ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Decision on the Common methodology for redispatching and countertrading cost sharing for the Core CCR: Annex I

Common methodology for redispatching and countertrading cost sharing for the Core CCR

in accordance with Article 74 of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management

30 November 2020

Contents

Whereas

(1) This document is the common methodology for redispatching and countertrading cost sharing (hereafter referred to as the 'cost sharing methodology') for the Core CCR in accordance with Article 74 of Commission Regulation (EU) 2015/1222 establishing a guideline on Capacity Allocation and Congestion Management ('CACM Regulation').

(2) This methodology needs to be consistent with the Core day-ahead and intraday common capacity calculation methodologies in accordance with Articles 20 and 21 of the CACM Regulation, in particular regarding the assumptions being made on how the different types of flows are being calculated. This will ensure that the congestions forecasted and expected during capacity calculation are as close as possible to the congestions identified in regional operational security coordination and as well considered in this cost sharing methodology.

(3) This methodology takes into account the coordination process for cross-border relevant redispatching and countertrading actions (XRAs) as well as other remedial actions (hereinafter referred to as 'coordination process') as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation ('SO Regulation'). This coordination process involves: (i) common identification of cross-border relevant network elements (XNEs) and remedial actions, including redispatching and countertrading, (ii) common identification of all congested cross-border relevant network elements with associated contingencies (hereinafter referred to 'coordinated security analysis') and (iii) a single optimisation that determines the optimal activation of cross-border relevant remedial actions to solve all congested cross-border relevant network elements (hereinafter referred to as 'remedial action optimisation', i.e. 'RAO').

(4) The RAO, which is a part of the coordination process as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation should also determine the costs and revenues of activated cross-border relevant redispatching and countertrading actions that are used as inputs to this cost sharing methodology. These costs and revenues generally include the costs and revenues of activated cross-border relevant redispatching and countertrading actions. However, in case other costly remedial actions are also activated by the RAO, the costs and revenues of these remedial actions should also be included in the costs and revenues that are to be distributed in accordance with this methodology, in order to ensure full consistency in the sharing of costs and revenues of all costly remedial actions activated by the RAO.

(5) Article 16(13) of Regulation (EU) 2019/943 of the European Parliament and of the Council on the internal market for electricity ('Electricity Regulation') specifies that for the congestions between two bidding zones observed, the regulatory authorities shall analyse to what extent flows resulting from transactions internal to bidding zones contribute to such congestions and then allocate the costs based on the contribution to the congestions, to the transmission system operators of the bidding zones creating such flows. For the application of this principle (i.e. polluter-pays principle), the costs of cross-border relevant redispatching and countertrading actions first need to be distributed to individual congested cross-border relevant network elements and then the costs on these elements need to be shared by identifying the origins of physical flows that are contributing to the congestions on those network elements.

(6) In accordance with Article 16(13) of the Electricity Regulation, the physical flows resulting from electricity exchanges (i.e. transactions) internal to bidding zones (i.e. internal flows and loop flows) should be identified as the main contributors to the congestion and the TSOs of bidding zones in which those exchanges are settled should therefore bear the proportional part of the costs attributed to the congested network elements. In case of cross-zonal network elements, these flows are loop flows, whereas in case of internal network elements, these flows are internal flow and loop flows, the former being caused by electricity exchanges within a bidding zone where such network element is located and the latter being caused by electricity exchanges within other bidding zones. Since the network users causing internal flows are financing the investment and maintenance of such internal

network element via network tariffs, whereas the network users causing loop flows are not, the loop flows beyond a 'legitimate' level (i.e. the level that could be expected without structural congestion in a bidding zone) should be identified as the primary contributor to the congestion on internal network elements, whereas internal flows should be penalised only for the remaining volume of congestion.

(7) While Article 16(13) of the Electricity Regulation defines a cost sharing solution for congestions between bidding zones, it does not specify the cost sharing solution for congestions that fall outside the scope of congestions between two bidding zones. Namely, Article 74(2) of the CACM Regulation requires the cost sharing methodology to determine cost sharing for all cross-border relevant redispatching and countertrading actions. Since the coordination process and RAO, in accordance with the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation, apply cross-border relevant redispatching and countertrading actions to solve congestions on all cross-border relevant network elements (regardless of whether they are within the scope of congestion between two bidding zones or not), this cost sharing methodology must provide a cost sharing solution for all cross-border relevant network elements. For consistency, this methodology therefore applies the same polluter-pays principle as defined in Article 16(13) of the Electricity Regulation to all cross-border relevant network elements (regardless of whether they are within the scope of congestion between two bidding zones or not).

(8) Article 16(13) of the Electricity Regulation also specifies that physical flows resulting from transactions internal to bidding zones that are below the 'legitimate' level should not be considered as contributors to the congestion. This Article also specifies a process to define this 'legitimate' level. However, until this level is defined by TSOs and approved by regulatory authorities, this methodology applies a temporary solution based on expert opinions of the majority of the Core TSOs. At the time of the adoption of this methodology, the majority of experts from the Core TSOs were of the opinion that this level for all Core bidding zones combined should be approximately 10% of the maximum admissible flow on each cross-border relevant network element. This 'legitimate' level is, however, without prejudice to the analysis and approval of the final level as foreseen in Article 16(13) of the Electricity Regulation.

