European Network of
Transmission System Operators
for Electricity

entsoe

FCA-FRC Explanatory note

15 May 2020

Disclaimer
This explanatory document is submitted by all TSOs to the Agency for the Cooperation of Energy Regulators for information and clarification purposes only accompanying the "All TSOs' proposal for methodology for sharing costs incurred to ensure firmness and remuneration of long-term transmission rights (FRC Methodology) in accordance with Article 61 of the Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation.

Contents

I. Introduction

Article 61 of the Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation (hereinafter referred to as the "FCA") requires that within six months after the approval of the methodology for sharing congestion income referred to in Article 57 of the FCA (hereinafter referred to as the "FCA CID Methodology"), all TSOs shall jointly develop a methodology for sharing costs incurred to ensure firmness and remuneration of long-term transmission rights (hereinafter referred to as the "FRC Methodology"). Within this deadline all TSOs shall jointly submit a proposal for a FRC Methodology to ACER for revision and approval pursuant to Article 5.3 of Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators (hereinafter referred to as "Regulation 2019/942").

Capitalised terms used in this document are understood as defined in the FCA, Regulation (EU) 2019/942, Commission Regulation (EU) 543/2013, the FCA CID Methodology and the FRC Methodology proposal.

The objective of the methodology is

- To define who are the relevant TSOs for the different cases that can occur
- How the costs related to ensuring firmness and remuneration of the LTTRs are to be shared between them

As propounded in Article 61 FCA, the FRC Methodology needs to be consistent with FCA CID Methodology. This is addressed by applying the same sharing keys in most use cases.

The FRC Methodology is interlinked with the congestion income distribution methodology developed in accordance with Article 73 of the Commission Regulation (EU) 2015/1222 of 24 July 2015 (hereinafter referred to as "CACM CIDM"). That is to say, the FRC methodology takes as its starting point the DA CI on the BZB as defined in the CACM CIDM. The FRC Methodology first addresses the payment obligation arising from LTTRs remuneration prior to any eventual socialisation process that might precede the final attribution of the DA CI to each TSO. Both methodologies are to be applied regionally in order to reflect CCR-specific differences in the capacity calculation methodologies.

In addition, the FRC Methodology governs cases where the firmness and remuneration of long-term transmission rights is subject to an interaction between multiple BZBs within the day-ahead capacity calculation process. This can exist in CCRs applying the implicit daily allocation process based on flow-based capacity calculation and in CCRs applying cNTC capacity calculation where for certain BZBs other allocation constraints are applied on top of NTC.

II. Scope clarification

Article 61 refers to the cost of re-dispatching, countertrading and imbalance. These references are somewhat ambiguous considering that the sharing of the related costs is governed through other Articles in the FCA & CACM. This chapter explains how this ambiguity is addressed.

1 Cost of re-dispatching and countertrading

According to the FCA, the assumed availability of costly remedial actions can be a factor in methodologies that determine the calculation of capacities in long-term timeframes (before the day-ahead).

The coordination, application and cost sharing of remedial actions are however determined by a combination of processes (coordinated security analysis - CSA) and methodologies (art. 76 of System Operation Guidelines (SOGL), art. 35 of CACM and art. 74 of CACM) that take place after the day-ahead allocation. Therefore, TSOs are of the opinion that the sharing of costs accrued in terms of costly remedial measures should be governed exclusively via the aforementioned methodologies instead of adding complexity through the inclusion of additional rules within this methodology under FCA Art 61.

This will ensure equal treatment for all time horizons, acknowledging that it is difficult, if not impossible, to distinguish between the time horizons of capacity for which the specific remedial actions were used.

2 Cost of imbalance

Article 61(1) FCA refers to 'imbalance'.

As 'imbalance' is a general concept, and in order to avoid misunderstanding in relation to the triggers for imbalance that ought to be addressed by this methodology, it is important to keep in mind that Art 61 explicitly mentions "associated with compensating market participants". Hence, the reference to imbalance in Article 61(1) should be construed as referring to compensations to market participants in cases of curtailment rather than as a reference to imbalance in the sense of EBGL (where the topic of imbalance can relate to ramping restrictions).

TSOs carry the cost for compensating the market parties in cases of curtailment, where the legal framework of the FCA & CACM already defines the amount of compensation to pay as illustrated in point 3.2. Hence there are no additional rules to be defined by this methodology.

Note that in case the TSO is an interconnector, it is the interconnector that compensates the market parties regardless of whether or not it is the interconnector that is responsible for the curtailment. Indeed, curtailment of capacity on the interconnector can be upon request of one of the connected TSOs. Arrangements can therefore be put in place for settling the compensation cost between the involved parties (connecting TSOs and interconnectors). The governance of these arrangements falls outside the scope of this methodology.

III. Distribution of costs to the bidding zone border

3 Compensation of LTTRs

According to Article 35 of the FCA, for BZBs where the capacity is allocated implicitly, TSOs shall remunerate LTTRs holders with the price spread as long as the price difference is positive in the direction of LTTRs.

3.1 Congestion income in day-ahead on relevant BZB covers LTTR pay out

When a sufficient amount of capacities was offered and allocated in day-ahead on the respective BZB, the income generated on that border will be enough to remunerate the LTTRs. Accordingly, the cost sharing will only take place on the relevant BZB and it is proposed to base it on the FCA CID Methodology sharing keys.

3.2 Curtailment

Curtailment of LTTRs before Day Ahead Firmness Deadline (DAFD) can happen due to force majeure or due to operational security limits.

In case of force majeure FCA Art 56 prescribes that the TSO invoking the Force Majeure has to compensate.

In case of curtailment due to operational security limits, the costs need to be shared among the TSOs of the border where curtailment is applied, for which two situations are to be acknowledged:

- The costs of curtailment are divided among TSOs following the same sharing key calculated according to FCA CID Methodology for that border
- The involved parties have made a specific arrangement to share the costs, as is typically the case for Interconnectors

Curtailment after DAFD is already handled by article 61 of the EU HAR and article 72 of CACM, so there is no need to add any different way of cost sharing in this methodology.

The table below presents an overview of all curtailment use cases and how these are governed through FCA & CACM regulation. Please note that only the first use case in this table needs a rule governing the sharing of costs and hence is the use case reflected in the FCA FRC proposal.

Curtailment of Capacity	Who should compensate (according to FCA/ CACM GL) the LTTRs
Before DAFD – curtailment of LTTR *Operational security limits* (FCA art 53 & 54)	**Concerned TSOs on the BZB**
Before DAFD – curtailment of LTTR *Force Majeure* (FCA art 56)	**TSOs invoking** the Force Majeure
After DAFD – (implicit or explicit allocated capacity) *Force Majeure* (FCA art 70, 72 & 79)	**Implicit allocation** is mentioned in CACM 72.3 referring to the obligation of keeping CCPs/shippers financially neutral. This concerns imbalances during post-coupling processes (physical schedules created by CCPs/shippers on the borders) which are out of scope of FCA / LTTR discussions **Explicit allocation** (in any case out of scope for the FCA-FRC Methodology): invoking TSO shall compensate the market parties
After DAFD – (implicit or explicit allocated capacity) *Emergency situation* (FCA art 70, 72 & 79)	

3.3 Congestion income in day ahead on relevant BZB does NOT cover LTTR pay out due to lower day-ahead allocation on the relevant BZB

Flow-based

The day-ahead congestion income on a particular BZB might be sufficient to remunerate holders of LTTRs on that BZB, but it might also not be sufficient. Whether or not it is sufficient depends on how many LTTRs were sold and on the result of the day ahead allocation on that BZB.

Indeed, in CCRs with flow-based allocation in place, there is no one-to-one relationship between actual day-ahead allocation (or day-ahead market flows) and capacity made available to the day-ahead market on an individual bidding zone border level.

As the capacity calculation and allocation processes in a FB setting seek to optimize societal benefits (welfare) at CCR level, it should be acknowledged that the "CCR level" is the starting point to establish rules regarding the distribution of congestion income.

In flow-based allocation, the flows are optimized within a flow-based domain, where all TSOs within the CCR offer their full capacity (given operational and security margins and some restrictions taking into account regional specificities) without any assumptions as to how the capacity will be allocated. Once the market participants enter their bids, the transmission capacity is allocated to the BZB where it generates the highest welfare. Therefore, the TSOs have less control over how much of the available capacity on their BZB is used.

This can lead to situations where the flow on BZB A is for example just 300 MW of 500 MW made available to the day-ahead market, despite there being a price spread between the two BZs, in order to allow higher flows on BZB Z. Since it is possible that some BZBs lose (e.g. are allocated a counterintuitive flow or less flow than LTTRs issued) to the benefit of other BZBs and for overall higher welfare, a socialisation mechanism on CCR level can be justified in clearly defined cases.

Different flow-based designs can require different solutions to ensure the cost of firmness

It is possible to design flow-based capacity calculation in different ways to take into account the regional specificities of the CCR. Accordingly, in the course of implementation of CACM CIDM appropriate socialisation processes need to be developed on a CCR level. In the Annex to this Explanatory Note the approaches currently being developed in the CCRs Core and Nordics are explained in detail.

For this methodology under Art 61 FCA the question arises as to whether or not the TSOs of the CCR have chosen to include LTTRs in their FB domain. In both cases, it can happen that the day-ahead flow on BZB A is lower than the volume of LTTRs sold on BZB A, but the implications are different

- If LTTRs are included in the FB domain, the day-ahead congestion income is sufficient to cover for the LTTRs within the CCR (see Core example in the annex).
- If LTTRs are not included in the FB domain, it is not possible for the LTTRs to influence the allocation and welfare distribution in the CCR. Firmness should therefore be treated as a bilateral financial matter between the TSO and the LTTR holder (see Nordics example in the annex).

ACER's Alternative proposal for socialisation for flow-based analysis

In its Shadow Opinion to the FRC Methodology ACER mooted the idea of applying an alternative approach to determine how much each BZB contributes from its day-ahead congestion income to the socialisation.

