European Network of
Transmission System Operators
for Electricity

COORDINATED CAPACITY CALCULATION IMPLEMENTATION GUIDE

2019-12-11

APPROVED DOCUMENT
VERSION 1.0

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The force of the following words is modified by the requirement level of the document in which they are used.

- SHALL: This word, or the terms “REQUIRED” or “MUST”, means that the definition is an absolute requirement of the specification.
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- SHOULD: This word, or the adjective “RECOMMENDED”, means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
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Revision History

Version	Release	Date	Paragraph	Comments
0	1	2019-07-10		First draft of the coordinated capacity calculation Implementation guide.
0	2	2019-11-26		Second draft of the IG. Comments from CIM EG and CCR working groups were taken into account.
1	0	2019-12-11		Approved by MC.

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1 Scope

The objective of coordinated capacity calculation implementation guide is to make it possible for software vendors to develop an IT application for TSOs and RSCs that allow them to exchange information for the coordinated capacity calculation process.

The implementation guide is one of the building blocks for using UML (Unified Modelling Language) based techniques in defining processes and messages for interchange between actors in the electrical industry in Europe.

This guide provides a standard for enabling a uniform layout for the transmission of data between TSOs and RSCs necessary to calculate cross-zonal capacities for different timeframes and different regions. The implementation guide is developed for the harmonisation of the underlying data exchange process. The implementation guide refers to information models based on the European style market profile (ESMP), IEC 62325-351. In particular, the IEC 62325-450 methodology was applied to develop the contextual and assembly models.

2 References

2.1 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- IEC 62325-301:2018, Framework for energy market communications – Part 301: Common information model (CIM) extensions for markets;
- IEC 62325-351:2016, Framework for energy market communications – Part 351: CIM European market model exchange profile;
- IEC 62325-450:2013, Framework for energy market communications – Part 450: Profile and context modelling rules;
- IEC 62325-451-1:2017, Framework for energy market communications – Part 451-1: Acknowledgement business process and contextual model for CIM European market;
- IEC 62325-451-3:2014+AMD1:2017 CSV Consolidated version - Framework for energy market communications - Part 451-3: Transmission capacity allocation business process (explicit or implicit auction) and contextual models for European market;
- IEC TS 61970-600-1:2017 Energy management system application program interface (EMS-API) - Part 600-1: Common Grid Model Exchange Specification (CGMES) - Structure and rules;
- IEC TS 61970-600-2:2017 Energy management system application program interface (EMS-API) - Part 600-2: Common Grid Model Exchange Specification (CGMES) - Exchange profiles specification.

2.2 Other references

- The Harmonised Electricity Market Role Model;
- Contingency List, Remedial Actions and Additional Constraints document UML model and schema;
- Critical Network Element document UML model and schema;
- Generation and Load Shift Key document UML model and schema;
- Area configuration document UML model and schema;

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- Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM);
- Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation (FCA);
- Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (EB GL).

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3 Terms and definitions

Already Allocated Capacity (AAC) means the total amount of allocated transmission rights i.e. transmission capacity reserved by virtue of historical long-term contracts and the previously held transmission capacity reservation auctions.

Allocation Constraints means the constraints to be respected during capacity allocation to maintain the transmission system within operational security limits and have not been translated into cross-zonal capacity or that are needed to increase the efficiency of capacity allocation.[1]

Available Transfer Capacity (ATC) means the transmission capacity that remains available, after allocation procedure, to be used under the physical conditions of the transmission system. ATC value is defined as: ATC = NTC - AAC.

Bidding zone means the largest geographical area within which market participants are able to exchange energy without capacity allocation.[2]

Capacity Calculation Region (CCR) means the geographic area in which coordinated capacity calculation is applied.[1]

Common Grid Model (CGM) means a Union-wide data set agreed between various TSOs describing the main characteristic of the power system (generation, loads and grid topology) and rules for changing these characteristics during the coordinated capacity calculation process.[1]

Constraint situation means a network configuration, corresponding either to the expected nominal state, or to an hypothetical degraded state where one or several contingencies occur. In both cases, associated remedial actions can be included in the network configuration.

Contingency means the identified and possible or already occurred fault of an element, including not only the transmission system elements, but also significant grid users and distribution network elements if relevant for the transmission system operational security.[1]

Coordinated Capacity Calculator (CCC) means the entity or entities with the task of calculating transmission capacity, at regional level or above.[1]

CRAC: Contingency list, Remedial actions and Additional Constraints.

Critical Network Element (CNE) means a network element either within a bidding zone or between bidding zones taken into account in the coordinated capacity calculation process, limiting the amount of power that can be exchanged.

Cross Zonal Capacity (CZC): Cross-zonal capacity in the EU energy market is defined as the capability of the interconnected system to accommodate energy transfer between bidding zones. Cross-zonal capacity can be expressed either as a coordinated net transmission capacity value, or a flow-based parameter.[2]

Flow-based approach means a capacity calculation method in which energy exchanges between bidding zones are limited by power transfer distribution factors and available margins on critical network elements.[1]

Flow-based domain means the set of constraints that limits the CZC calculated with a flow-based approach.

Generation Shift Key (GSK) means a method of translating a net position change of a given bidding zone into estimated specific injection increases or decreases in the common grid model.[1]

[1] Source: CACM

[2] Source: COMMISSION REGULATION (EU) No 543/2013 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council

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Generation Shift Key (GSK) means a method of translating a net position change of a given bidding zone into estimated specific injection increases or decreases in the common grid model.[1]

Individual Grid Model (IGM) means a data set describing power system characteristics (generation, load and grid topology) and related rules to change these characteristics during the coordinated capacity calculation process, prepared by the responsible TSOs, to be merged with other individual grid model components in order to create the common grid model.[1]

Long-term allocation margin is the amount of MW that is added to the capacity of the critical network element in order to automatically include the long-term allocation domain into the flow-based domain.

Load Shift Key (LSK) constitutes a list specifying those load that shall contribute to the shift in order to take into account the contribution of generators connected to lower voltage levels (implicitly contained in the load figures of the nodes connected to the EHV grid).

Monitored network element means the network element of the power system monitored during the network studies. The list of these elements is established by power system analysts and is used to identify the critical network elements after the network studies. Some Analog measurements associated with these elements provides the maximum flows allowed in a given network situation.

Nominated Electricity Market Operator (NEMO) means an entity designated by the competent authority to perform tasks related to single day-ahead or single intraday coupling.[1]

Network constraint means a situation in which there is a need to prepare and activate a remedial action in order to respect operational security limits.[3]

Net Transmission Capacity (NTC) is defined as NTC = TTC – TRM and corresponds to the maximum exchange between two areas compatible with operational security limits applicable in both areas and taking into account the technical uncertainties on future network conditions.

NTC approach means the capacity calculation method based on the principle of assessing and defining ex ante a maximum energy exchange between adjacent bidding zones. [1]

Permanent admissible transmission limit (PATL) means the permanent loads of transmission system elements which are allowed for an unlimited period and which do not cause physical damage to the transmission system elements as long as the defined thresholds are respected.

Power Transfer Distribution Factor (PTDF) is a factor representing the impact of a variation of the net position of the corresponding bidding zone on the critical network element.

Reliability margin means the reduction of cross-zonal capacity to cover the uncertainties within capacity calculation.[1]

Remaining Available Margin (RAM) is the amount of MW that will be offered to the market for a given CNE.

Remedial Action means any measure applied by a TSO or several TSOs, manually or automatically, in order to maintain operational security.[1] Those elements are used to alleviate the constraints induced by the constraint situation.

Remedial Action Series is a set of one or several network elements on which remedial actions are carried out to relieve the network constraint.

[3] Source: SO GL

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Regional Security Coordinator (RSC) is the entity or entities, owned or controlled by TSOs, in one or more capacity calculation regions performing tasks related to TSO regional coordination.