(9) Article 15(3) of the Electricity Regulation specifies that the costs of the remedial actions necessary to achieve the linear trajectory referred to in Article 15(2) of the same Regulation or make available cross-zonal capacity on critical network elements (in case of flow-based approach) concerned by the action plan shall be borne by the Member State or Member States implementing the action plan. This cost sharing methodology allocates all the costs attributed to a specific network element to the TSO(s) of bidding zones where such element is located, except for the costs that are caused by loop flows originating from other bidding zones. Remedial actions necessary to resolve congestion caused by these loop flows cannot be considered as remedial actions necessary to achieve the linear trajectory referred to in Article 15(2) of the Electricity Regulation. This is because the action plan and the related linear trajectory are designed to address the congestion identified within the bidding zone(s) of the concerned Member State in accordance with Articles 15(1) and (2) of the Electricity Regulation. The loop flows on the other hand arise from other bidding zones and the action plans are not designed to increase cross-zonal capacities to address these loop flows. This cost sharing methodology therefore ensures that the costs of remedial actions necessary to achieve the linear trajectory referred to in Article 15(2) of the Electricity Regulation on critical network elements concerned by the action plan are always borne by TSOs of Member States implementing such action plans, whereas costs of remedial actions necessary to address loop flows are always shared based on polluter-pays principle.

(10) The cost sharing methodology contributes to the achievement of the objectives of Article 3 of the CACM Regulation. In particular, this cost sharing methodology:

(a) Facilitates the objectives of the Electricity Regulation, namely in maximising cross-zonal capacities and ensuring the minimum required capacities pursuant to Article 16(8) of the same Regulation and thereby promotes effective competition in the generation, trading and supply

of electricity in accordance with Article 3(a) of the CACM Regulation and optimises the calculation and allocation of cross-zonal capacity in accordance with Article 3(d) of the CACM Regulation;

(b) Promotes the polluter-pays principle by which the costs of congestions are attributed to the origins of flows that contribute to congestion and thereby ensures optimal use of transmission infrastructure in accordance with Article 3(b) of the CACM Regulation;

(c) Is an essential element required for RAO of the application of remedial actions within a capacity calculation regions to resolve congestions, which significantly improves the ensuring of operational security in accordance with Article 3(c) of the CACM Regulation;

(d) Ensures fair and non-discriminatory treatment of TSOs in accordance with Article 3(e) the CACM Regulation as it attributes the costs of congestions to TSOs that are identified as the main origins of flows that contribute to congestion based on the legal principles established by the CACM Regulation and the Electricity Regulation. On the other hand, this methodology is deemed to have no direct effect on NEMOs, regulatory authorities, ACER and market participants;

(e) Ensures and enhances the transparency and reliability of information in accordance with Article 3(f) the CACM Regulation as it clearly identifies contributions to congestions and ensures all the information necessary for cost sharing are archived and available to regulatory authorities;

(f) Applies a polluter-pays principle for sharing the congestion costs and this contributes to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union in accordance with Article 3(g) of the CACM Regulation;

(g) Is deemed to have no direct effect on the objectives of Article 3(h), (i) of the CACM Regulation; and

(h) Mitigates the problems related to loop flows and internal flows, which arise from inefficient bidding zone configuration, insufficient network investments and congestions internal to bidding zones and thereby helps to avoid discrimination between internal and cross-zonal exchanges. It therefore contributes to providing non-discriminatory access to cross-zonal capacity in accordance with Article 3(j) of the CACM Regulation.

TITLE 1
GENERAL PROVISIONS

Article 1
Subject matter and scope

1. This cost sharing methodology is the common methodology for redispatching and countertrading cost sharing in accordance with Article 74 of the CACM Regulation. It covers the sharing of costs of cross-border relevant redispatching and countertrading actions activated pursuant to the coordination process as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation. If this coordination process and its optimisation results in activation of other costly remedial actions, these costs shall also be included in the total costs to be shared in accordance with this methodology.

2. This cost sharing methodology shall apply to all Core TSOs. This cost sharing methodology shall also apply to third country TSO(s), if such TSO(s) have signed an agreement with all Core TSOs that they shall comply with this cost sharing methodology, as well as the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation and accept all the rights and obligations stemming from them. In such case the reference to Core TSO(s) and Core CCR in this methodology shall also include such third country TSO(s).

Article 2
Definitions

1. For the purpose of this methodology, the terms used in this document shall have the meaning of the definitions included in Article 2 of the CACM Regulation, Article 3 of the SO Regulation and Article 2 of the Electricity Regulation.

2. In addition, the following definitions and abbreviations shall apply:

   (a) 'allocated flow' means a physical flow on a network element where the source and sink are located in different bidding zones;

   (b) 'agreed XRA' means an XRA which has agreed during the coordination among Core TSOs and RSC(s);

   (c) 'ordered XRA' is an agreed XRA that bindingly ordered after the end of CROSA;

   (d) 'agreed but not ordered XRA' or 'ANORA' is an agreed XRA that has not been ordered after the end of CROSA;

   (e) 'burdening flow' means a flow identified on a network element in the direction that is aggravating a constraint on that network element;

   (f) 'CGM' means the common grid model as defined in Article 2(2) of the CACM Regulation and used within the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation;

   (g) 'common threshold' means a share of loop flows from all Core bidding zones together, which is considered legitimate and shall not be identified as contribution to congestions with the same priority as the loop flow from all Core bidding zones above this value.