ACER proposed a socialisation process where the LTTRs are converted via PTDF matrices into 'commercial flows' treating these LTTRs as nominations. It is assumed that ACER takes as its reasoning that a deficit to remunerate LTTRs is characterized by the following situation

- the LTTRs generate a remuneration cost on a bidding zone border e.g. there is positive price spread resulting from the allocation

- the allocation did use to some extent capacity from the BZB which issued the LTTRs but not sufficiently to remunerate the LTTRs
- the allocated capacity from the BZB issuing the LTTRs generates flows not only on the BZB issuing the LTTRs but also generates flows on the other BZBs in the CCR, which in turn generates day-ahead congestion income on the other BZBs

Such reasoning is only relevant where flow-based allocation applies, as it is only with flow-based allocation that PTDFs are used to describe the relationship between

- a market exchange on a particular BZB
- and the amount of capacity this market exchange uses on all BZBs in the CCR

In addition, this reasoning assumes that the capacity allocated in the LT has an impact on the day-ahead domain. This is only the case if LT allocation inclusion is practised.

To summarize, ACER proposes basing principles of the socialisation process on physical aggregated grid parameters (PTDF matrices used for the CACM CIDM).
Actually, the foreseen socialisation processes in Core CCR and Nordic CCR already take into account the physical properties of the grid. Indeed, in a first step the pot of DA CI on CCR level is distributed to individual BZBs using PTDFs and price spreads. Socialisation subsequently groups all deficits across BZBs and re-assigns congestion income from BZBs with a surplus to cover for the sum of deficits on a pro-rata basis. Therefore, one could argue that ACER's proposal to design a day-ahead CID with socialisation around PTDFs is already met.

At this stage it remains uncertain which additional benefits the utilisation of PTDFs as described in ACER's proposal would bring to the table and if the additional efforts/costs for implementing it are proportionate. Most likely it would necessitate adaptations to the regional implementation of CACM CIDM.

The complexity of the above-mentioned issues makes evaluating them a very time-consuming exercise and the outcomes are hardly predictable from today's point of view. Therefore, the need for making a decision on an alternative solution based on PTDF matrices on a TSOs level would risk not submitting the FRC Methodology on time.

cNTC

The day-ahead congestion income on a particular BZB might not be sufficient to remunerate holders of LTTRs on that BZB also in cases where MC allocation is applied based on cNTC capacity calculations. Such situations can occur when a set of BZBs share a common additional technical limit like, for instance, allocation constraints in Italy North CCR.

This can also lead to situations as in the FB case, where the flow on BZB A is lower than the capacity made available to the day-ahead market, despite there being a price spread between the two BZs, in order to allow higher flows on BZB Z, where the price spread is higher. Since it is possible that some BZBs lose to the benefit of other BZBs and for overall higher welfare, a socialisation mechanism on a BZB level can be justified too.

Consideration of long-term congestion income before socialisation

Long-term congestion income can have a role to play, for example if the day-ahead congestion income on a BZB level is insufficient to ensure the firmness of LTTRs.

All TSOs propose that LT congestion income on the relevant BZB based on individual MTU is used before deficits are socialised as illustrated in the statement of pros and cons appended in the annex 2 of this explanatory note.

3.4 Fallback solutions in cases of (partial) decoupling

In case a fallback solution is applied for the allocation of day-ahead capacity according to art. 35 (3) FCA *"[…] the remuneration of long-term transmission rights shall be equal to the market spread […]"*.

This means that in case of decoupling or even shadow auctions LTTRs still need to be compensated by market spread which may trigger the missing money issue. According to the current provisions of FCA Guidelines the proposed solution would be to compensate those costs on a BZB level by TSOs on that border with FCA CID Methodology sharing keys.

IV. Cost sharing on the Bidding Zone border

For the BZBs where costs were assigned as described in chapter III above, these costs shall be split according to sharing keys prescribed in the FCA CID Methodology i.e. currently based on a 50%-50% sharing key. In specific cases the concerned TSOs may also use a sharing key different from 50%-50%. Such cases may involve different ownership shares, different shares of investments costs, exemption decisions or decisions on cross-border cost allocation by competent NRAs. According to the FCA CID Methodology, the percentages for these specific cases, as well as the underlying reasons, are defined in a common document published by ENTSO-E.

V. Implementation and revision of the FCA FRC Methodology

The FRC Methodology can only be implemented when two preconditions are met:

- First, the capacity calculation methodology within the respective CCR in accordance with Article 10 of the FCA is implemented.
- Second, FCA CID Methodology (Article 57) is ready to be implemented.

The second of these prerequisites is needed in order to ensure coherence of the FCA CID Methodology and FCR Methodology.

The implementation requirements are clearly interlinked. There exists a link between the CACM and FCA capacity calculation methodologies in the CCR, the CACM CIDM, the FCA CID Methodology and FCR Methodology. It is commonly understood by all TSOs that a socialisation of the costs linked to the remuneration of LTTRs requires a coordinated approach on the calculation of the volume of LT capacity. Hence, the implementation of the LT CCM in the respective CCRs is considered a prerequisite.

Further this methodology shall be revised, if needed, when the preconditions and premises for the application of this methodology change. This concerns for example the CCR configuration, specifically when BZB subject to a regulatory decision according to FCA Art 30 are involved, but also changes in other methodologies mentioned in the article 7 of this methodology and in this explanatory note.

VI. Annex

1. Socialisation approach being developed in Core and Nordic CCRs

1.1. Socialisation approach being developed in Core CCRs

1.1.1. Introduction

- In an allocation framework of explicit auctions congestion income can be set equal to the allocated capacities times the respective auction prices. In an ATC based market coupling basically the same logic applies, as the commercial flows resulting from market coupling times the market clearing price difference between respective adjacent BZs, in principle equals the received the congestion income.
- In both cases this is possible as it consists of a direct assignment of congestion income to bidding zone borders (BZB). This is **no longer the case in a flow-based allocation framework**, as the DA FB MC not only considers cross-border lines, but all grid elements that are significantly affected by the market coupling outcome, i.e. the so-called critical network elements (CNE).
    - Implementing FB MC enables optimised allocation of available capacity determined by a flow-based domain for the CCR; on the other hand, this FB-method **no longer maintains a direct link between accepted bids and allocated XB-capacity**.
    - The respective legal framework for this is already fixed (73 CACM + 57 FCA), but there are degrees of freedom in the details of how to apply the specific implementation based on a CCR level.

- Due to the FB MC and the related CID approach, it is no longer guaranteed that sufficient congestion income is assigned to a Core BZB to cope with the LTTR remuneration pay-outs on that BZB.
    - Indeed, in a first step the CID approach distributes the DA CI from the CCR to the individual bidding zone borders based on
        - The physical properties of the grid, the so-called ‘PTDF factors’
        - The net positions, thus the result of the welfare optimization obtained from allocation
    - A way needs to be found how to treat fairly a BZB that, after this first step, has not been assigned sufficient CI to pay-out LTTR remunerations.
    - According to this FRC Methodology, in a second step the income generated on that BZB in all preceding allocation processes is taken into account in order to pay-out the necessary LTTR remunerations.
    - In Core CCR socialisation is triggered if the result from step 2 is insufficient for at least one BZB to remunerate its LTTRs
        - Socialisation is inherent to flow-based allocation, as the allocation and thus the congestion income reflects a CCR optimum
        - Socialisation groups all deficits across BZBs and re-assigns congestion income from BZBs with a surplus to cover for the sum of deficits on a pro-rata basis

- The contribution of BZBs on which capacity is allocated within DA FB MC to cover any deficit on BZBs not having enough DA CI is addressed taking into account the physical network as appropriate (as PTDFs are used in step 1).

1.1.2. Numerical example

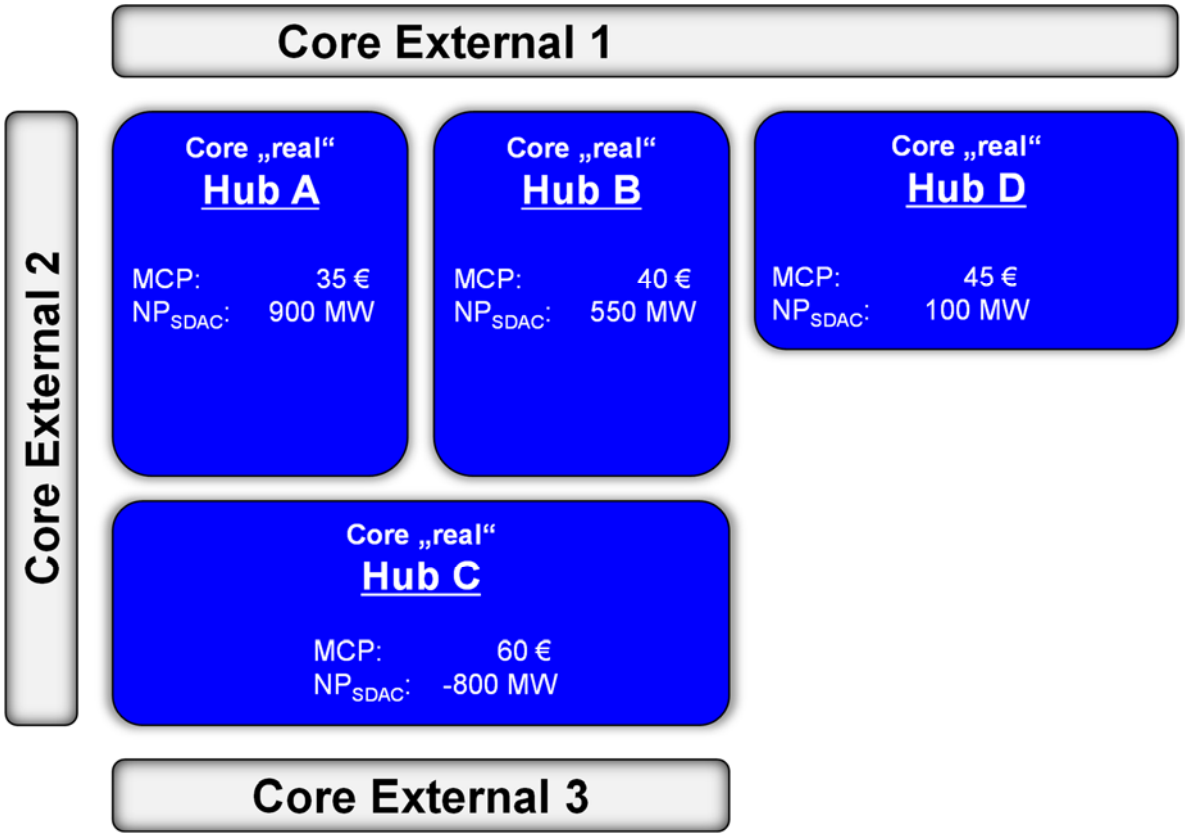
A numerical example on the Core CID and LTTR Remuneration implementation approach is described below consisting of the following 12 process steps:

