gas Regulation