System Protection Scheme (SPS)[4] is an automatic protection system designed to detect abnormal or predetermined system conditions and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. Such actions may include changes in demand, generation or system configuration to maintain system stability, acceptable voltage or power flows.

Transmission Capacity Allocator (TCA) is an entity that manages the allocation of available transmission capacity for a bidding zone border on behalf of the System Operators. The TCA offers the available transmission capacity to the market, allocates the available transmission capacity to individual Capacity Traders and calculates the billing amount of already allocated capacities to the Capacity Traders.

Transitory admissible overloads mean the temporary overloads of transmission system elements which are allowed for a limited period and which do not cause physical damage to the transmission system elements as long as the defined duration and thresholds are respected.[3]

Transmission Reliability Margin (TRM) is the minimum reserve that system operators must have available at their connections so that they can help other countries to which their system is directly or indirectly connected, if necessary.

Total Transfer Capacity (TTC) is the maximum exchange program between two areas compatible with operational security standards applicable at each system if future network conditions, generation and load patterns were perfectly known in advance.

Virtual Bidding Zone: A non-geographical bidding zone to be able to apply extra constraints to Bidding Zones

[4] The SPS can be called System Integrity Protection Schemes (SIPS) in some CCRs (e.g. Nordics CCR)

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4 The Coordinated Capacity Calculation Business Process

4.1 Overview

There are three key network codes which outline specific requirements and obligations on SOs in relation to coordinated capacity calculation:

- Commission Regulation (EU) 2015/1222 of 24 July 2015 on establishing a guideline on capacity allocation and congestion management (CACM), which outlines the following requirements: - Develop a common capacity calculation methodology, - The capacity calculation methodology will include details of any allocation constraints, - Establish a Coordinated Capacity Calculator, - Establish a common Coordinated Redispatching and Countertrading Methodology;

- Commission Regulation (EU) 2016/1719 of 26 September 2016 on establishing a guideline on forward capacity allocation (FCA), which outlines the following requirements: - Develop a common capacity calculation methodology for long-term allocations, - Use the Coordinated Capacity Calculator established under CACM, - Develop a methodology for splitting long-term CZC;

- Commission Regulation (EU) 2017/2195 of 23 November 2017 on establishing a guideline on electricity balancing (EB GL), which outlines the following requirements: - Develop a common capacity calculation methodology within the balancing timeframes for the exchange of balancing energy or for operating the imbalance netting process.

The network codes require the CZC calculation to be carried out by the appointed Coordinated Capacity Calculator for each CCR, in accordance with the relevant coordinated capacity calculation methodology. The CCC process uses the technical parameters of the network (such as a common grid model, contingencies, shift keys, etc) as inputs. Coordinated capacity calculation should be efficient, transparent, and strongly coordinated among System Operators and RSCs. Two different approaches can be used to calculate the CZC.

- Flow-based approach should be applied on all bidding zone borders, which are electrically interdependent with other bidding zone borders (in the sense that electricity exchange on one border causes significant physical flows on other borders);

- Net Transfer Capacity (NTC) approach may be used on bidding zone borders where physical flows are less interdependent on exchanges on other borders.

The aim of coordinated capacity calculation implementation guide is to define the different data submissions needed for both approaches, for the different timeframes specified in the network codes and for the different CCR.

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4.2 Use cases

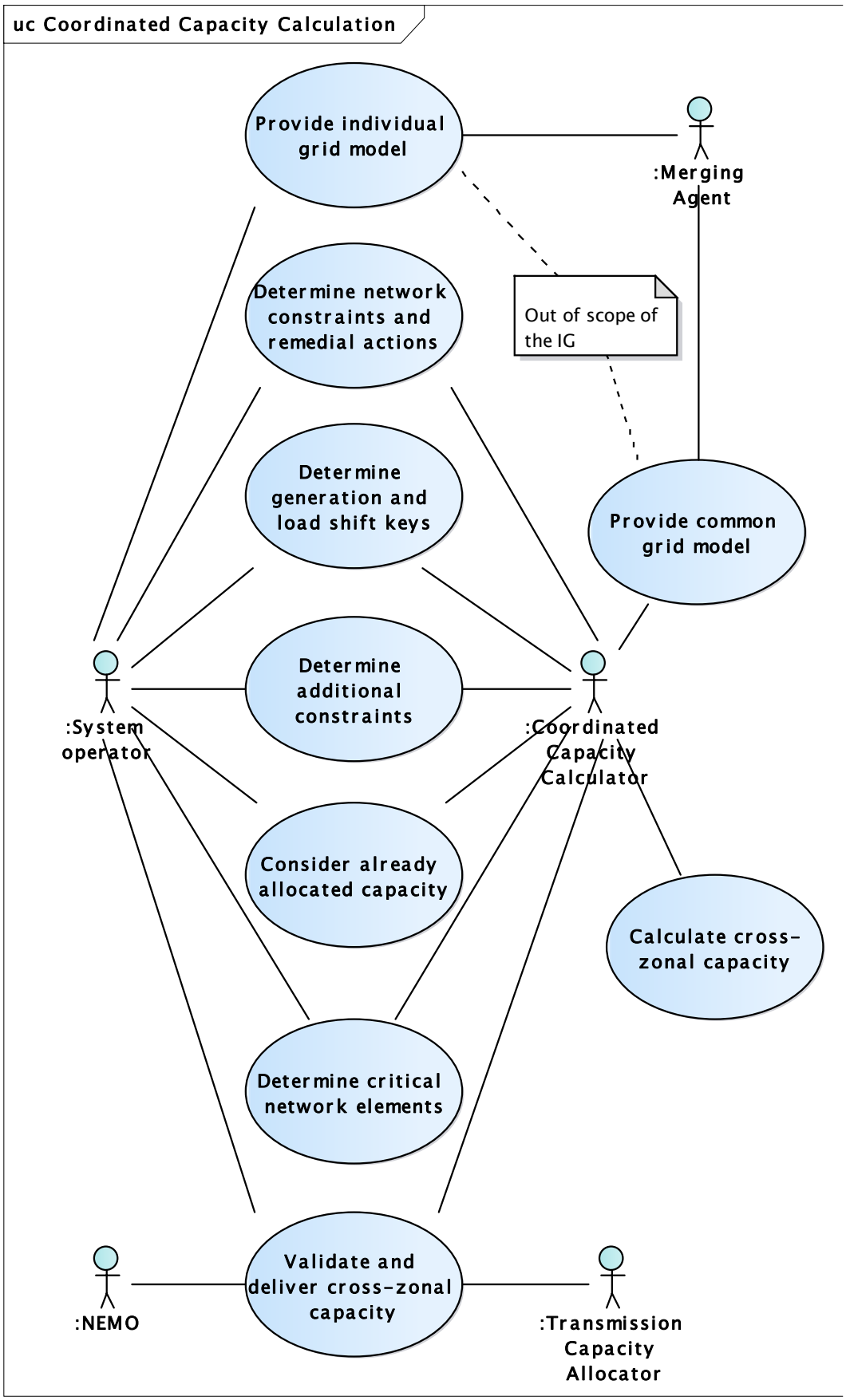

Figure 1 - Use Cases

296 Table 1 gives a list of roles involved in the CCC business process.
297
298 **Table 1 - Role labels and descriptions**

Role Label	Role Description
Coordinated Capacity Calculator	The CCC calculates the transmission capacity between the bidding zones of his CCR based on the inputs received from SOs. The CCC submit CZC to the SO within its CCR for validation and delivery for allocating capacity.
Merging Agent	The Merging Agent is responsible to gather the IGMs from SOs and merge them into a CGM. The Merging Agent provides the CGM to the Coordinated Capacity Calculator, who uses it as an input to calculate the CZC.
NEMO	The NEMO performs tasks related to single day-ahead or single intraday coupling. Within coordinated capacity calculation process, the NEMO receives the day-ahead and intraday CZC results. These results are used for day-ahead/intraday capacity allocation.
System Operator	Within coordinated capacity calculation process, SO provides most of the needed inputs to perform the coordinated capacity calculation and validates the results provided by the Coordinated Capacity Calculator. The SO also provides the long-term capacity allocation results to the TCA for publication purposes.
Transmission Capacity Allocator	TCA manages the allocation of available transmission capacity for a bidding zone border. In coordinated capacity calculation process, TCA receives the long-term CZC results. These results are used for long-term capacity allocation.