1) SDAC global outcome
(according to Art. 39 (2) CACM)
2) Creating the regional Core net positions (NP_{Core})
(according to Art. 39 (2) CACM)
3) Calculation of the total CI generated in the day-ahead market coupling to be shared among Core TSOs
4) Determination of Internal Flows (IFs)
(according to Art. 2 (3) CACM CID)
5) Determination of artificial CI assigned to Core internal BZBs and "internal pot"
6) Determination of External Flows (EFs) and Slack Zone (SZ)
(according to Art. 3(3) & (4) CACM CID)
7) Determination of the Slack Zone Price (P_{SZ})
(according to Art. 3(4) CACM CID)
8) Determination of artificial CI assigned to Core open borders and "external pot" (according to Art. 3(4) & 5(2) CACM CID)
9) LTTR Remuneration Claims
10) Commercial result after LTTR Remuneration consideration and need for compensation of missing DA income on some BZBs
11) Commercial result after LTTR Remuneration consideration with partly LT income consideration
12) Distribution of the final CI from the day-ahead process with partly LT income consideration

Each step is described using a numerical example:

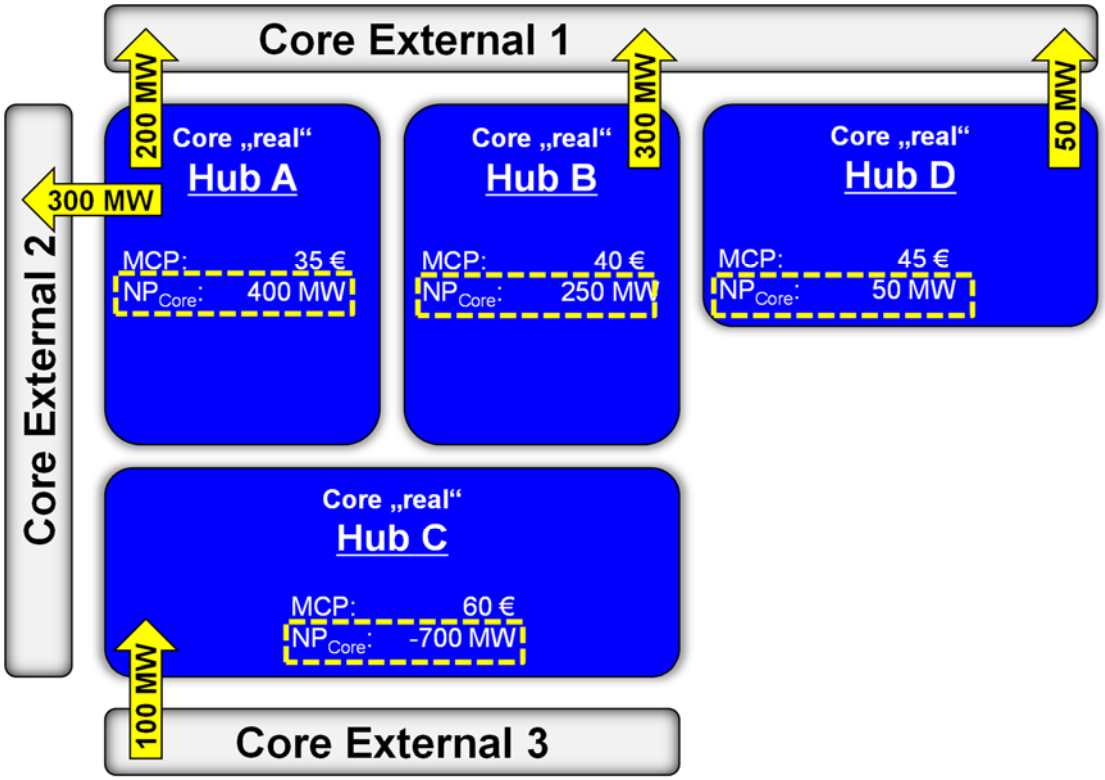
1) SDAC global outcome (according to Art. 39 (2) CACM)

The results of the SDAC are the starting point and they are then validated by the Global Confirmation MC results delivered to JAO (as verification module operator of the Core Common Environment):



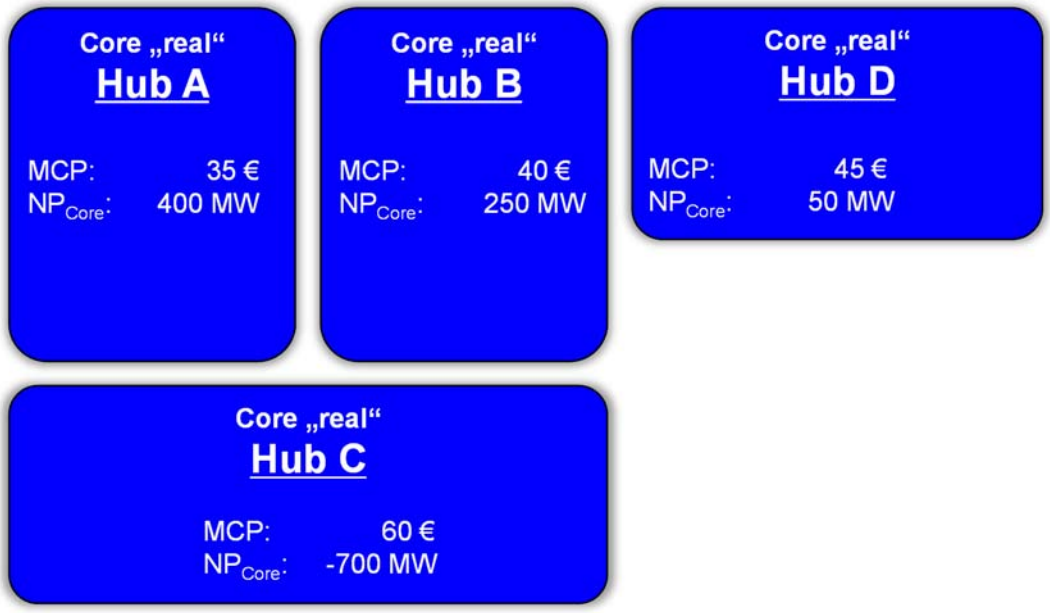
2) Creating the regional Core net positions (NPCore) (according to Art. 2 (3) CACM CID)

- As a first step, the net positions of Core "real" hubs are subtracted from the commercial exchanges with bidding zones outside the Core CCR
- The goal is to share the CI generated within the Core CCR only based on Core CCR internal commercial exchanges
- There are flows marked in yellow in the picture and the NPs are changed from NP_{SDAC} to NP_{Core}
- The so called "nomination proof" known from today's CWE CIA is not applied as
  - It is not foreseen in the DA CIDM (i.e. only limited to DA net positions)
  - No sufficiently convincing arguments were brought forward by CWE TSOs to remain with this practice in the Core context
  - FTRs shall be used in Core
- Therefore, Core regional NPs form the basis for Core CID (and LTTR Remuneration socialisation)



3) Calculation of the total CI generated in the day-ahead market coupling to be shared among Core TSOs

- The total amount of congestion income (CI) generated in the day-ahead market coupling that is to be shared among Core TSOs is calculated as the negative sum of all regional net positions multiplied by the respective market clearing prices
- This calculation is reflected in the formula 1 at the bottom of the following figure
- In example here, the total CI is calculated as
  CI_{Total}= – (35x400 + 40x250 + 60x(-700) + 45x50) = 15.750 EUR



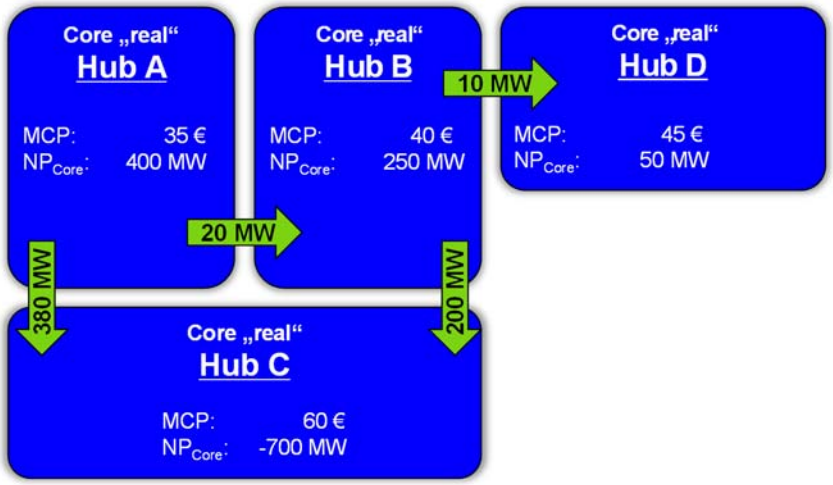
$$CI_{total} = -\sum_{i=1}^{NRH} NP_i \times P_i \qquad \text{(Eq. 1)}$$

Where:

- NP_i = regional net position of hub i resulting from the SDAC
- P_i = clearing price of hub i resulting from the SDAC
- NRH = number of real hubs in the Core CCR (ie. (initially) 12 bidding zones)

4) Determination of Internal Flows (IFs) (according to Art. 2 (3) CACM CID)

- Based on n-state PTDFs calculated solely for CID purposes (also called "(N-0)-PTDFs", based on cross-border-CNEs only), the regional net positions are allocated to the Core CCR internal bidding zone borders first
- Resulting CCR internal cross-zonal flows (cf. green arrows in the picture) are so called "Internal Flows"
  - These flows equal the "AAFs" of the DA CCM
  - Accordingly, "AAFs" have a different meaning in the today's CWE CIA (i.e. there they also consider long-term nominations), Core TSOs decided to use "Internal Flows" (IF) as term
- Internal Flows are calculated based on formula 2 at the bottom of the following figure
- The net positions based on the internal flows of Hubs B (190 vs. 250 MW), C (-580 vs. -700 MW) and D (-10 MW vs. 50 MW) do not level out to the regional net positions of these hubs. This issue will be **tackled within step 6** onwards.