   (h) 'Core CCR' means the Core capacity calculation region as established by the Determination of capacity calculation regions pursuant to Article 15 of the CACM Regulation;

(i) ‘CROSA’ or ‘coordinated regional operational security assessment’ means a process of an operational security analysis performed by RSC(s) in accordance with Article 78 of the SO Regulation;

(j) 'cross-border relevant network element' or 'XNE' means a network element identified as cross-border relevant and on which operational security violations need to be managed in a coordinated way;

(k) 'cross-border relevant network element with contingency' or 'XNEC' means an XNE associated with a contingency. For the purpose of this methodology, the term XNEC also cover the case where a XNE is used in operational security analysis without a specified contingency;

(l) ‘eligible XNE' or ‘eligible XNEC’ means the XNE or XNEC, which is eligible for cost sharing in accordance with this cost sharing methodology;

(m) ‘HVDC’ means a High Voltage Direct Current network element;

(n) ‘individual threshold’ means a share of loop flow from an individual bidding zone, which is considered legitimate and shall not be identified as contribution to congestion with the same priority as the loop flow above this value

(o) ‘internal flow’ means a physical flow on a network element where the source and sink and the complete network element are located in the same bidding zone;

(p) ‘loop flow’ means a physical flow on a network element where the source and sink are located in the same bidding zone and the network element or even part of the network element is located in a different bidding zone;

(q) ‘maximum flow’ or ‘F_{max}’ means a maximum admissible active power flow on XNE that corresponds to the current limit on XNE as applied in the RAO;

(r) ‘PST’ means a phase-shifting transformer;

(s) ‘PST flow’ means a physical flow on a network element, which is caused by a PST with a tap position not in neutral position. PST flow is a cyclic flow, with the sink and source located at the same network element (the PST);

(t) ‘PSDF’ means a phase-shifter distribution factor;

(u) ‘RAO’, means remedial action optimisation that determines optimal set of XRAs within each CROSA;

(v) ‘relieving flow’ means a flow identified on a network element in the direction that is relieving a constraint on that network element;

(w) 'total flow' means the flow on an XNEC that can be calculated before the RAO, which is used to identify whether the XNEC is congested or not, or after RAO to verify that the XNEC is not congested anymore. The total flow is calculated in accordance with the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation;

(x) ‘volume of overload’ means a share of the total flow on an XNEC that is exceeding the maximum flow of that XNEC; and

(y) ‘XNE connecting TSO’ means the TSO responsible for the control area where the XNE is located or connected. In case of an interconnector, the TSOs on both sides of the interconnector shall be considered as XNE connecting TSOs.

3. In this methodology, unless the context requires otherwise:

   (a) the singular indicates the plural and vice versa;

   (b) references to one gender include all other genders;

   (c) any reference to legislation, regulations, directives, orders, instruments, codes or any other enactment shall include any modification, extension or re-enactment of it then in force;

   (d) any reference to another agreement or document, or any deed or other instrument is to be construed as a reference to that other agreement, or document, deed or other instrument as amended, varied, supplemented, substituted or novated from time to time.

TITLE 2
THE SCOPE OF COST SHARING AND INPUT DATA

Article 3
XRAs and XNECs eligible for cost sharing

1. This cost sharing methodology covers the sharing of costs and revenues of the cross-border relevant redispatching and countertrading actions that are determined as eligible for cost sharing in accordance with the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation.

2. In accordance with Article 74(4)(b) of the CACM Regulation, all cross-border relevant redispatching and countertrading actions activated pursuant to the coordination process as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation shall be considered as guaranteeing the firmness of cross-zonal capacities calculated in accordance with the capacity calculation methodology pursuant to Articles 20 and 21 of the CACM Regulation.

3. The costs and revenues of all cross-border relevant redispatching and countertrading actions activated pursuant to the common regional coordination and optimisation process as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation shall be considered as eligible for cost sharing.

4. All cross-border relevant network elements shall be eligible for cost sharing in accordance with this cost sharing methodology.

5. In accordance with Article 74(4)(a) of the CACM Regulation, the costs of redispatching and countertrading actions, as well as other remedial actions considered in the capacity calculation, shall not be eligible for cost sharing, unless these actions have been confirmed to be activated within the common regional RAO process as defined in paragraph 3.

6. The eligible costs and revenues shall include only the costs and revenues of the cross-border relevant redispatching and countertrading actions that are determined as eligible for cost sharing in accordance with the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation. In particular, any capacity and reservation costs shall not be eligible for cost sharing.

7. The eligible costs and revenues shall be auditable and transparent.

8. The total costs of cross-border relevant redispatching and countertrading actions eligible for cost sharing shall be determined as the netted sum of costs and revenues arising from the cross-border relevant redispatching and countertrading actions activated pursuant to the common regional RAO process as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation.