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300 Table 2 gives a list of use cases for the CCC Transparency reporting.
301
302 **Table 2 - CCC use cases**

Use case label	Roles involved	Action descriptions and assertions
Provide individual grid model	SO, Merging Agent	SO provides its own IGM to the Merging agent. Merging agent merges all the IGMs into one CGM. (Out of scope of the IG)
Provide common grid model	Merging Agent, CCC.	Merging agent provides the CGM to the CCC. (Out of scope of the IG)
Determine network constraints and remedial actions	SO, CCC	SO provides a list of the network constraints and remedial actions to be taken into account during the coordinated capacity calculation. CCC collects and validates them and might propose changes if some inconsistencies are found.
Determine generation and load shift keys	SO, CCC	SO also provides a list of the generation and load shift keys that are considered during the coordinated capacity calculation. Like in the previous use case, CCC collects and validates them and propose changes if some inconsistencies are found. CCC uses GLSK as an input to change the net position of a given bidding zone into injection or consumption increases or decreases in the CGM.
Determine additional constraints	SO, CCC	SO provides the additional constraints to CCC for limiting the bilateral exchanges or the flow in the network elements. CCC collects and validates them. The additional constraints can be bilateral exchanges values, bidding zone net position values.
Consider Already Allocated Capacity	SO, CCC	SO and CCC have to consider the CZC that has been already allocated in a previous timeframe (If there has been an allocation previously).

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Calculate cross-zonal capacity	CCC	Having into account all the inputs defined in the previous use cases, CCC calculates the CZCs between bidding zone borders within the CCR. The calculation basically enables to identify which are the most important limiting elements of the power network in several studied constraint situation, i.e. outages. This IG takes into account both NTC and flow-based approaches.
Determine critical network elements	SO, CCC	Once the calculation is performed, CCC provides the SO with a list of critical network elements for internal process. The critical network elements enable to define the NTC. The critical network elements may be provided, complemented by flow-based parameters in case that flow-based calculation is performed. Those flow-based parameters will include the influence of the critical network elements on the market coupling process.
Validate and deliver cross-zonal capacity	SO, CCC, NEMO, TCA	Finally, SO performs the appropriate validations on the CZC results and either SO or CCC deliver them to TCA and/or NEMO. For long-term capacity calculation, SO delivers cross-zonal capacity results to TCA. For day-ahead and intraday capacity calculation, CCC delivers cross-zonal capacity results to NEMO.

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4.3 Activity diagram

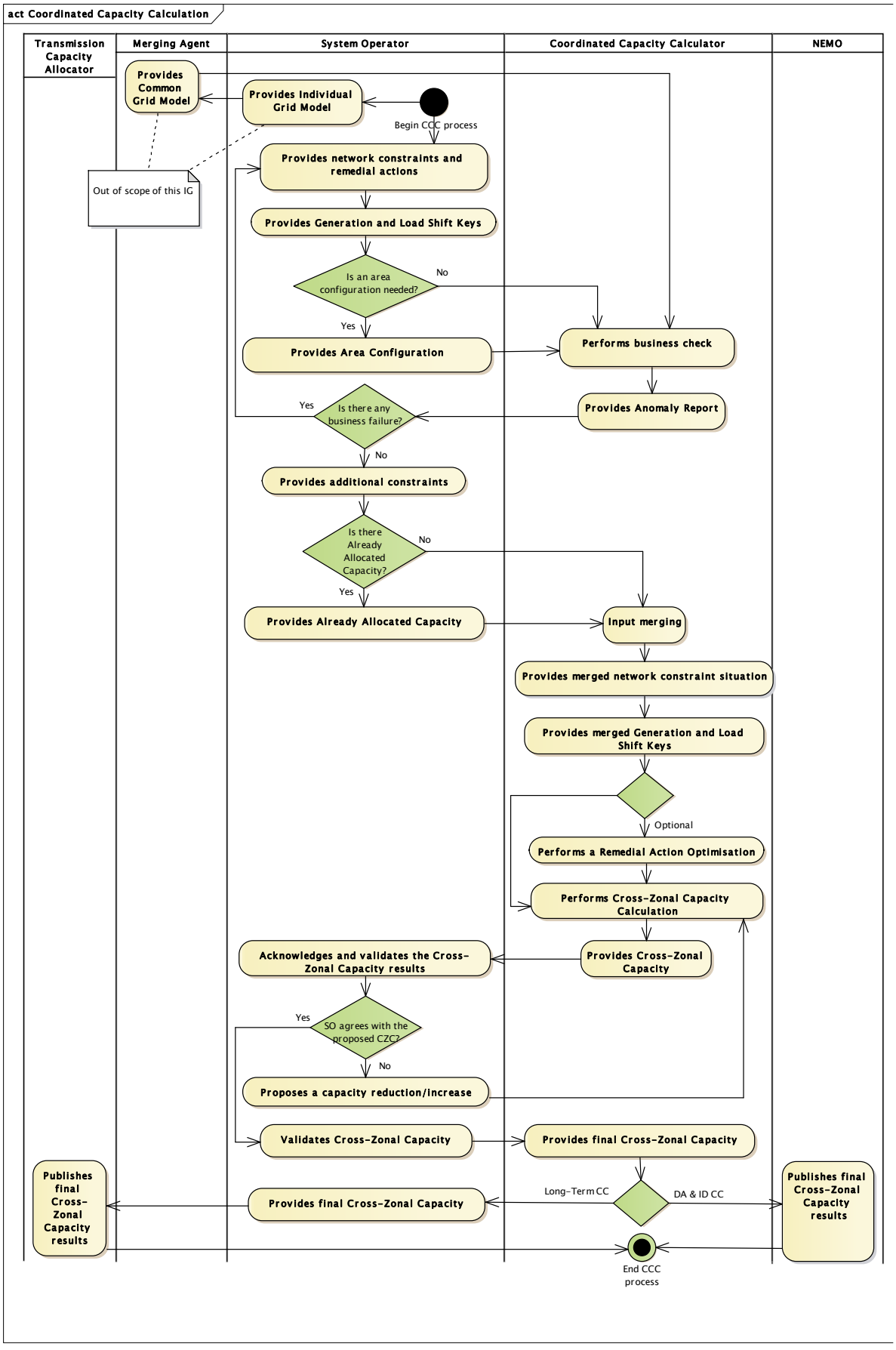

Figure 2 - Activity diagram

The process described in the workflow diagram and in the text below applies for any timeframe where coordinated capacity calculation is performed (i.e. from Y-1 to ID).

The first part of the coordinated capacity calculation process consists in the gathering of input (e.g. network constraints, GLSKs…) for capacity calculation that are transmitted to the CCC, responsible for performing the capacity calculation.

The merging agent, who is responsible for the creation of a common grid model (CGM) from individual grid models (IGM) provided by SOs (process out of scope of coordinated capacity calculation Implementation Guide), provides the common grid model relevant for the studied timeframe to the CCC.

System Operators provide the network constraint situations to be studied (elements to be monitored and contingencies to be simulated), as well as remedial actions which can be applied to relieve the network constraints, to the CCC. These network constraints situations flows can consist of 'configuration documents' exchanged only when there is a change in the characteristics of the set of network elements described, and of 'network constraints document' exchanged each time the process is run and consisting in associations between the elements to be monitored, the contingencies to be simulated, and the remedial actions to be applied.