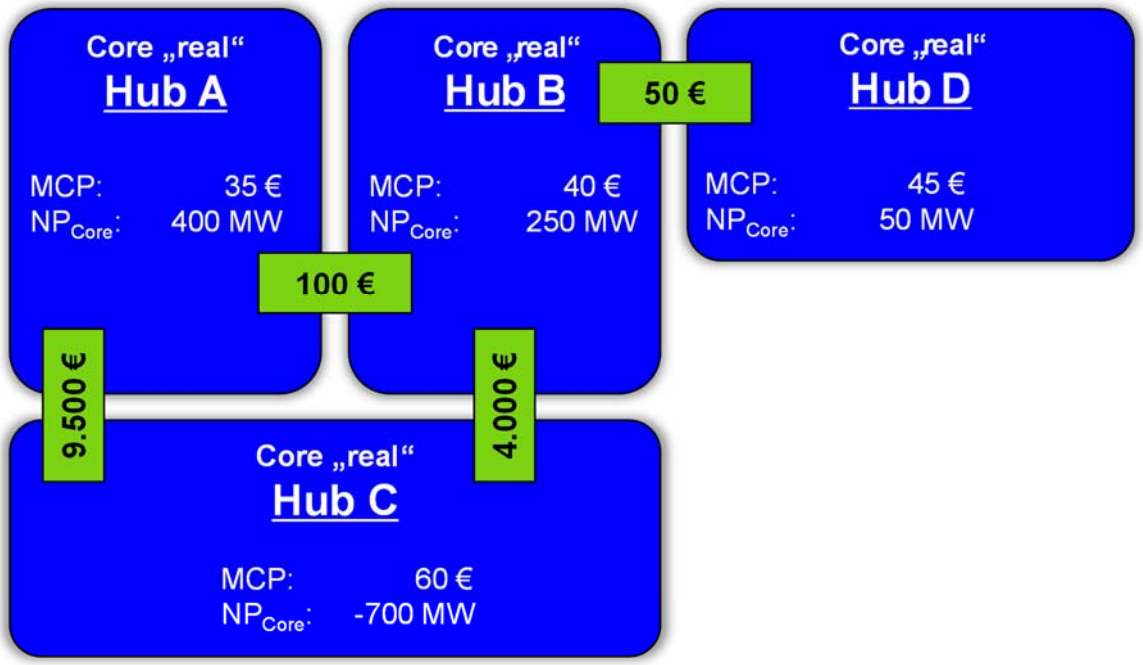
$$IF_j = \sum_{i,k \in j} NP_i \times PTDF_{i,k} \qquad \text{(Eq. 2)}$$

Where:

- IF_j = Internal Flow on a Core CCR internal BZB j, where i and j = 1 to NRH, and
- $PTDF_{i,k}$ = (N-0)-PTDF for a cross-zonal network element k at the bidding zone border j

5) Determination of artificial CI assigned to Core internal BZBs and "internal pot"

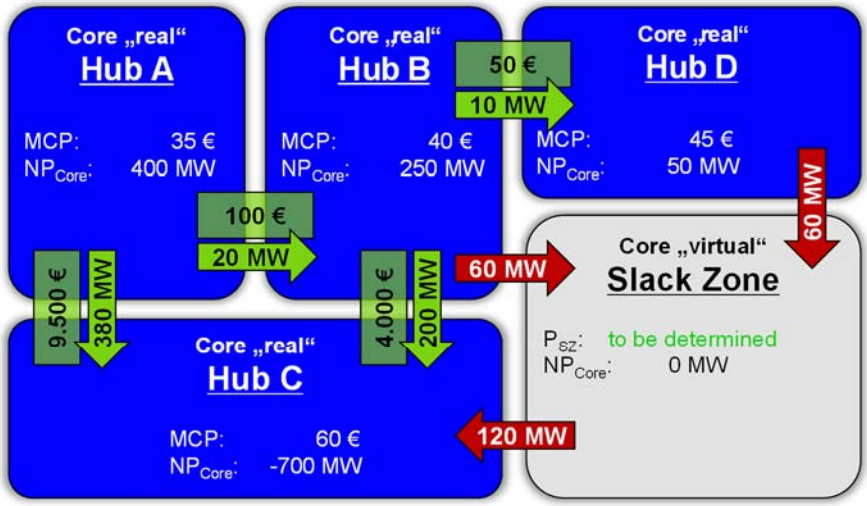
- In order to determine the so called "internal pot" (share) as a first step artificial CI is assigned to each Core internal BZB (for the so called "external pot" see slide 14)
- The artificial CI per each Core internal BZB is calculated as the absolute value of the respective Internal Flow multiplied by the price spread in the direction of the Internal Flow (cf. formula 6 below)
- This formula determines the hourly distribution key for each internal BZB
- The resulting artificial CI per each Core internal BZB in this example is displayed in the green boxes in the picture
- The sum of this artificial CI is 13.650 EUR



$$CI_j = |IF_j \times \Delta P_j| \qquad \text{(Eq. 6)}$$

6) Determination of External Flows (EFs) and Slack Zone (SZ) (according to Art. 3(3) &(4) CACM CID)

- As mentioned in step 4, net positions based on the internal flows do not level out to the regional Core net positions
- Therefore, some flows must exit and re-enter the Core CCR
- These flows leaving or entering a so called "open Core Hub" (i.e. Hub B, C and D in the example left) are summarized in so-called External Flows (cf. red arrows in the picture)
- An External Flow (EF) of an open Core Hub is calculated based on formula 3 below
- As the hub-to-hub relation of External Flows cannot be calculated, as the topology is unknown for outside the Core CCR, the so-called "Slack Zone" approach is used
- The Slack Zone constitutes a virtual sink and source for all External Flows of the Core CCR. The net position of the Slack Zone must be zero, otherwise a mistake has occurred
- Core TSOs might consider two Slack Zones in future, but this is subject to further investigation and the common decision of Core TSOs



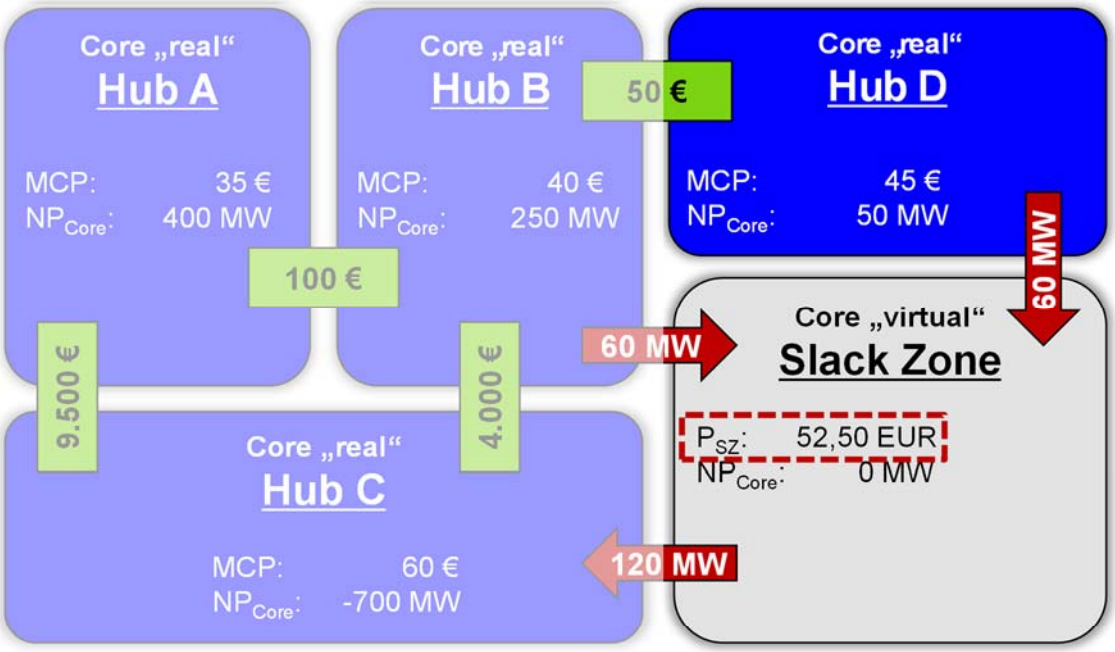
$$EF_i = NP_i - \sum_{j \in NOB} IF_j \qquad \text{(Eq. 3)}$$

Where:

- EF_i = external flow for a bidding zone i to the Slack Zone;
- NOB = the subset of bidding zone borders having an open border within a CCR

7) Determination of the Slack Zone Price (PSZ) (according to Art. 3(4) CACM CID)

- The DA CIDM foresees that part of the CITotal shall be assigned to so called "open borders" where adjacent Core TSOs receive shares of the CITotal as compensation for the use of their lines for the realisation of CCR Core internal bidding commercial exchanges
- In order to do so, a so-called Slack Zone Price PSZ needs to be determined
- The PSZ is calculated as the price minimising the so called "external pot". The calculation follows formula 5 under the following figure
- The so called "external pot" hereby is the total sum of EFs* PSZ that (after potential rescaling, if needed) form the delta between the total CI and the "internal pot" (that is also rescaled, if needed)
- In the example the PSZ is calculated as 52,50 €