Article 4
Input data for cost sharing

1. For the application of this cost sharing methodology, at least the following input data shall be used:

   (a) The volumes, costs and revenues of agreed cross-border relevant redispatching and countertrading actions eligible for cost sharing as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76(1) the SO Regulation as well as all their accompanying information. This includes the information about ordered XRAs and ANORAs after each CROSA;

   (b) The list of XNECs for which the cross-border relevant redispatching and countertrading actions have been applied in order to solve congestions on those XNECs as required in Article 5(1). This list shall include the information on XNE connecting TSO(s);

   (c) For each XNEC pursuant to (b): (i) the maximum flow (F_{max}), (ii) the flow before the RAO which was considered when identifying the congestion on the XNEC, (iii) the flow after the application of non-costly XRA (with and without PST actions), (iv) the flow after the application of non-costly XRAs without PST actions and agreed costly XRA and (v) the flow after the application of all XRAs;

   (d) The CGMs used for the identification of congestions in accordance with the coordination procedure as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76(1) of the SO Regulation, as well as the net positions and scheduled HVDC exchanges that were assumed in these CGMs;

   (e) For the cost sharing process, the following versions of CGM for the given CROSA shall be used:

      i. Input CGM for the CROSA before the RAO application shall be used for the flow decomposition and for the calculation of total flow on XNECs;

      ii. Input CGM for the CROSA with included non-costly agreed XRAs except PSTs shall be used for the calculation of PTDFs and PSDFs applied in mapping;

      iii. Input CGM for the CROSA with included costly ANORAs and non-costly agreed XRAs except PSTs shall be used for mapping as defined in Article 5(4)(e);

   (f) The GSK used in the application of the Core day-ahead and intraday capacity calculation methodology; and

   (g) The sensitivity factors: PTDF describing the impact of each XRA to each XNEC, and PSDF describing the impact of PST tap position change to each XNEC.

2. The cost sharing methodology shall be executed independently for each CROSA. The inputs for the cost sharing of XRAs from a given CROSA, such as CGM, ANORAs and ordered XRAs, shall be determined exclusively from the data used and resulting from this CROSA. The costs and/or revenues for each CROSA shall be determined only for ordered XRAs resulting from that CROSA.

TITLE 3
COST SHARING PRINCIPLES

Article 5
Mapping of XRA costs to XNECs

1. All Core TSOs shall distribute the costs and revenues of cross-border relevant redispatching and countertrading actions eligible for cost sharing as referred to in Article 4(1)(a) to each hour and each individual XNE eligible for cost sharing as referred to in Article 3(4) associated with a single reference contingency (or N-situation) that represents the worst contingency to be determined and agreed among Core TSOs pursuant to governance rules in accordance with Article 9. Any reference to XNEC in the remainder of this cost sharing methodology shall be understood as referring to XNE with this single reference contingency (or N-situation) unless otherwise defined in paragraph 5.

2. The costs and revenues of each XRA eligible for costs sharing pursuant to paragraph 1 shall first be split into hourly costs using the following principles:

   (a) The costs and revenues of an XRA, which are attributed clearly to a specific hour (such as activated redispatching energy), shall remain associated only to that hour;

   (b) The costs and revenues of an XRA, which cannot be attributed clearly only to one specific hour, shall be split equally between the multiple hours to which these costs are attributed;

   (c) The costs and revenues of an XRA, which have been attributed to hours in which there was no congestion in the Core CCR, shall be set to zero; the costs and revenues of such XRA in other hours (considered in the same RAO) in which there was a congestion in the Core CCR, shall be increased proportionally for the same amount; and

   (d) The incurred costs of curative XRAs shall be considered when the associated contingency materializes, otherwise they shall be equal to zero. Further, curative XRAs shall be considered in paragraph 3 and 4(e)(ii) only when they are associated to the eligible XNECs.

3. Subsequently, the costs and revenues of all XRAs for a specific hour as determined pursuant to paragraph 2 shall be summed up and split between all XNECs eligible for cost sharing in accordance with the following formula (all variables are applicable for the specific hour *h*):

$$c_i = \frac{r_i}{\sum_i r_i} C^{all} \tag{1.1}$$

$$r_i = \sum_j \frac{\alpha_{i,j}}{\sum_i \alpha_{i,j}} C_j \tag{1.2}$$

$$r_i' = \sum_j \alpha_{i,j} C_j \tag{1.3}$$

and r_i' is calculated for each XNEC by solving the following optimisation:

$$\min_{\alpha,\beta} r_i' \tag{1.4}$$

$$0 \leq \alpha_{i,j} \leq 1 \tag{1.5}$$

$$0 \leq \beta_{i,k} \leq 1 \tag{1.6}$$

$$\sum_{j \in RDCT} \alpha_{i,j} V_j = 0 \tag{1.7}$$

$$\sum_j \alpha_{i,j} V_j PTDF_{i,j} + \sum_k \beta_{i,k} T_k PSDF_{i,k} = F_{limit,i} - F'_{b,i} \tag{1.8}$$

$$F_{limit,i} = \begin{cases} F_{max,i} & \text{if} \quad 0 \le F_{a,i} \le F_{max,i} \le F'_{b,i} \\ -F_{max,i} & \text{if} \quad F'_{b,i} \le -F_{max,i} \le F_{a,i} < 0 \\ F_{a,i} & \text{if} \quad F_{max,i} \le |F_{a,i}| \le |F'_{b,i}| \\ F'_{b,i} & \text{if} \quad F_{max,i} \le |F'_{b,i}| < |F_{a,i}| \end{cases} \tag{1.9}$$