SOs also provide generation and load shift keys (GLSKs) to the CCC, which describe the participation of generation or load units or their respective scheduling area to the net position shift of the whole area. Optionally some CCRs may require SOs to provide an area configuration document including the list of bidding zones.

Then, the CCC perform business checks on the input provided by SOs. These checks consist in comparing the data provided with the common grid model to ensure consistency in the characteristics of the network elements between the different documents. For example, the input provided by SOs can be compared with the information contained in the CGM to make sure that all the network elements to be monitored exist in the CGM, or that all the generation units on which generation shift keys are provided can be operated according to the CGM. In case of a failure of this business checks on some files, the sending SOs are notified, and can potentially provide new version of these input documents.

SOs can also provide additional constraints for the coordinated capacity calculation (i.e. constraints which are not directly related to network elements to be monitored) to the CCC, as well as the capacity which was already allocated at previous timeframes. This allows the CCC to make sure that the calculated capacity is higher than the already allocated capacity during the calculation step.

The CCC then performs the merging of all the individual input from SOs to get merged network constraint situations to be studied and merged GLSKs on the whole CCR. These merged documents are provided to SOs for information.

Depending on the CCR[5] and the timeframe, a remedial action optimization step can also be run by the CCC, consisting in finding the optimal remedial actions to be applied in all the network constraint situations studied, amongst the remedial actions provided by TSOs. If a remedial action optimization is run, the output, consisting in the remedial actions which is applied in each constraint situation, is forwarded to SOs.

The coordinated capacity calculation process is then run to maximise the exchanges on the borders of the CCR while taking into account the parameters and constraints provided as input. The output of this calculation is designated as the proposed CZC. If the coordinated capacity calculation process is NTC-based, the CZCs consist of capacity values (TTCs, NTCs, or ATCs) on the borders of the CCR, associated with the constraint situations which limited the capacity. If the coordinated capacity calculation process is flow-based, the CZCs consist of a flow-based domain. At that stage, the CZCs are "proposed" because they still need to be validated by SOs.

SOs validate the proposed CZCs they receive to make sure they are in line with their network security. SOs can either accept the capacity, propose a reduction of the capacity if the proposed

[5] List of CCRs is available: https://www.entsoe.eu/bites/ccr-map/

capacity does not ensure internal grid security, or propose an increase of the capacity in case internal studies have shown that additional capacity can be provided to the market without jeopardizing grid security. In case a SO proposes a reduction of the capacity, it has to justify it by providing the additional constraints leading to this capacity reduction. In case a SO proposes an increase of the capacity, the coordinated capacity calculation step is run again, and another capacity validation is performed as long as the duration of these steps respects the deadlines defined in the process.

Once SOs have validated the CZC, the CCC concatenates the validated CZC and send to SOs the final CZCs which are provided to the market. The final CZCs take into account the potential additional constraints provided by SOs.

Finally, the final CZCs are published by the CCC towards NEMOs in case of a day-ahead or an intraday process, or by SOs towards the TCA in case of a long-term process. Optionally, the CCC can also provide allocation constraints (which are additional constraints on the capacity provided to the market) alongside with the validated CZCs.

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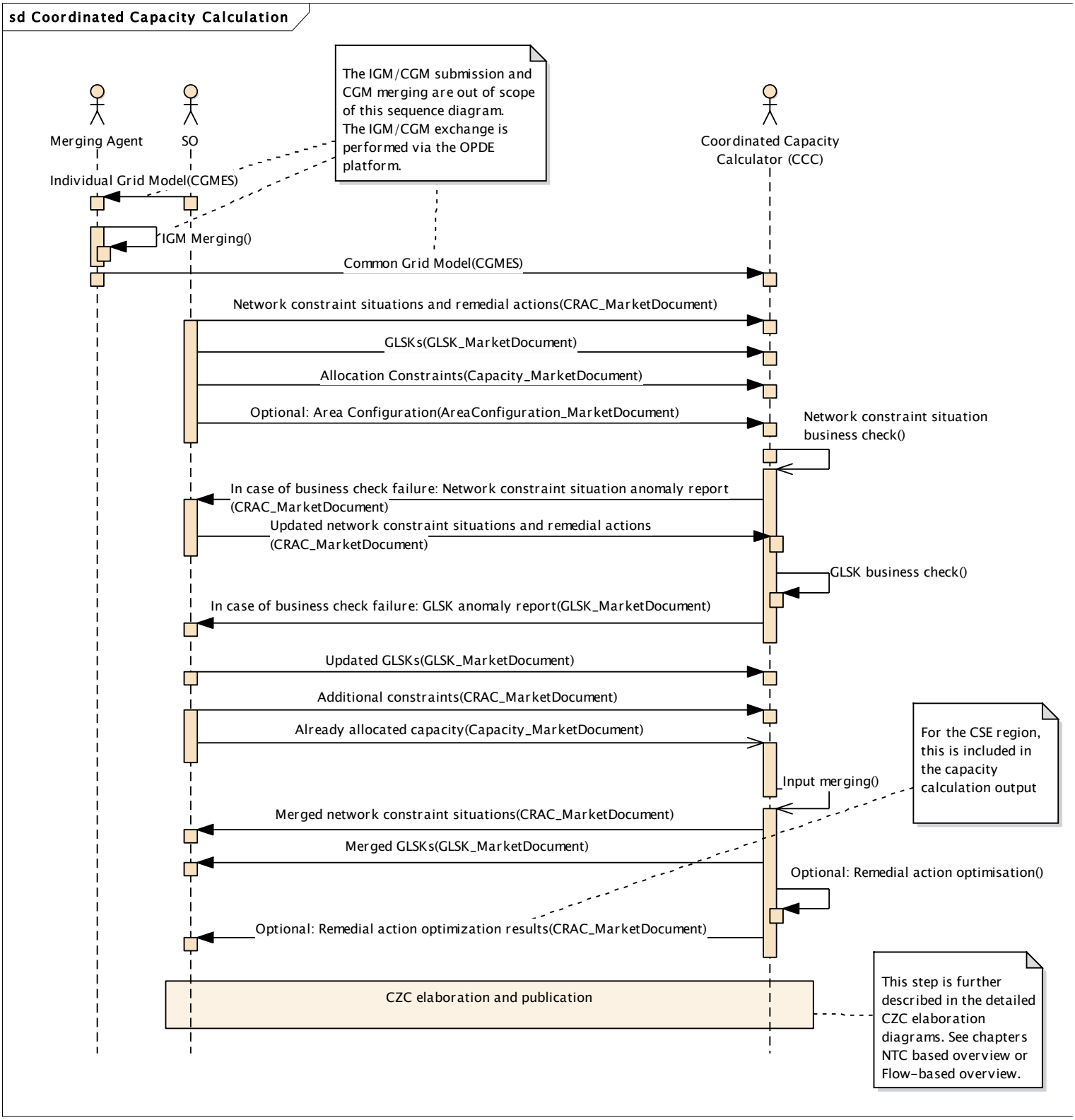
373 ## 4.4 Document exchange processes

374 ### 4.4.1 General overview

375 Next figure shows a general sequence diagram of the document exchange processes.



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377 **Figure 3 - Sequence diagram**

The use cases are supported by the following document exchanges:

4.4.1.1 Acknowledgement – Acknowledgement_MarketDocument

All received documents must be acknowledged with an acknowledgment document, IEC 62325-451-1, in a syntactic and business/semantic way by the different parties.

4.4.1.2 Submit IGM (Out of scope)

As a first step, SO provides each own individual grid model to the Merging agent.

4.4.1.3 Submit CGM (Out of scope)

Merging agent gets the individual grid models as an input from the SO and merge them into a common grid model for each hour of a studied timeframe (long-term, day-ahead or intraday). CGM are inputs to the CCC process of each timeframe.