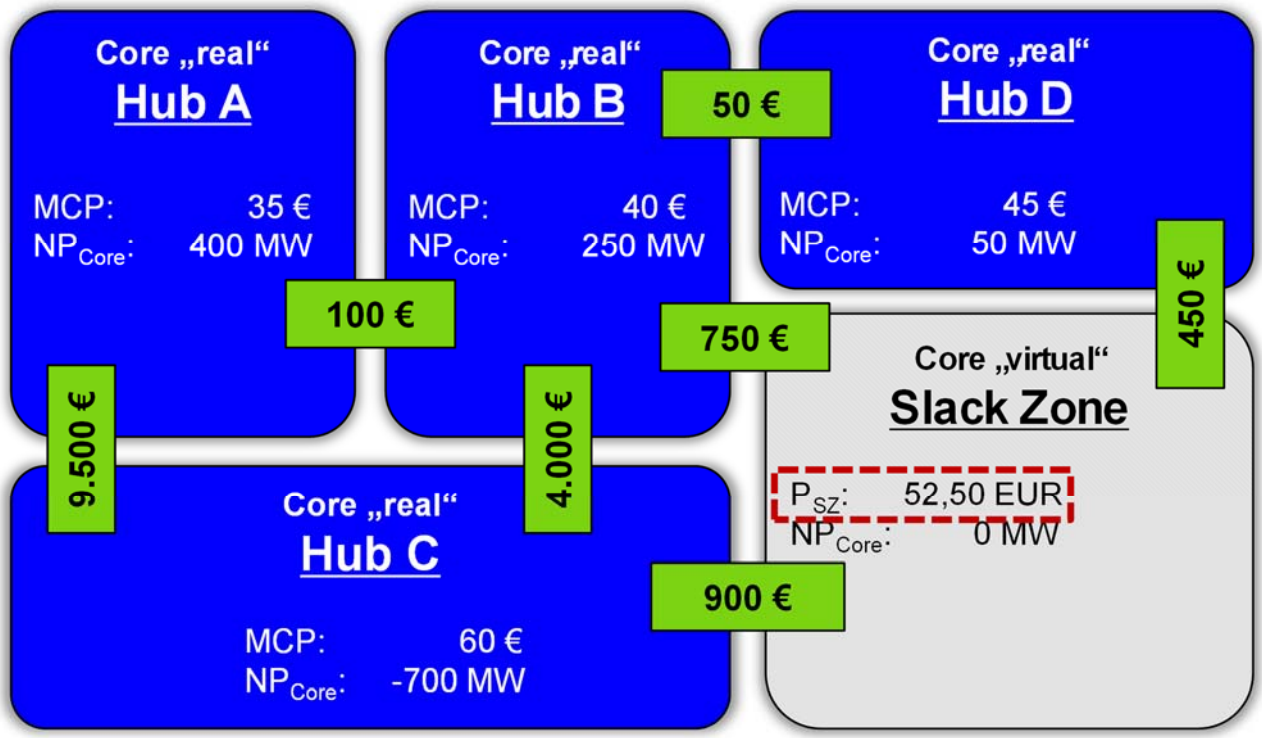
$$P_{SZ} = \arg\min_{P_{SZ}} \sum_{i=1}^{NOB} |(P_i - P_{SZ}) \times EF_i| \qquad \text{(Eq. 5)}$$

Where:

- NOB = the number of hubs with open borders in the Core CCR

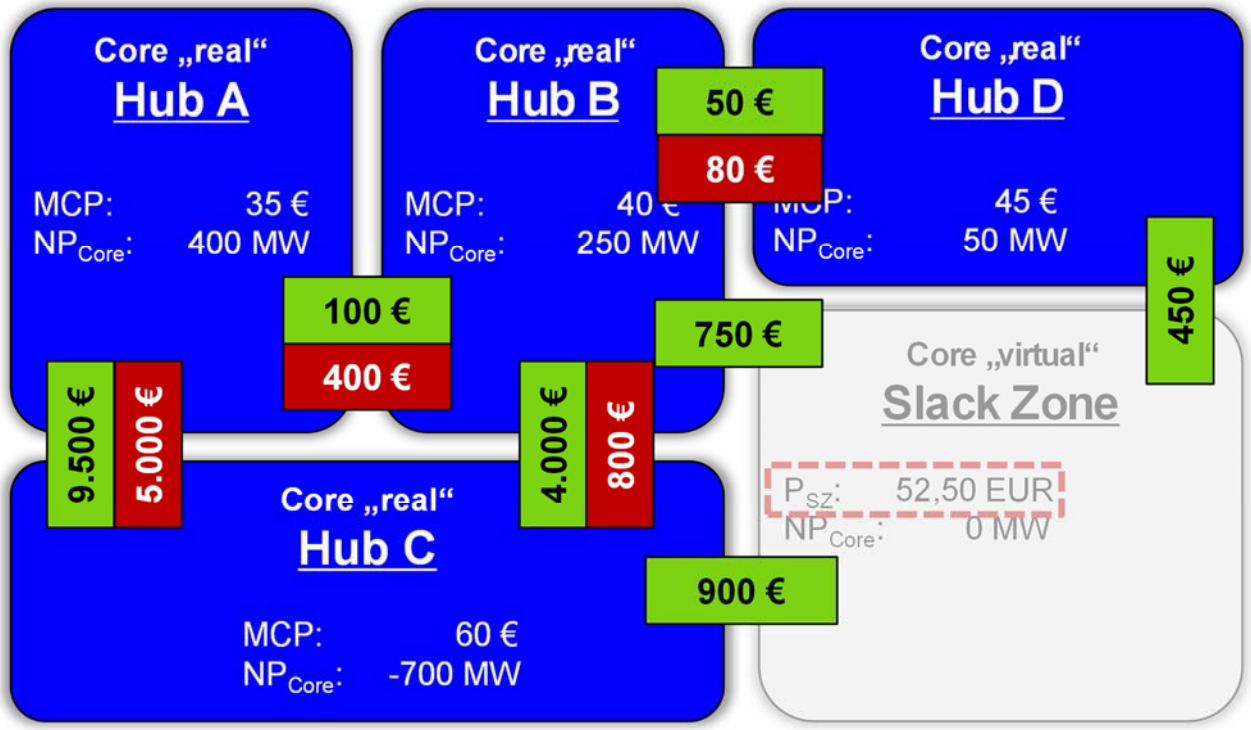
8) Determination of artificial CI assigned to Core open borders and "external pot" (according to Art. 3(4) & 5(2) CACM CID)

- As a first step the External Flows are now multiplied by the price spreads each between the Slack Zone (PSZ) and the respective hubs, i.e. here Hubs B, C and D
- The external pot is completely assigned to the open borders (cf. Art. 5(2) of the DA CID method).
- In the example no rescaling is needed.
- Note: in case of non-intuitive FB allocation (i.e. FB "plain"), rescaling might become necessary. Anyhow Rescaling should always be applied for the correction of rounding errors.



9) LTTR Remuneration Claims (in line with this FRC-Methodology)

- The red boxes show the random example LTTR Remuneration amounts claimed at the respective Core internal BZB (6.280 €), whereas the total generated DA-CI is 15.750 €.
- Note: the LTTR Remuneration on open borders needs to be paid out via the CI generated during the DA processes at these BZBs. Due to the ATC MC on these BZBs it is ensured by default that sufficient income is generated to cope with the LTTR Remuneration claims at these BZBs



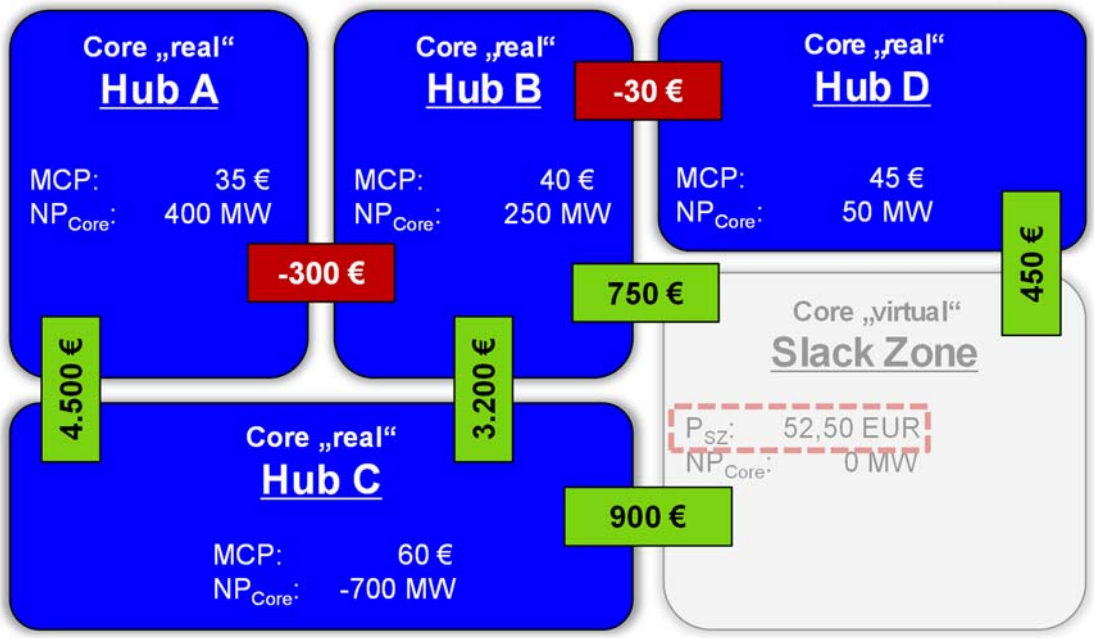
10) Commercial result after LTTR Remuneration consideration and need for compensation of missing DA income on some BZBs (in line with this FRC-Methodology)

- Based on DA-FB market coupling principles implementing LTA-inclusion for the FB-domain, total generated DA-CI is always sufficient to compensate all LTTRs of the relevant CCR as long as each BZB in Core CCR participates to the socialisation. If one BZB would not participate, irrespective of whether or not this BZB issues LTTRs, a missing money issue arises.

  (Note: The impact/importance of the 'LTA-inclusion' is expected to fade out in the years to come due to growth in the FB domain triggered by the CEP legislation (min. 70% rule).)