Equation 1

with

c_i	Share of total costs of all XRAs attributed to XNEC *i* [€]
r_i	Relative weight of XNEC *i* in cost sharing [€]
C^{all}	Total costs or revenues of all ordered XRAs at a given CROSA, equal to $\sum_j C_j$ [€]
$\alpha_{i,j}$	Optimisation variable representing a fraction of optimal volume V_j of XRA *j* (consisting of redispatching or countertrading) determined by RAO which is needed to solve the congestion on XNEC *i*
r'_i	Least cost weight on XNEC *i* [€]
$\beta_{i,k}$	Optimisation variable representing a fraction of the T_k determined by RAO which is needed to solve the congestion on XNEC *i*
C_j	Total cost or revenue of applied XRA *j* [€]
V_j	The optimal volume of ordered XRA *j* (consisting of redispatching or countertrading) determined by RAO at a given CROSA [MW]
T_k	The optimal change of tap of ordered XRA *k* (consisting of PSTs), which is the difference between the tap of this XRA before the RAO and the optimal tap determined by RAO at a given CROSA
$PTDF_{i,j}$	Power transfer distribution factor describing the impact of a change of 1 MW of XRA *j* on the physical flow on XNEC *i*
$PSDF_{i,k}$	Phase shifting distribution factor describing the impact of a change of 1 tap position of PST *k* on the physical flow on XNEC *i* [MW]
$F'_{b,i}$	Adjusted total flow on XNEC *i* [MW]
$F_{max,i}$	Maximum flow on XNEC *i* [MW]
$F_{a,i}$	Total flow on XNEC *i* calculated after RAO, which includes the impact of all XRAs [MW]

4. The following additional rules shall apply for the calculation of variables in paragraph 3:

   (a) If C^{all} is positive/negative and less than half of relative weights r_i of XNECs are lower/higher than 0, these weights shall be set to 0 before applying the Equation 1.1;

   (b) If C^{all} is positive/negative and half or more of relative weights r_i of XNEC *i* are lower/higher than 0, the positive/negative value of the lowest/highest negative/positive weight shall be added to all weights of all XNECs before applying the Equation 1.1;

(c) If C^{all} is positive/negative and all relative weights r_i of XNEC i are 0, new weights shall be calculated and shall be equal to the absolute value of the right side of Equation 1.8;

(d) In case the absolute value of the right side of the Equation 1.8 is higher than the absolute value of the left side of this equation when all $\alpha_{i,j}$ and $\beta_{i,k}$ are set to 1, the right side of this equation shall be set equal to the left side of this equation when all $\alpha_{i,j}$ and $\beta_{i,k}$ are set to 1;

(e) Adjusted total flow on XNEC $F'_{b,i}$ shall be calculated as the lower among the two values:

i. flow from the input CGM for a given CROSA; and

ii. flow from the input CGM for a given CROSA, with included non-costly agreed XRAs except PSTs and costly ANORAs.

The rules (a) to (c) are also explained in the following table:

C^{all}	**relative weights r_i**	**treatment of relative weights r_i**
>0	Less than half are < 0	Set negative weights to zero before applying Equation 1.1
<0	Less than half are > 0	Set positive weights to zero before applying Equation 1.1
>0	Half or more are < 0	Opposite (i.e. positive) value of the lowest negative weight is added to all weights before applying Equation 1.1
<0	Half or more are > 0	Opposite (i.e. negative) value of the highest positive weight is added to all weights before applying Equation 1.1
Any	All are equal to 0	Weights are equal to the absolute value of right side of Equation 1.8, i.e.: $r_i = \left\|F_{limit,i} - F'_{b,i}\right\|$

5. The final costs attributed to XNECs for each hour shall be the sum of costs attributed to XNECs resulting from regional coordination process pursuant to this Article and possible additional costs attributed to XNECs in accordance with the cross-regional coordination process as defined in the methodology pursuant to Article 75 of the SO Regulation. In case cross-regional coordination process attributes additional costs to XNE which has zero costs resulting from regional coordination process pursuant to this Article, the reference contingency as determined in paragraph 1 for such XNE shall be the contingency determined by cross-regional coordination process.

Article 6
Flow decomposition on XNECs

1. All Core TSOs shall calculate at least for each XNEC with attributed costs pursuant to Article 5(5) and for each hour the following components of flows, which shall be used for cost sharing:

(a) PST flow, representing the component of physical flow resulting from the effect of using all PSTs located within and outside the Core CCR as determined within the CGM;

(b) Allocated flow, representing the component of physical flow resulting from all cross-zonal exchanges within and outside the Core CCR;

(c) Loop flow from outside the Core CCR, representing the component of physical flow resulting from internal exchanges within all bidding zones outside Core CCR;

(d) Loop flow for each bidding zone in the Core CCR, representing the component of physical flow resulting from internal exchanges within each bidding zone within the Core CCR; and

(e) Internal flow, in case the eligible XNEC is an internal network element, representing the component of physical flow resulting from internal exchanges within the bidding zone where an XNE is located.