4.4.1.4 Submit network constraints, remedial actions - CRAC_MarketDocument

SOs shall submit the network constraints, remedial actions and additional constraints towards the CCC using the CRAC_MarketDocument.

The information to be provided within CRAC document is the following one:

- The list of contingencies, each one identified by a mRID and including one or more contingencies. A contingency list is a list of network elements to be simulated as disconnected during the contingency analysis study. The elements are identified by their mRID (which is the identification of the network element as it is identified in the CGM);
- The list of monitored elements, each one identified by a mRID and including one or more monitored resources. A monitored element list consists in the network elements to be monitored during the load flow studies and if overloaded, become critical network elements. The monitored elements are identified by their mRID (which is the identification of the network element as it is identified in the CGM);
- The list of remedial actions, each remedial action is identified by a mRID and it is composed of one or several actions on network elements or bilateral exchanges. Each element is identified by its mRID (which is the identification of the network element as it is identified in the CGM).

The additional constraints are provided by the SO for limiting the bilateral exchanges or the flow in the network elements. The additional constraints can be bilateral exchanges values, bidding zone net position values, etc.

Depending on the regional calculation rules, the network constraint document can be more or less restrictive. A SO can decide to define a network constraint as a list of contingencies, associated with only one monitored network element, itself associated with one set of remedial actions. It can also define a network constraint as only a list of contingencies. A list of monitored network elements is also provided and a third list of remedial actions without any link between them. In this case, the CCC simulates the contingencies, monitoring all the provided network elements and choosing the best remedial actions to relieve the network constraints.

SOs may send their contingency lists, remedial actions and additional constraint through two submissions of the CRAC document:

- CRAC configuration document: the purpose of this document is to provide all the characteristics of the network elements and remedial actions that are used by the CCC for the load flow studies. This step enables to give a unique master identifier (mRID) for each element and its characteristics.

  The SOs can update these configuration data as necessary, it can be once a year or every day, etc. depending on the update frequency of the SOs network data.

- CRAC network constraint document: this document provides the link between contingencies, monitored elements and remedial actions, using the master identifiers (mRID) defined in the previous document. This link defines the network constraint situation to be taken into account by the CCC during the load flow studies.

It is also possible for SOs to send only one version of the CRAC document providing both configuration and the network constraints. In this case the configuration data shall be sent every day, even if there is no change in the network element characteristics.

CCC performs the necessary business check on it in order to ensure the quality of the provided data. In case of business check failure CCC provides an anomaly report pointing the issues or errors found in the file. The anomaly reports are also provided using the same CRAC_MarketDocument. Which will only contain the elements in error associated with the reason of the anomaly. Just after, SO should provide a new file amending the found errors or proposing additional constraints, if needed.

Just after merging all the individual CRAC documents, CCC provides the merged network constraints to the SO. In some CCRs, the CCC performs a remedial action optimisation, once done the CCC also provides the results of the remedial action optimisation. In both cases, CRAC_MarketDocument is used to provide the merged network constraint and remedial action optimisation results.

4.4.1.5 Submit GLSKs – GLSK_MarketDocument

The GSK and LSK are computed by the SO in charge of the area and provided to the CCC using GLSK_MarketDocument.

Generation shift key are needed to transform any change in the balance of one bidding zone into a change of injections in the nodes of that area or a change on the interconnections flow with another area.

Generation and load shift keys are elaborated on the basis of the forecast information about the generating units and loads. In order to avoid newly formed unrealistic congestions caused by the process of generation shift, SOs should be able to define both generation shift key (GSK) and load shift key (LSK).

GSK and LSK are defined for:

- A bidding zone, named in the document as “a”;
- A time interval: GSK and LSK are dedicated to individual daily hours in order to model differences between peak and off-peak conditions per SO.

Depending on the calculation methods, SO can define the following information associated to each generation and load nodes:

- proportional to base case;
- proportional to the participation factors;
- proportional to the remaining or available capacity;
- depending on a merit order list;
- interconnection shift keys;
- flat participation for all generators or loads;
- proportional to installed capacity of generators.

Once the SOs have sent the GLSK document, the CCC shall send an anomaly report if inconsistencies or errors have been detected in the GLSK during the business check process. The anomaly report will be provided using GLSK_MarketDocument as well, which will only contain the elements in error associated with the reason of the anomaly. For example, generation or load nodes described in the GLSK may be missing in the associated CGM, or the maximum power may be higher than the maximum power provided in the CGM.

Just after, SO should provide a new file amending the found errors in the document or providing the updated shift keys. Just after merging all the inputs, CCC provides the merged shift keys to the SO.

4.4.1.6 Submit allocation constraints – Capacity_MarketDocument

SO also submits the allocation constraints using the capacity document. An example of these constraints could be link constraints or capacity ramping limitations The allocation constraints submissions from SO towards CCC is performed using Capacity_MarketDocument.Submit

4.4.1.7 Area Configuration – AreaConfiguration_MarketDocument

The SO is responsible for maintenance of master data for the bidding zones.

The area configuration document is composed by a list of bidding zones. The bidding zones shall be described either by the nodes contained by them (or implicitly through node containers), or by the borders enclosing the zone, or both. The bidding zone information is used to determine net positions per bidding zone and to determine CNE flow at zero net positions.

4.4.1.8 Submit AACs – Capacity_MarketDocument

One of the items that SOs have to provide to the CCC is the AAC. In case that capacity was allocated in a previous timeframe, SOs shall provide AAC to CCC using the Capacity_MarketDocument in order CCC to properly perform the coordinated capacity calculation.

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4.4.2 NTC based overview

Next sequence diagram focuses on the document exchange part related to the NTC approach.