- However, after subtracting LTTR Remuneration claims it can seen that in our example not enough DA CI has been assigned to the BZB Hub A <-> Hub B and BZB Hub B <-> Hub D, so that this BZB is missing money from the DA process in order to satisfy all LTTR Remuneration claims on this BZB

- For this a solution must be found, to render these BZBs neutral after the DA process, i.e. to zero income from the DA time-frame

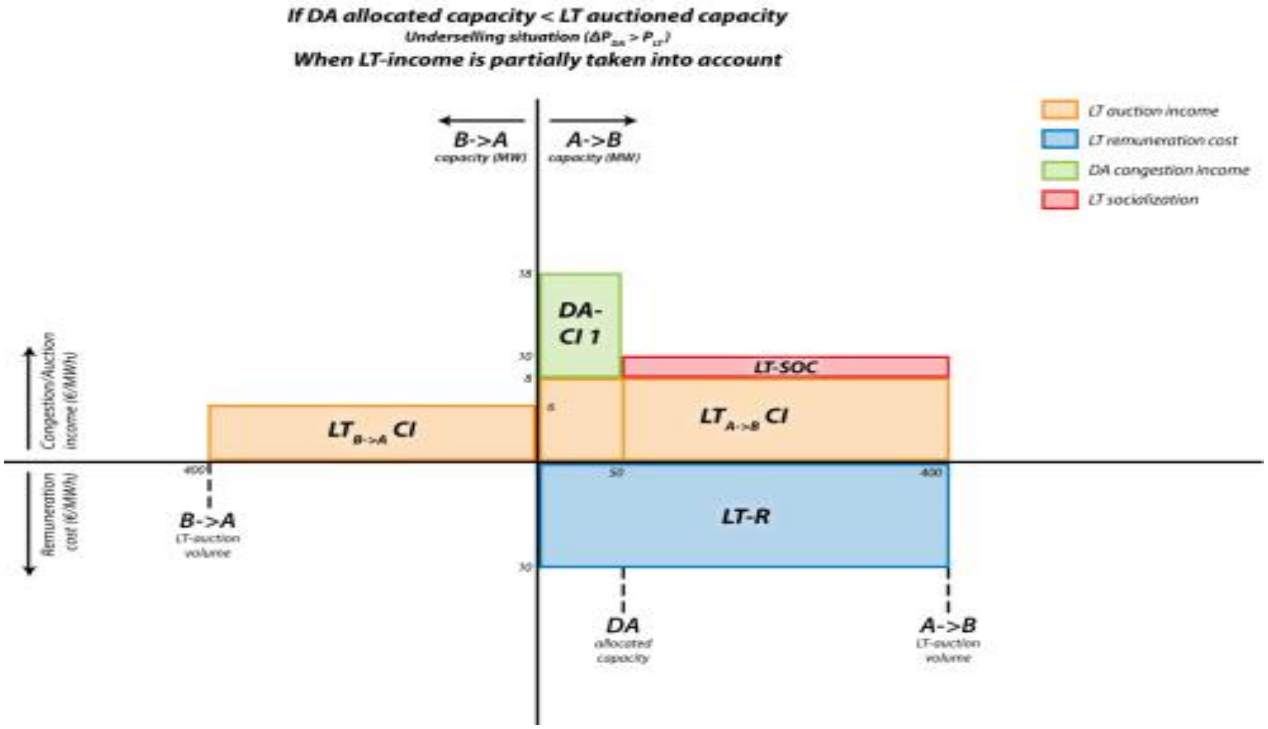


At the time of developing this numerical example, for the next steps 11) and 12) the possibility of considering only parts of LT income before the socialisation has been assessed in Core CCR and is described below.

However, please note that according to Article 3 (3) of the FRC Methodology that has been submitted to ACER for approval on 23 April 2020, it is foreseen to consider the total LT income generated in a respective MTU in all preceding allocation processes before any socialisation process.

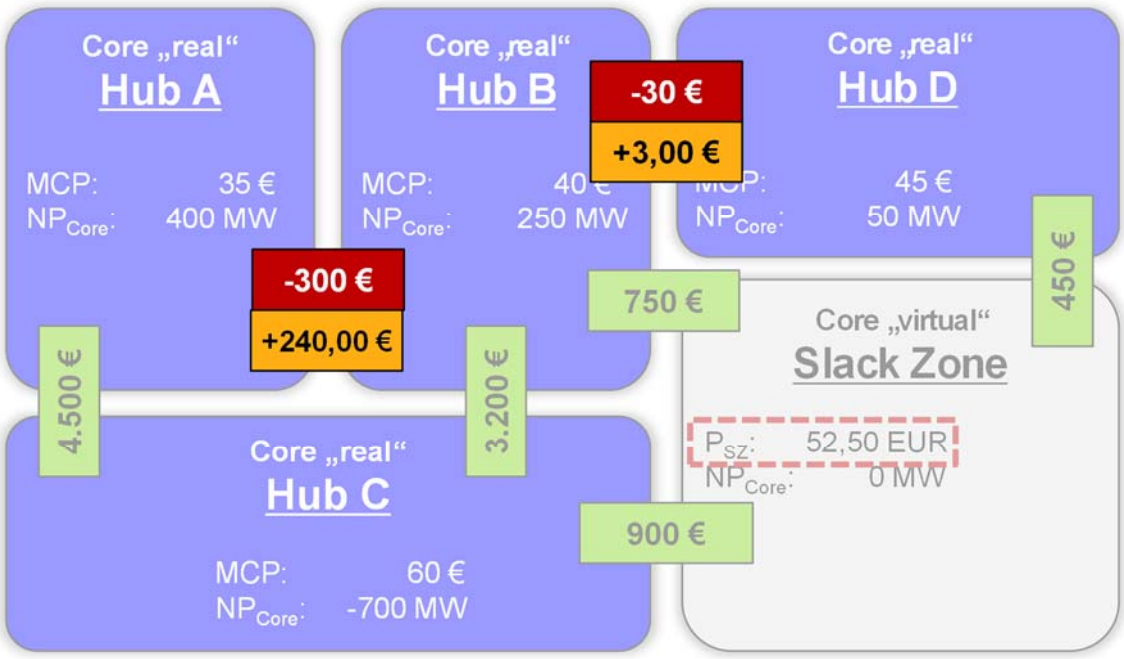
11) Commercial result after LTTR Remuneration consideration with partly LT income consideration

One idea of how parts of LT CI could be considered before the socialisation of "missing money" on BZBs applies is presented in the following example:



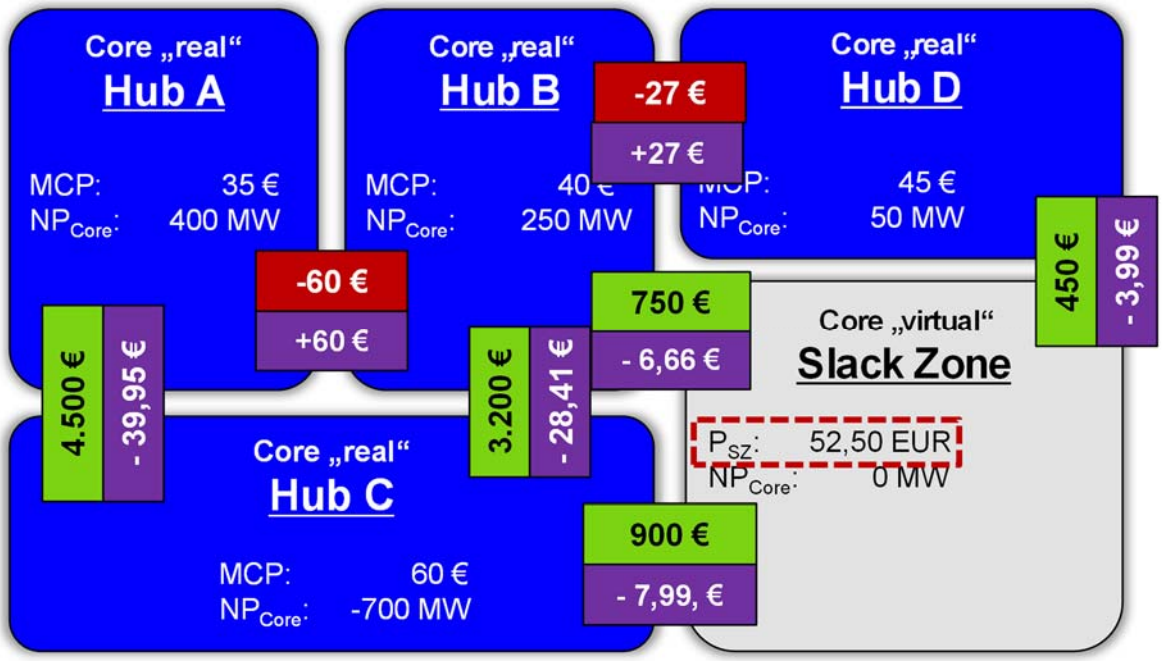
	Example characteristics		Partial LT-income taken into account				
Example 3: DA-allocated capacity much smaller than LT-auction volume Underselling situation (P_delta_DA > P_LT_auc)	DA price spread A->B	10 €/MWh		Volume	Price	Total	
	DA-allocated capacity A->B	50 MW	LT-remuneration cost A->B	400	-10	-4000	
	LT-auction price A->B	8 €/MWh	DA-CI income A->B	50	10	500	
	LT-volume A->B	400 MW	LT-auction income A->B	350	8	2800	Taken into account
	LT-auction price B-> A	6 €/MWh	LT-auction income A->B	50	8	400	Not taken into account
	LT-volume B->A	400 MW	LT-auction income B->A	400	6	2400	Not taken into account
			Result BZB before socialization			-700	
			Taken from LT income			2800	
			LT-remuneration cost socialized			**700**	
			Resulting LT-income A->B			400	
			Resulting LT-income B->A			2400	
			Resulting DA-income			0	
	Illustration: ex3_LT-SOC_image1.jpg		Illustration: ex3_LT-SOC_image-5.jpg				

- In order to illustrate the idea of partial LT CI consideration, it is assumed that 80 MW were sold in the LT Auctions in the direction Hub A to Hub B for an average price of 4 EUR per LTTR per hour. Based on the principle described before, now 60 MW (i.e. the delta between the LTA amount of 80MW and the actual IF of 20 MW) multiplied by 4 EUR are taken into account for the border A-B before socialisation. This means that the Commercial result after LTTR Remuneration consideration of -300 EUR is compensated by 240 EUR from the LT income on this BZB in the relevant direction.
- The same rationale is applied for the border Hub B to Hub D 16 MW with an average price of 0,50 EUR per LTTR per hour. This means that the Commercial result after LTTR Remuneration consideration of -30 EUR is compensated by 3 EUR from the LT income on this BZB in the relevant direction.



- After consideration of parts of the LT income at the border Hub A to Hub B and Hub B to Hub D, still these borders are missing some money from the DA process.
- Now the remaining deficit is compensated via the so-called socialisation.
- For this process which is applied on an ex-post basis, day-ahead income assigned to other internal and open borders, is assigned to the border Hub A to Hub B and Hub B to Hub D (i.e. socialisation)
- This is done based on the ratio of each border having a positive commercial result still compared to the total CI remaining after LTTR Remuneration consideration on these BZBs.