2. For the purpose of transparency and auditability, Core TSOs may calculate different sub-components of the flow components pursuant to paragraph 1.

3. The first step of the flow decomposition shall be to perform the Alternating Current (AC) load flow calculation on a CGM, for the topology without any contingency (base case) and then separately for each contingency. The active power network losses shall be recorded per each network element (for base case and for each contingency) in the CGM. These losses shall be assigned to the sending end of each branch (omitting the virtual nodes representing the boundary points, in which case the losses shall be appointed to the real node at the receiving end), thus preparing the injections for further power flow decomposition, which is linearised from this point onwards.

4. The power flow decomposition is performed by calculating the:

    a) node-to-hub PTDF matrix, which is calculated with linearised approach, providing information of the sensitivity of active power flow over an XNEC, to the power exchange between each node containing nodal injections and arbitrarily selected hub node;

    b) nodal injections for allocated flows as defined in paragraph 6; and

    c) nodal injections for loop flows and internal flows as defined in paragraph 7

5. The PST flows are the flows that the PST is generating at the actual tap position at the two connection points of each PST. The PST flow pursuant to paragraph 1(a) on a single XNEC is calculated by summing up the contributions of individual PSTs on that same XNEC. The PST flow by a single PST is determined via phase shifter distribution factors (PSDF). The PSDF expresses the change of MW flow on a network element for the change of one tap of that PST. PSDF is calculated as the difference in physical flow on an XNEC, when changing the tap of this PST from currently applied tap to the next tap. Then the PST flow is calculated by multiplying all PSDF with the differences between the tap positions of phase shifting transformers contained in the CGM and their neutral tap position.

6. The nodal injections for allocated flows are calculated by multiplying the net positions contained within the CGM, with the factors contained within the GSK that is used in the application of day-ahead capacity calculation methodology and/or intraday capacity calculation methodology by the concerned Core and non-Core bidding zones. In the absence of such GSK for a certain bidding zone, the default GSK shall be used for such zone, where the factors are determined in proportion to generation in the generation nodes of that bidding zone. The allocated flow pursuant to paragraph 1(b) is then calculated by multiplying all the nodal injections for allocated flow from each bidding zone with node-to-hub PTDF factors and summarising the contributions from all such nodal injections for each XNEC.

7. The nodal injections used for the calculation of loop flows and internal flows are the nodal injections calculated pursuant to paragraph 3 reduced by nodal injections for allocated flows pursuant to paragraph 6. The loop flows and internal flows are then calculated by multiplying all the nodal injections for loop flows and internal flows with node-to-hub PTDF factors and summarising the contributions from all such nodal injections as follows:

    (a) for loop flows outside the Core CCR, all contributions from non-Core bidding zones are summarised for each XNEC;

    (b) for loop flows from each bidding zone in the Core CCR, all contributions from a particular Core bidding zone are summarised for each XNEC; and

(c) for internal flow, which is calculated only when the concerned XNE is an internal network element, all contributions from a Core bidding zone where the concerned XNE is located, are summarised for such XNEC.

8. The treatment of HVDC lines in flow decomposition shall follow the following principles:

   a) Modelling of HVDC network elements in flow decomposition shall be compatible with the virtual hub approach defined within the Core day-ahead and intraday capacity calculation methodologies.

   b) Exchanges over HVDC network element located on the bidding zone borders may be decomposed only into allocated flows on such element and other network elements impacted by it. The flow decomposition shall identify the positive injections feeding into the sending node of each such HVDC network element and negative injections supplied by the receiving node of each such HVDC network element and then model and treat such injections as other nodal injections for allocated flows in accordance with the principles described in paragraph 6 above.

   c) Exchanges over HVDC network element located within a bidding zone may be decomposed only into internal flow on such network element as well as internal and loop flows on network elements impacted by it. The flow decomposition shall identify the positive injections feeding into the sending node of each such HVDC network element and negative injections supplied by the receiving node of each such HVDC network element and then model and treat these injections as other nodal injections for loop flows and internal flows in accordance with the principles described in paragraph 7 above.

9. The calculation of flow components shall be transparent and reproducible.

10. In case the flow obtained as the sum of all flow components is not equal to the flow on an XNEC obtained with the original AC load flow, all components shall be scaled proportionally such that the sum of all components become equal to the flow on the XNEC obtained with the original AC load flow.

11. Flow decomposition shall be performed on each eligible XNEC and for each hour separately.

12. To identify the different flow components contributing to the congestions (or relieving them) and their bidding zone of origin, the flow decomposition calculation shall consider the bidding zone configuration as defined pursuant to the CACM Regulation.

Article 7
Distribution of costs on XNECs to TSOs

1. All Core TSOs shall use the flow components on each eligible XNEC to calculate the share of the total costs attributed to eligible XNEC that shall be attributed to each TSO from the Core CCR. The calculations shall consist of the following steps:

   i. Application of threshold(s) as described in paragraphs 2 to 5;

   ii. Identification of contributions to congestion as described in paragraph 6; and

   iii. Distribution of costs to bidding zones and TSOs as described in paragraphs 7 and 8.