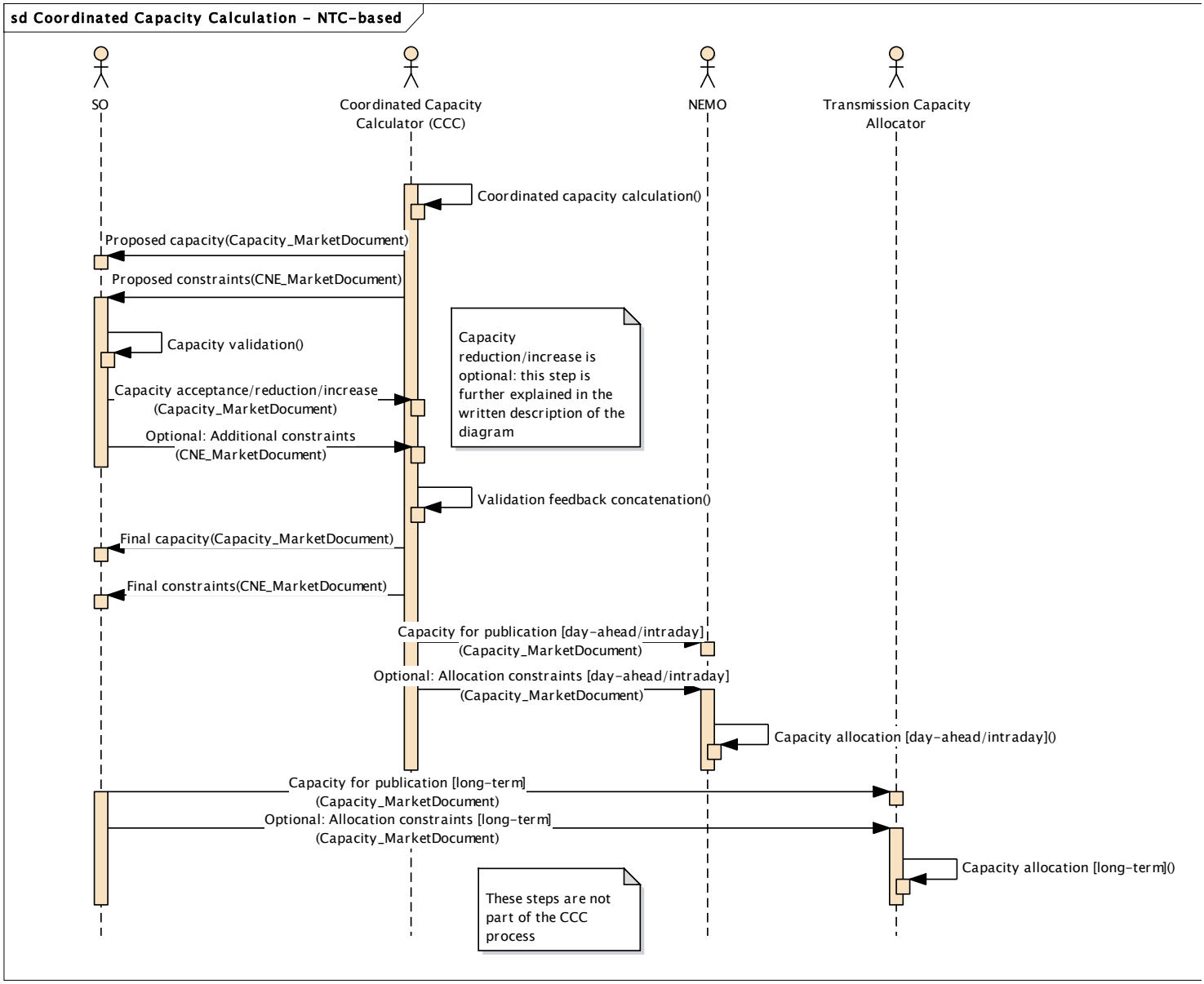

Figure 4 - Sequence diagram for NTC

4.4.2.1 Submit proposed capacity results and constraints

- Proposed capacity – Capacity_MarketDocument;
- Proposed constraints and constraints – CNE_MarketDocument.

CCC sends the proposed list of identified critical network elements that constraint the power network and induces congestions. Those critical network elements are identified for one specific point of time hour of a delivery day.

There may be one or several constraint situations identified on the power network for one specific point of time. Per constraint situation, one or several critical network elements may be identified. It is of SOs' responsibility to monitor each critical network element. In this condition, threshold values are provided as "monitored Analog measurements" of the "monitored elements" for SO internal process.

The net transfer capacity (NTC) will be calculated based on the critical network elements determined by the CCC. The related oriented border associated to the critical network elements calculation is provided in the critical network elements results. This information is needed as an input for NTC determination. For instance, the critical network elements identified in the calculation of the full export situation (from France to Italy) will be used as inputs for NTC calculation on France-to-Italy border.

Just after the coordinated capacity calculation, CCC provides the proposed capacity results and the proposed constraints for validation purposes to the SOs. SOs have to evaluate if they agree or disagree with the proposed capacity results by the CCC. In case of acceptance, the SO just send a positive acknowledgement to the CCC. In case of disagreement, SO has to provide a negative acknowledgement, their proposed capacities and optionally new additional constraints. See following points.

4.4.2.2 Submit a capacity acceptance/increase/reduction – Capacity_MarketDocument

If SOs don't agree with the capacity results provided by the CCC, they can propose a reduction or increase of the capacity along with the reason for that reduction/increase. In that case, SOs provide a new Capacity_MarketDocument with their proposed capacities.

4.4.2.3 Submit constraints – CNE_MarketDocument

In case that a SO proposes a change in the capacities, they can provide the additional constraints leading to this capacity modification using the CNE_MarketDocument.

4.4.2.4 Submit final capacity results and constraints

- Final capacity – Capacity_MarketDocument;
- Final constraints and limiting elements – CNE_MarketDocument.

CCC does a validation on the proposed capacities submitted by the SO. Once the validation is performed, CCC provides the final capacity results and the final constraints to the SO.

4.4.2.5 Capacity for publication – Capacity_MarketDocument

Finally, the final capacity is published by the CCC towards NEMOs in case of a day-ahead or an intraday process, or by SOs towards the TCA in case of a long-term process. Both capacity submissions towards NEMO and TCA are performed using Capacity_MarketDocument.

4.4.2.6 Submit allocation constraints – Capacity_MarketDocument

Optionally, CCC may submit the allocation constraints together with the capacities for publication towards NEMO in case of day-ahead or intraday process. For long-term process, SOs may submit the allocation constraints towards TCA. Both allocation constraints submissions towards NEMO and TCA are performed using Capacity_MarketDocument.

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4.4.3 Flow-based overview

Next sequence diagram focuses on the document exchange part related to the Flow-based approach.

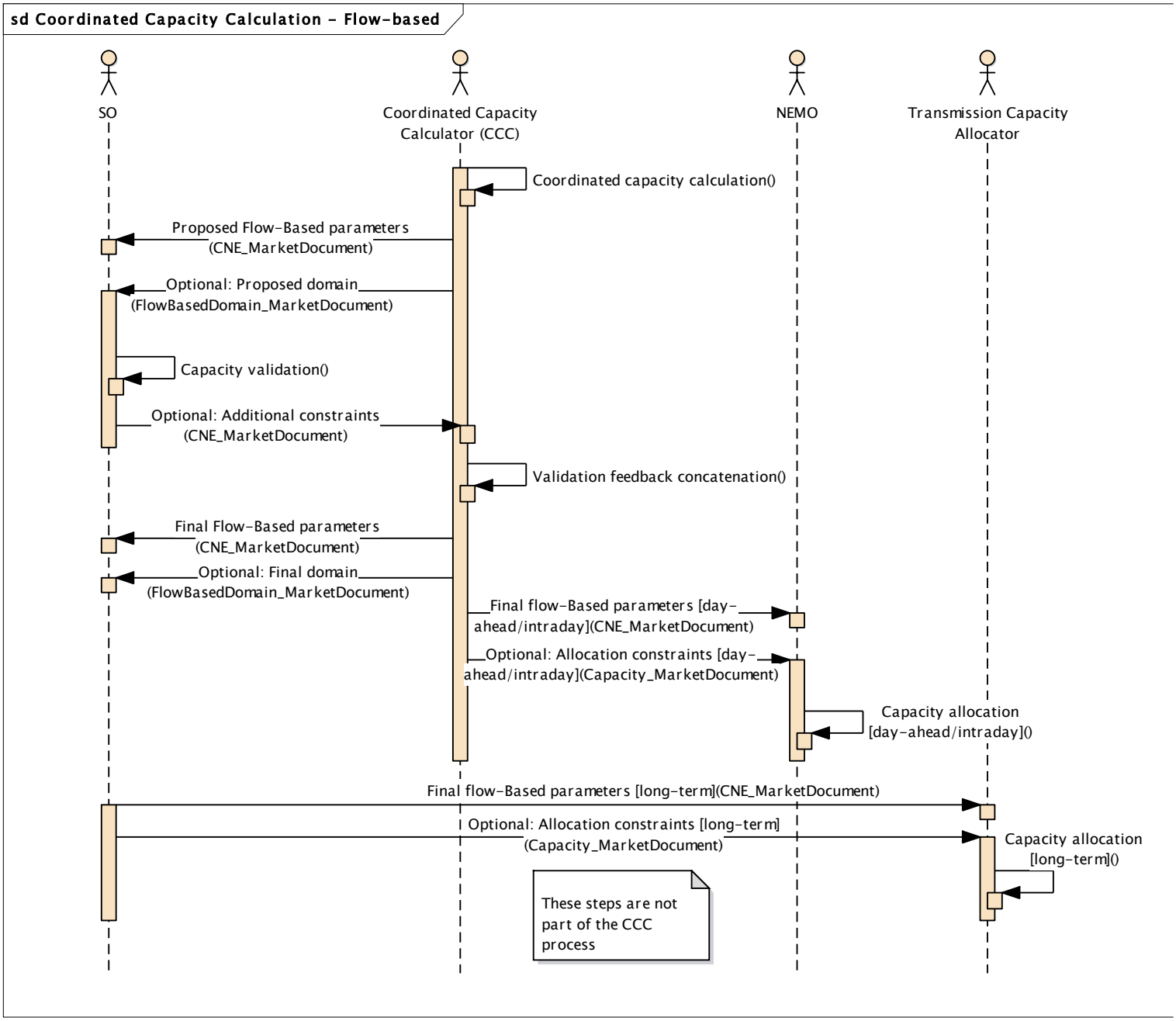

Figure 5 - Sequence diagram for flow-based

4.4.3.1 Submit proposed flow-based parameters (CNE_MarketDocument)

The process is not so different to the one described in the document exchange for the NTC approach Just after the coordinated capacity calculation, CCC provides the proposed flow-based parameters for validation purposes to the SOs.