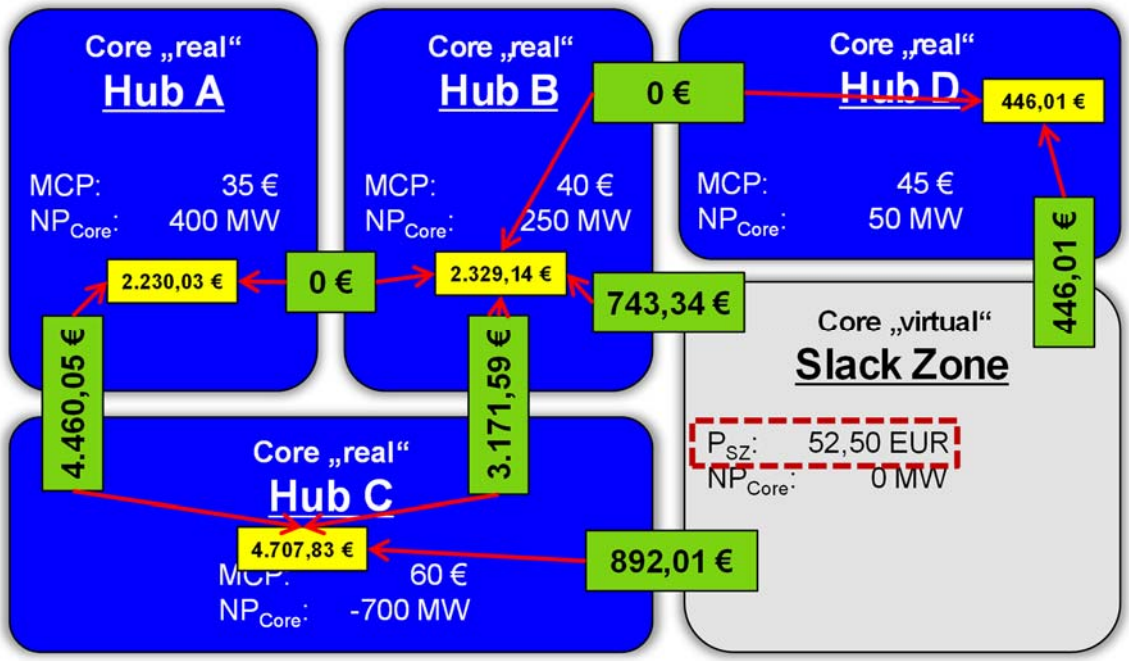
- For instance, the border Hub A to Hub C in this case contributes an amount of 39,95 EUR in total to put the borders A-B and B-D to zero (i.e. (4.500/9.800) * 87 EUR)
- The same calculation is done for the other internal and open borders.
- Note: this is just a simple example. In practice there will be several sources and sinks for socialisation. Once a border no longer has income left, then it is omitted from the socialisation.



12) Distribution of the final CI from the day-ahead process with partly LT Income consideration

- Applying this approach, the total remaining CI from the day-ahead timeframe of
  - Hub A levels up to 2.230,03 EUR
  - Hub B levels up to 2.329,14 EUR
  - Hub C levels up to 4.707,83 EUR
  - Hub D levels up to 446,01 EUR

  Total: 9.713 EUR



1.2. Flow based and socialisation in the Nordics

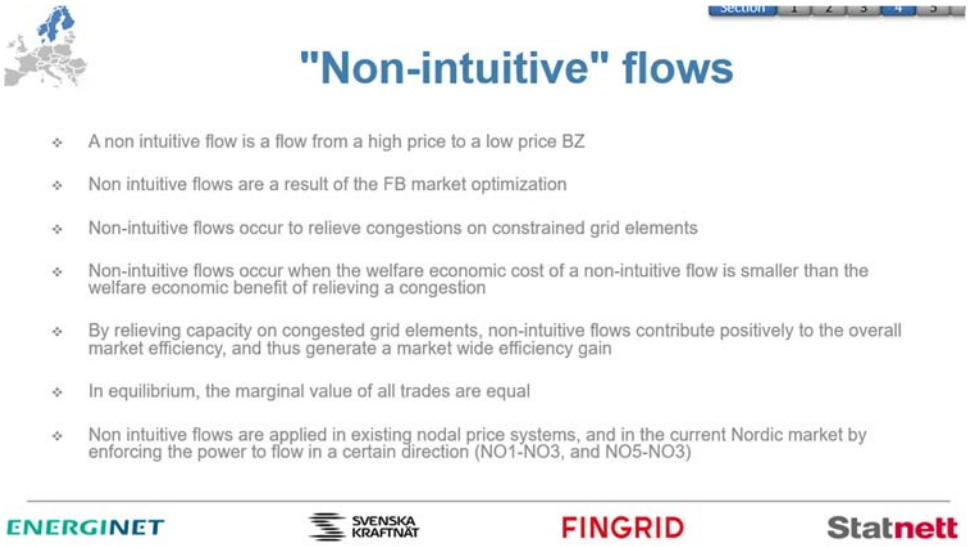
1.2.1. The flow-based domain

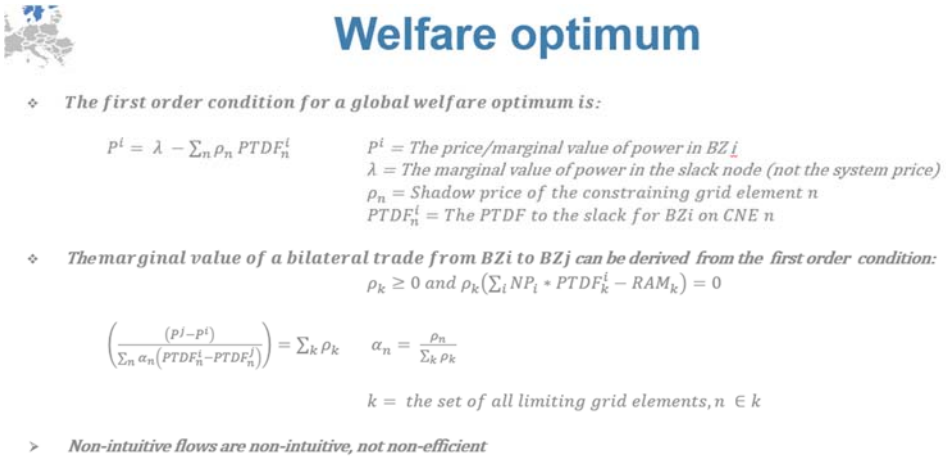
The Nordic day ahead flow based domain includes physical constraints such as thermal limitations for each grid element, steady state and dynamic voltage limits, dynamic stability limits for groups of grid elements, short circuit limits and N-1 considerations. Furthermore, it includes non-costly remedial actions (and costly if beneficial) and allows capacity allocated for the exchange of balancing reserves to be included. The objective of the capacity calculation is to calculate the security-domain, which provides the boundaries for valid market positions.

The Nordic TSOs have decided not to apply FTR-inclusion in the flow-based domain. In this they are following the CACM guidelines, which state in Art 21 (1) (b) (iii): "rules for taking into account, where appropriate, previously allocated capacity", that previously allocated capacity, i.e. nominated Physical Transmission Rights (PTRs), should be taken into account, where appropriate, but that there is no such requirement for non-nominated PTRs and certainly not for **Financial** Transmission Rights (FTRs).
When the security-domain is calculated in this way, all market results will be physically feasible for the transmission grid. In the Nordic view, it is not cost-efficient to allocate more (or less) capacity than feasible within operational security parameters by the application of LTTR-inclusion. If the day ahead result is outside the security parameters, it can lead to costly redispatch and countertrade, not only on the border where the domain was extended, but also on other borders. In the long run day-ahead price signals may become misleading if the domain is systematically extended at the same BZBs. Systematic costly re-dispatching and countertrading imply a redistribution and a loss of social welfare.

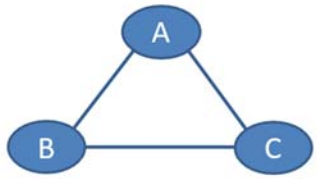
1.2.2. Congestion income distribution and socialisation

If LTTRs are sold as FTR options, they are **financial instruments** and by definition there is no need to include them in the DA flow-based domain. Therefore, allocated LTTRs have no impact on day-ahead flows either directly or indirectly. Therefore, they do not have any impact on day-ahead welfare within the Nordic region. Since LTTRs do not have any impact on the day-ahead flow on BZB they are not addressed in the Nordic DA CID methodology. Therefore, there can also be no missing money on the regional level – day ahead physical and financial forward markets are kept completely separate.
The Nordic DA CID foresees socialisation only in the case of non-intuitive flows (high price area to low price area) that may be allowed on one BZB to make room for higher beneficial flows on other BZB. In that case, since the other TSOs and BZBs benefit from the non-intuitive flow on one BZB, those losses are socialised. The BZBs with a positive congestion income contribute pro rata so that the concerned BZB ends up with 0.