2. First, all Core TSOs shall split the burdening loop flow by each biding zone within the Core CCR on each eligible XNEC in two parts: one part will define the burdening loop flow below the individual threshold and the other part the burdening loop flows above the individual threshold as defined in paragraph 4.

3. To calculate the individual threshold for burdening loop flows from each bidding zone within the Core CCR on each eligible XNEC, all Core TSOs shall first calculate a common threshold for burdening loop flows from all bidding zones within the Core CCR on each eligible XNEC. This common threshold shall be equal to 10% of the F_{max}, for each eligible XNEC.

4. All Core TSOs shall calculate an individual threshold for burdening loop flows for each bidding zone within the Core CCR for each eligible XNEC, by dividing the common threshold as defined in paragraph 3 equally among all burdening loop flows from bidding zones within the Core CCR. If any burdening loop flow from any bidding zone within the Core CCR is below such calculated individual threshold, the individual threshold can be increased, such that the sum of all burdening loop flows (from all bidding zones within Core CCR) below the individual threshold is equal to the common threshold as defined pursuant to paragraph 3.

5. The individual threshold pursuant to paragraph 4 is without prejudice to the determination of the level of loop flows that could be expected without structural congestion in a bidding zone and that is to be determined in accordance with Article 16(13) of the Electricity Regulation. Once this level is approved, it shall automatically replace the individual threshold as defined in paragraph 4.

6. In order to identify which flow components contribute to congestion and to which degree, all Core TSOs shall calculate the volume of overload, which shall be equal to the total flow on the eligible XNEC before the RAO, reduced by the maximum flow on that XNEC. The contributions to the volume of overload shall be calculated as follows:

   (a) The burdening loop flows from bidding zones within the Core CCR above the individual threshold calculated pursuant to paragraph 4 or 5 shall be identified as the first contributor to the volume of overload. If the volume of these burdening loop flows is higher than the volume of overload, the contribution of each burdening loop flow from bidding zone within the Core CCR above the individual threshold shall be reduced proportionally such that the sum of contributions from burdening loop flows from bidding zones within the Core CCR above the individual threshold is equal to the volume of overload. The burdening loop flow contributions to the volume of overload shall be attributed to bidding zones that are the origins of the respective burdening loop flow components.

   (b) The burdening internal flow shall be considered as the second contributor to the volume of overload. The burdening internal flow contribution shall be equal to the volume of overload reduced by burdening loop flow contributions calculated pursuant to (a) and shall not be higher than the burdening internal flow.

   (c) The rest of the contribution to the congestion shall be identified with the following flow components in the order of following priority:

      i. Burdening loop flow from outside the Core CCR;

      ii. Burdening loop flows from bidding zones within the Core CCR below the individual threshold;

      iii. Burdening allocated flow; and

      iv. Burdening PST flow.

   (d) The contribution to the congestion pursuant to points (b) and (c) shall be attributed to the XNE connecting TSO. In case the concerned XNE of the XNEC is a network element connecting two Core bidding zones, and XNE connecting TSOs have defined the same F_{max} for this element, the corresponding costs for such XNEC pursuant to points (b) and (c) shall be shared 50:50 between the two XNE connecting TSOs. In case the XNE connecting TSOs

on both sides have defined a different F_{max} for the concerned XNE, the costs for such XNEC pursuant to point (b) and (c) shall be shared in accordance with the following formula:

$$S_{HI} = 0.5\frac{\max(0, F_{total} - F_{max,HI})}{F_o}$$

$$S_{LO} = S_{HI} + \frac{\max\left(0, \min\left(F_{total}, F_{max,HI}\right) - F_{max,LO}\right)}{F_o}$$

Equation 2

with

S_{LO}	Share of the costs for XNE connecting TSO which defined a lower F_{max} [%]
S_{HI}	Share of the costs for XNE connecting TSO which defined a higher F_{max} [%]
$F_{max,LO}$	Lower F_{max} [MW]
$F_{max,HI}$	Higher F_{max} [MW]
F_{total}	Total flow on XNEC [MW]
F_o	Volume of overload on XNEC which is equal to $F_{total} - F_{max,LO}$ [MW]

7. The total costs attributed to XNEC as defined in Article 5(5) shall be split proportionally to the calculated contributions to congestion as defined in paragraph 6, where the burdening loop flow contributions are attributed to the concerned bidding zones and the remaining contributions to the XNE connecting TSO(s) pursuant to paragraph 6(d).

8. The costs attributed to a bidding zone shall be attributed to the TSO(s) of that bidding zone. In case a bidding zone consists of several TSOs, the costs for such bidding zone shall be split between the TSOs of such bidding zone in proportion to the annual consumption within the previous calendar year within the control area of each TSO. TSOs of such bidding zone may also agree on a different sharing key in which case they shall either inform the settlement entity of the agreed sharing key, or appoint a single TSO of such bidding zone which shall be a settlement counterparty for settlement of all the costs attributed to such bidding zone, including the costs directly attributed to the TSOs of such bidding zone.

TITLE 3
MONITORING AND IMPLEMENTATION

Article 8
Settlement of costs

All Core TSOs shall agree on the settlement of costs resulting from the application of the cost sharing principles defined in this methodology and define the entity that will perform the settlement of costs ('settlement entity'). For this purpose, they shall enter into agreement that shall become effective at the latest by the day of implementation of this cost sharing methodology.