There may be one or several constraint situations identified on the power network for one specific point of time. Per constraint situation, only one critical network element is identified by the flow-based calculation. It is of SOs' responsibility to monitor each critical network element.

In this condition, threshold values are provided as “monitored Analog measurements” of the “monitored elements” for SOs internal process.

4.4.3.2 Submit additional constraints – CNE_MarketDocument

SOs have to evaluate if they agree or disagree with the proposed capacity results provided by the CCC. In case of acceptance, the SO just send a positive acknowledgement to the CCC. In case of disagreement, SO sends a negative acknowledgement and propose a capacity reduction or increase. For that purpose, additional constraints have to be submitted using CNE_MarketDocument.

4.4.3.3 Submit final flow-based parameters – CNE_MarketDocument

CCC does a validation on the additional constraints submitted by the SO. Once the validation is performed, CCC provides the final flow-based parameters to the SO.

In case of day-ahead and intraday timeframes, the flow-based parameters are sent by the CCC to the NEMO to take into account the critical network elements with their PTDFs and RAM in the market coupling calculation process. In case of long-term timeframe, SO will send the flow-based parameters to TCA.

4.4.3.4 Submit flow-based Domain – FlowBasedDomain_MarketDocument

The critical network elements with flow-based parameters define the flow-based domain. This domain represents all feasible combinations of commercial exchanges between all the participating bidding zones in the CCR. The Flow based domain can be analysed by computing its volume, which is spanned by all binding constraints, i.e. critical network elements.
Moreover, maximum and minimum net positions for each hub and bilateral exchanges between any two hubs, feasible within the Flow based domain can be computed.

The flow-based domain identifies the domain where the power system is safely operated depending upon commercial exchanged flows and congestion management on the borders. The flow-based domain is identified per point of time by a set of critical network elements influencing the allocation market with given weighting factors defined by the PTDF factors and their associated RAM.

Flow-based domain document is mainly used to provide the vertices (limit net position) of the flow-based domain and maximum bilateral exchange. Two submissions of flow-based domain market document from CCC to SO are expected. The first one is submitted after the capacity calculation and the second one after the capacity calculation by the CCC to the SO.
Another two submissions of flow-based domain market document are expected for publication purposes. The first one is submitted from CCC towards NEMOs in case of a day-ahead or an intraday process. The second is submitted from SOs towards the TCA in case of a long-term process.

Discussion on the flow-based domain document still needs to be completed in order to know if this profile is going to be finally needed.

4.4.3.5 Submit allocation constraints – Capacity_MarketDocument

Optionally, CCC may submit the allocation constraints together with the capacities for publication towards NEMO in case of day-ahead or intraday process. For long-term process, SOs may submit the allocation constraints towards TCA. Both allocation constraints submissions towards NEMO and TCA are performed using Capacity_MarketDocument.

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4.5 Documents overview

The document exchange processes of CCC described in the previous chapter require sending and receiving various ESMP documents. The information to be exchanged is:

- Acknowledgement_MarketDocument v8.0 based on IEC 62325-451-1:2017 Ed2;
- Capacity_MarketDocument v8.0 based on IEC 62325-451-3:2014+AMD1:2017;
- CGMES v2.4.15 based on IEC TS 61970-600-1:2017 Ed1 and IEC TS 61970-600-2:2017 Ed1 (Out of scope): Please contact the CGM program to get the complete set of specifications. Please note that the transmission of IGM/CGM in CGMES format is done through OPDE. Please, check the OPDE manual to get more information about it;
- CRAC_MarketDocument v2.4;
- CriticalNetworkElement_MarketDocument v2.4;
- FlowBasedDomain_MarketDocument v1.0 (Discussion on the flow-based domain document still needs to be completed in order to know if this profile is going to be finally needed. No region is using it yet at this moment);
- GLSK_MarketDocument v2.1.

4.6 Capacity_MarketDocument

4.6.1 Capacity_MarketDocument General Overview

Following table shows a description of the different attributes in Capacity_MarketDocument v8.0 to be used in this business process and the XSD requirements for each one of them.

Table 3 - Capacity_MarketDocument General Overview

Capacity_MarketDocument			
Class	**Attribute**	**Description**	**XSD Requirements**
Capacity_MarketDocument	mRID	Unique identification of the Capacity Market Document	Mandatory
	revisionNumber	Identification of version that distinguishes one version from another	Mandatory
	type	The coded type of a document	Mandatory
	process.processType	Identification of the nature of the process that the document addresses	Mandatory
	sender.mRID	Sender ID	Mandatory
	sender.roleType	Role played by the sender	Mandatory
	receiver.mRID	Receiver ID	Mandatory
	receiver.roleType	Role played by the receiver	Mandatory
	createdDateTime	Date and time of document creation	Mandatory

	docstatus	The identification of the condition or position of the document with regard to its standing	Optional
	received_MarketDocument.mRID	The identification of an electronic document that is related to an electronic document header	Optional
	received_MarketDocument.revisionNumber	The version of an electronic document that is related to an electronic document header	Optional
	period.TimeInterval	Start and end date time of a given period interval	Mandatory
	domain.mRID	The domain covered within the Capacity Document	Mandatory
TimeSeries	mRID	Sender's identification of the time series instance that uniquely identifies the Capacity time series	Mandatory
	businessType	Identifies the nature of the time series	Mandatory
	product	Identification of an energy product such as Power, energy, reactive power, transport capacity, etc.	Mandatory
	in_Domain	The area where the energy is to be put	Mandatory
	out_Domain	The area where the energy is coming from	Mandatory
	measure_Unit.name	The unit of measure that is applied to the quantities in which the time series is expressed	Mandatory
	auction.mRID	A unique identification of the set of specifications that clearly identify the auction to which the capacity is addressed	Optional
	auction.category	The category type of the addressed auction	Optional
	curveType	The coded representation of the type of curve being described	Optional
	connectingLine_RegisteredResource.mRID	The identification of a line that connect two areas together	Optional
Series_Period	timeInterval	The start and end date and time of the time interval of the period in question	Mandatory
	resolution	The resolution defining the number of periods that the time interval is divided	Mandatory
Point	position	The relative position of a period within an interval	Mandatory
	quantity	The quantity that represents the capacity for the interval in question	Mandatory

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4.6.2 Capacity_MarketDocument Dependendency Table