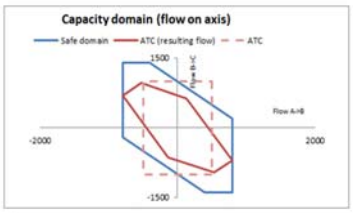




Example - Non intuitive flow



Line (CNE)	Max flow	Min flow	PTDF A	PTDF B	PTDF C
A -> B (CNE 1)	800 MW	-800 MW	33 %	- 33 %	0
B -> C (CNE 2)	1400 MW	-1400 MW	33 %	67 %	0
A -> C (CNE 3)	1000 MW	-1000 MW	67 %	33 %	0



Line	Max NTC	Min NTC
A -> B	500 MW	-500 MW
B -> C	1000 MW	-1000 MW
A -> C	400 MW	-400 MW

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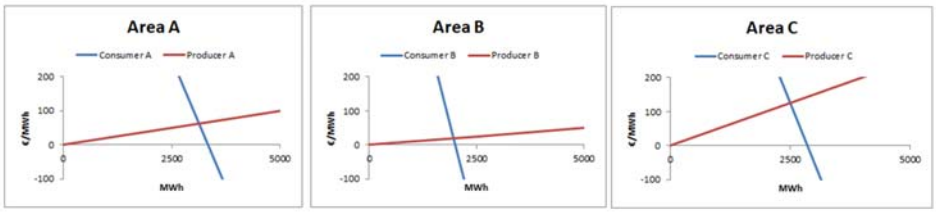
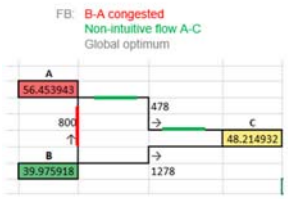
Example – The market



FB and FB intuitive market solution

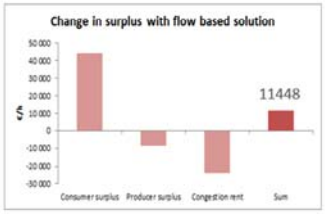


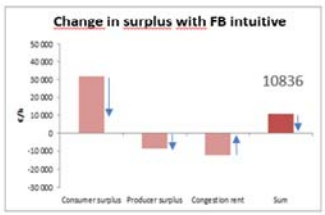
Marginal value of bilateral trades in FB

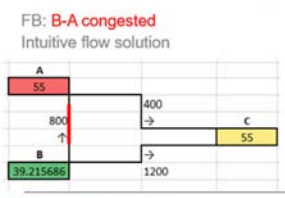
A-B	B-A	B-C	C-B	A-C	C-A	Sum shadow prices
24.717	24.717	24.717	24.717	24.717	24.717	24.717

Marginal value of bilateral trades in FB intuitive

A-B	B-A	B-C	C-B	A-C	C-A	Sum shadow prices
47.352	47.352	47.353	47.353	0.006	0.006	15.784







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Congestion income distribution in FB in an hour with a counter intuitive flow

	CI before socialisation	Final CI after socialisation	Contribution: 16,6087%
B -> A	13 182,420000	10 992,984600	2 189,435410
B -> C	10 529,459900	8 780,648050	1 748,811850
A -> C	-3 938,247260	0,000000	

1.2.3. Long term markets in the Nordics

LTTRs are currently sold on only one border within the Nordic CCR – between DK1 and DK2. They are issued on that border to provide hedging opportunities for market participants in addition to price derivatives available in the financial forward market. Price derivatives (System price forward and Electricity Price Area Differentials) are currently the primary markets where market participants hedge. That financial forward market is functioning independent from the physical day-ahead market and the TSOs. It is connected to the day-ahead market via the reference prices (system price and area prices) that result from the day-ahead market coupling.

Firmness is understood to be financial firmness towards the LTTR holder since LTTRs are purely sold to facilitate hedging for market participants. In the Nordic view, hedging is the main purpose of LTTRs – this is supported amongst other articles by the requirements in the decision in Article 30 of FCA. The decision not to issue LTTRs can only be made if market participants have sufficient hedging possibilities. It does not make any difference to the LTTR holder, whether the LTTR is included in the domain or not, and what the day-ahead flow looks like. The LTTR holder is hedged, since it will be paid out the positive day-ahead spread in the direction of the option (in case there is no force majeure)

Since LTTRs are seen as complementary to the financial markets and their only purpose is to support hedging, Energinet sells 50% of the capacity foreseen to be available on the HVDC link between DK1 and DK2. (as mentioned above: this does not have any impact on the capacity made available in the DA market coupling – there more capacity is made available, if it is feasible within operational security parameters). In addition, FCA art 10(4) requires that TSOs take into account the uncertainty associated with long term timeframes. This should lead to a conservative approach to assess long term available grid capacity i.e. often lower capacities are made available in the long term than in the day-ahead where the uncertainty is reduced considerably. Energinet and the NRA also need to balance the hedging benefits with possible losses for tariff payers.

It may happen that the day-ahead flow may be bigger or smaller than the secure capacity offered to the day-ahead on DK1-DK2 and bigger or smaller than the volume of LTTRs sold on the BZB. This is of no concern to the other TSOs in the CCR as long as the day ahead domain is based on the physical security of the grid and the market result is physically feasible. Since LTTRs are not included in the domain, the situation is actually comparable for non-LTTR issuing TSOs – their day-ahead flow may also be smaller than the capacity they offered to the day ahead domain.

If the LTTR volume sold is lower than the day-ahead flow, Energinet's DA CI covers the payout.

If the volume of LTTRs sold is higher than day-ahead flow, the day-ahead congestion income is not enough to cover the remuneration of the LTTR holders. Energinet covers the "missing money" with congestion income received from the sale of LTTRs on that border. This is a risk the NRA obliging the TSO to sell LTTRs and the TSO selling LTTRs have accepted.

This setup gives incentives to take the uncertainties associated with long-term capacity calculation into account and issue an amount of LTTRs with an associated risk that is considered acceptable by the TSO. It is important to underline again, that LTTRs are sold to facilitate financial hedging – they are not intended to have an impact on the day-ahead markets and welfare optimization. In addition, costs for the tariff payers need to be taken into account.

There is no relevance in socialising LTTR losses due to flow-based – since LTTR-inclusion is not applied in the flow-based domain, the other TSOs do not have any benefits.

If LT allocated capacity is in one hour higher than DA flows, DA income and, in addition, LT income is used to cover the loss: in our view LT income should be used to reduce the cases where socialisation is needed to create incentives to reduce the risk of "overselling". If LT income would not be used and there were no risk-minimizing incentives, it would in the long run increase cost for all TSOs. As a result, it would be discriminatory for TSOs that actually have taken costly measures to reduce their risk by, for example, improving the quality of their long term forecast and prudently managing the long-term capacity in accordance with FCA article 10(4).

2. LT income consideration before socialisation of DA income: pros and cons

LT income consideration before socialisation of DA income	
Pros	**Cons**
1. Efficient: reduces the number of cases where socialisation needs to be applied i.e. where the DA Congestion Income of other TSOs is reduced and where thereby tariff payers in other countries pay. **2.** It complements the socialisation principle as it enhances the options of adequate sharing of remuneration costs between all concerned parties, including those parties that have issued these rights. In contrast to this, a socialisation principle without consideration of long-term income does not necessarily guarantee that only those parties that benefit most from cross-border capacities are contributing to remuneration costs. Instead, a remuneration that is only based on day-ahead income may have distortionary and unintended distribution effects. **3.** Gives the right incentive to reduce risk exposure in line with FCA Art 10 (4), which advises to take into account the uncertainty of long-term forecasts, no incentive to take too high risk and sell too much capacity. With correct incentives there is no need for controls and regulation, given currently uncoordinated capacity calculation and political/regulatory influence (some TSOs sell 100% of forecasted capacity others 66%) **4.** LT income and DA CI are both income for transmission capacity sold, just received at different points in time – it is artificial not to use the whole income to compensate LTTR holders but to make a difference when that income was received. **5.** Via LTA inclusion, a link between LT and DA processes is already given. Income and costs should be treated symmetrically, it does not seem to be consistent to share LTTR remuneration costs within the CCR but related income remains at respective TSOs. **6.** LT capacities issued/allocated by TSO "A" and "B" may influence the CNECs of the TSO "C" while not sharing congestion income generated by LTTRs with TSO "C" due to 50/50 LT CID Rule. In consequence,	**1.** Mixing revenue streams of multiple timeframes into the firmness equation will make it more complex, not more efficient. **2.** Concerns intrinsic to the functioning of the LTTRs are to be dealt with within the appropriate methodologies and not as a by-product of the FCA FCR methodology as the latter will create unwanted side-effects. The risk of selling too much LT capacity seems more appropriate to solve through the regional LTCC methodology and LT Splitting methodology, which is anyway defined as a pre-requisite for the implementation of this FCA FRC methodology. **3.** The inclusion of LT CI to remunerate LTTRs can be counterproductive in terms of • promoting effective long-term cross-zonal trade. • striving for harmonised LTCC and Splitting rules methodologies **4.** The remuneration of LTTRs should be treated equally irrespectively of the applicable day-ahead allocation mechanism. A BZB should not be 'penalized' for its contribution to the DA market coupling for which it was less preferred due to the CCR welfare maximization principle of flow-based allocation. **5.** In Regulation (EU) 2019-943 (CEP) Art 19 states that congestion income shall in priority be used for "guaranteeing firmness" OR "maintaining or increasing cross zonal capacities". As explained before, the pot of DA CI on CCR level is sufficient to remunerate all LTTRs in the CCR provided that LTTRs are included in the flow-based capacity domain. Hence there is no 'default' need/obligation to use LT CI for the objective of "guaranteeing firmness". There is no restriction neither to do it, however, should LT CI be used one starts mixing revenue streams across time horizons. Mixing revenue streams creates more volatility hence

when socialisation process occurs TSO "C" need to give away its congestion income to compensate LTTRs for which congestion income was collected by TSOs "A" and "B". Therefore, considering LT income before socialisation process seems to be more fair solution having in mind approved FCA CIDM. At the same time current approved FCA CIDM does not allow to reflect this issue during LT CI calculation (it is simple 50/50 rule). **7.** In Regulation (EU) 2019-943 (CEP) Art. 19 (2) it is stated that any revenues resulting from the allocation of cross-zonal capacity shall be used for guaranteeing the firmness or maintaining or increasing the cross-zonal capacities. This also includes LT CI. **8.** The deficit on the DA-CI is a result of the reallocation of LTTRs (and LTA inclusion) on this border due to welfare optimization in the day-ahead process. So, it seems to be logical that the LT CI generated on this border is considered as well for LTTR remuneration. **9.** Not considering LT CI is contradictory to the purpose of using CI in general: DA CI is collected on borders with the highest market spread which means that on those borders there is the highest need for investing in increasing the cross-zonal transmission capacity. With not considering LT CI on other borders with deficit on DA CI, the DA CI on borders with the highest needs to spend the CI for increasing the cross-zonal capacity is reduced, which is counterproductive in terms of overall social welfare increase.	more uncertainty. And uncertainty is contra-productive to achieve the objective of "maintaining or increasing cross-zonal capacity". **6.** It is a basic principle in the design of FB-MC that all LTTR remuneration costs can be balanced by DA-MC income (no LT-CI needed). Therefore, TSOs of each BZB in some CCRs ensure sufficient DA capacity in DA-FB-domain to include offered LT capacity (firmness cost e.g. by redispatch). TSOs with a deficit in DA CI on BZBs could be discriminated 2 times – first to keep DA capacity firm on their border and then they were also forced to use LT-CI.