Article 9
Rules concerning governance and decision making among Core TSOs

1. All Core TSOs shall cooperate for the implementation and operation of this cost sharing methodology. This cooperation shall be carried out through common bodies where each TSO

shall have at least one representative. The members of the common bodies shall aim to make unanimous decisions. Where unanimity cannot be reached, qualified majority voting based on the voting principles established in accordance with Article 9(3) of the CACM Regulation shall apply.

2. All Core TSOs shall establish a steering committee consisting of one representative from each Core TSO. The steering committee shall make binding decisions on any matter or question related to the implementation and operation of this cost sharing methodology. The steering committee shall adopt rules governing its operation.

3. The steering committee shall also act as a body for settlement of disputes among Core TSOs regarding the implementation and operation of this cost sharing methodology. The steering committee shall solve the problems and disputes regarding, but not limited to, the following issues:

   (a) Resolution of disputes on the interpretation of aspects of this methodology, which may not be clear;

   (b) Resolution of disputes on design choices required for implementation and operation of this methodology, which are not defined in this methodology; and

   (c) Resolution of possible disputes in the application and operation of this methodology including the disputes related to the provisions ruling the day-to-day operation, but excluding the day-to-day operation itself.

Article 10
Monitoring of costs sharing

1. For the activation and cost sharing of cross-border relevant redispatching and countertrading actions, a dataset shall be stored in a central database. The dataset shall be made available to all Core TSOs, all Core regulatory authorities and ACER, and shall contain at least the following:

   (a) The input data pursuant to Article 4;

   (b) The results from mapping of costs, including the costs assigned to each XNEC;

   (c) The results from flow decomposition showing all flow components as defined in Article 6(1);

   (d) The results of application of threshold, including the separation of flow components below and above the individual threshold in accordance with Article 7(4);

   (e) The identified contributions to congestion for each flow component in accordance with Article 7(6); and

   (f) The splitting of costs of each XNEC to different bidding zones and TSOs.

2. All Core TSOs shall monitor the forecasting accuracy of network topology, generation and load in the individual grid models that are used for cost sharing and in particular the settings of PST tap positions. In case one or more Core TSOs identify or suspect abusive behaviour (such as systematic forecast errors) or other negative impact of such forecasting, all Core TSOs shall further investigate whether the concerned TSO has gained any financial advantage from such behaviour.

Article 11
Reporting to Core regulatory authorities and ACER

All Core TSOs shall provide a biannual report on cost sharing to all Core regulatory authorities and ACER by no later than one month after the end of the relevant semester. The biannual report shall include:

(a) An overview of the total costs attributed to each bidding zone and TSO in Core CCR in application of this cost sharing methodology;

(b) The information on the possible correction of results from previous biannual reports;

(c) Reporting on the monitoring of forecasting of individual grid models in case of identified or suspected abusive behaviour with possible gained financial advantages pursuant to Article 10(2); and

(d) Detailed analysis of specific cases with unexpected or unusual results with the underlying details on data inputs, flow decomposition, application of threshold, contributions to congestion and final cost sharing among bidding zones and TSOs.

Article 12
Review of cost sharing methodology

1. All Core TSOs shall perform an annual review of the cost sharing methodology in order to identify possible improvements in:

   (a) meeting the objectives and purpose of this cost sharing methodology, in particular with regard to the polluter-pays principle and fairness of the cost sharing;

   (b) effectiveness of this cost sharing methodology in terms of:

      i. Reasonable financial planning;

      ii. Providing correct incentives for managing congestions in an efficient way, including reconfiguration of bidding zones and capacity calculation as well as incentives for network investments;

   (c) the efficiency of the process for cost sharing with a specific focus on:

      i. Deadlines regarding the delivery of data and information;

      ii. Deadlines regarding the settlement process; and

   (d) the quality of cost estimations related to this cost sharing methodology.

2. No later than twelve months after the implementation of this cost sharing methodology, all Core TSOs shall develop a proposal for amendment of this methodology, which shall aim to improve all the aspects of this cost sharing methodology. By the same deadline, the proposal for amendment shall be submitted for approval to Core regulatory authorities.

Article 13
Implementation

1. Core TSOs shall publish this cost sharing methodology without undue delay after the decision has been taken by ACER in accordance with Article 9(12) of the CACM Regulation.

2. This cost sharing methodology shall be implemented by the implementation deadline as defined in the methodology pursuant to Article 35 of the CACM Regulation and the methodology pursuant to Article 76 of the SO Regulation.

3. The implementation process for this cost sharing methodology, which shall start with the entry into force of this methodology and finish by the deadline in accordance with paragraph 2, shall ensure provision of regular information to Core regulatory authorities and stakeholders on the development and testing of this methodology. It shall also provide to Core regulatory authorities regular reports on the results of testing.

TITLE 4
MISCELLANEOUS

Article 14
Language

The reference language for this methodology shall be English. For the avoidance of doubt, where Core TSOs need to translate this methodology into their national language(s), in the event of inconsistencies between the English version published by TSOs in accordance with Article 9(14) of the CACM Regulation and any version in another language, the relevant Core TSOs shall, in accordance with national legislation, provide the relevant Core regulatory authorities with an updated translation of the methodology.