Table 4 - Capacity_Market Document Dependency Table

Capacity_MarketDocument					
Class	**Attribute**	**AAC submission**	**Proposed Capacities, Capacity reduction/increase**	**Final CZC results submission**	**Allocation Constraint**
Capacity_MarketDocument	mRID	Used			
	revisionNumber	Used(Incremented with each transmission of the same document)			
	type	A26: Capacity document	A32: Proposed Capacity	A31: Agreed capacity	
	process.processType	The timeframe in which the capacity was allocated A01: Day ahead A31: Week ahead A32: Month ahead A33: Year ahead A40: Intraday process	A01: Day ahead A31: Week ahead A32: Month ahead A33: Year ahead A40: Intraday process	A01: Day ahead A31: Week ahead A32: Month ahead A33: Year ahead A40: Intraday process	A15: Capacity determination
	sender.mRID	EIC-X code of the sender Coding Scheme: A01			
	sender.roleType	A04: System operator	A04: System operator A36: Capacity Coordinator	A04: System operator A36: Capacity Coordinator	A04: System operator
	receiver.mRID	EIC-X code of the receiver Coding Scheme: A01			
	receiver.roleType	A36: Capacity Coordinator	A04: System operator A36: Capacity Coordinator	A04: System operator A07: Transmission capacity allocator A11: Market operator	A07: Transmission capacity allocator A11: Market operator A36: Capacity Coordinator
	createdDateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ			
	docstatus	May be used A34: Rejected A37: Confirmed A40: Proposed			
	received_MarketDocument.mRID	Not used			

	received_MarketDocument.revisionNumber	Not used			
	period.TimeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ			
	domain.mRID	EIC-Y code of the CCR Coding Scheme: A01			
TimeSeries	mRID	Used			
	businessType	A29: Already Allocated Capacity	A27: Net transfer capacity (NTC) A81: Total Transfer Capacity (TTC)	A27: Net transfer capacity (NTC) A81: Total Transfer Capacity (TTC)	A29: Already allocated capacity (Last hour flow) A60: Minimum possible (Minimum Net Position = Import) A61: Maximum available (Maximum Net Position = Export) B06: DC link constraints (Loss factor) B92: Capacity ramping limitation
	product	8716867000016: Active power			
	in_Domain	EIC-Y code of the importing bidding zone Coding Scheme: A01			
	out_Domain	EIC-Y code of the exporting bidding zone Coding Scheme: A01			
	measure_Unit.name	MAW: megawatt			
	auction.mRID	Not used			
	auction.category	Not used			
	curveType	A01: Sequential fixed block A03: Variable sized Block			
	connectingLine_RegisteredResource.mRID	May be used in case of capacity or allocation constraint is provided per interconnector EIC-T code of the interconnector Coding Scheme: A01			

Series_Period	timeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ
	resolution	PT60M
Point	position	Integer value > 0 The position must begin with 1
	quantity	Decimal value (Float)

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637 ## 4.7 CRAC_MarketDocument

638 ### 4.7.1 CRAC_MarketDocument General Overview

639 Following table shows a description of the different attributes in CRAC_MarketDocument v2.4
640 to be used in this business process and the XSD requirements for each one of them.
641

642 **Table 5 - CRAC_MarketDocument General Overview**

CRAC_MarketDocument			
Class	**Attribute**	**Description**	**XSD Requirements**
CRAC_Market Document	mRID	Unique identification of the CRAC Market Document	Mandatory
	revisionNumber	Identification of version that distinguishes one version from another	Mandatory
	type	The coded type of a document	Mandatory
	process.processType	Identification of the nature of the process that the document addresses	Mandatory
	sender.mRID	Sender ID	Mandatory
	sender.roleType	Role played by the sender	Mandatory
	receiver.mRID	Receiver ID	Mandatory
	receiver.roleType	Role played by the receiver	Mandatory
	createdDateTime	Date and time of document creation	Mandatory
	docstatus	The identification of the condition or position of the document with regard to its standing	Optional
	status	Status of subject matter this document represents	Optional
	time_Period.TimeInterval	Start and end date time of a given period interval	Mandatory
	domain.mRID	The domain covered within the CRAC Document	Mandatory
	received_MarketDocument.mRID	mRID of the received document in case of a CRAC anomaly report	Optional
	received_MarketDocument.version	Version of the received document in case of a CRAC anomaly report	Optional
MarketDocument	related_MarketDocument.mRID	mRID of a related MarketDocument within a given process	Mandatory
	related_MarketDocument.RevisionNumber	RevisionNumber of a related MarketDocument within a given process	Mandatory

TimeSeries	mRID	Sender's identification of the time series instance that uniquely identifies the CRAC time series	Mandatory
	businessType	Identifies the nature of the time series	Mandatory
	curveType	The coded representation of the type of curve being described	Mandatory
	in_Domain	The area where the energy is to be put	Optional
	out_Domain	The area where the energy is coming from	Optional
	currency_Unit.name	Currency of the expected costs for the remedial action	Optional
	price_Measurement_Unit.name	The unit of measure in which the price in the time series is expressed	Optional
Series_Period	timeInterval	The start and end date and time of the time interval of the period in question.	Mandatory
	resolution	The resolution defining the number of periods that the time interval is divided	Mandatory
Point	position	The relative position of a period within an interval	Mandatory
Series	mRID	Identification of the series instance	Mandatory
	businessType	Identifies the nature of the series	Mandatory
	Name	May be used as the name of the series	Optional
	optimization_MarketObjectStatus.status	Used to identify the status of the Series for a Remedial Action optimization process	Optional
Reason	code	Used to provide a reason code for MarketDocument, Timeseries, Point and Series	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional
AdditionalConstraint_Series	mRID	Identification of the additional constraint series instance	Mandatory
	businessType	Identifies the nature of the additional constraint series	Mandatory
	name	Used as the name of the Additional Constraint	Optional
	in_Domain.mRID	If the additional constraint is an exchange or a net position constraint: used to identify area where the energy flows into	Optional
	out_Domain.mRID	If the additional constraint is an exchange or a net position constraint:	Optional

		used to identify area where the energy comes from	
	measurement_unit.name	The measurement unit of the additional constraint	Optional
	quantity.quantity	The value of the additional constraint	Optional
AdditionalConstraint_RegisteredResource	mRID	Used as the id of one of the registered resources between which there is a maximum phase shift angle	Mandatory
	name	Used as the name of one of the registered resources between which there is a maximum phase shift angle	Optional
	in_Domain.mRID	Used to identify InArea where the registered resource is located	Optional
	out_Domain.mRID	Used to identify OutArea where the registered resource is located	Optional
	marketObjectStatus.status	Used to provide the direction of the phase shift angle	Optional
Contingency_Series	mRID	Used to identify a given contingency	Mandatory
	name	Used as the name of the contingency to be simulated	Optional
Contingency_RegisteredResource	mRID	Used as the id of the contingency	Mandatory
	name	Used as the name of the contingency	Optional
	in_Domain.mRID	Used to identify InArea where the registered resource is located	Optional
	out_Domain.mRID	Used to identify OutArea where the registered resource is located	Optional
	marketObjectStatus.status	Used to identify the state of the contingency	Optional
RemedialAction_Series	mRID	Used to identify a remedial action	Mandatory
	name	Used as the name of the remedial action to be applied	Optional
	businessType	Identifies the nature of the additional remedial action series	Optional
	applicationMode_marketObjectStatus.status	Used to identify the status of the remedial action	Optional
	availability_MarketObjectStatus.status	If a remedial action optimizer is used, used to identify whether or not the remedial action must be used by the optimizer	Optional
	in_Domain.mRID	It can be used to identify the area where the energy is going to	Optional
	out_Domain.mRID	It can be used to identify the area where the energy comes from	Optional

	measurement.unit.name	It can be used to identify the measurement unit of the quantity	Optional
	quantity.quantity	It can be used to identify the value of the new bilateral exchange	Optional
	price.amount	Expected cost of executing the Remedial Action	Optional
Shared_Domain	mRID	It can be used to provide the code of the area which can use the remedial action	Mandatory
RemedialAction_RegisteredResource	mRID	Used as the id of the element on which a remedial action is carried out	Mandatory
	name	Used as the name of the element on which a remedial action is carried out	Optional
	pSRType.psrType	Used to identify the type of the remedial action	Optional
	in_Domain.mRID	Used to identify InArea where the registered resource is located	Optional
	out_Domain.mRID	Used to identify OutArea where the registered resource is located	Optional
	in_AggregateNode.mRID	If the element is an HVDC link, used to identify the InAggregateNode for element orientation	Optional
	out_AggregateNode.mRID	If the element is an HVDC link, used to identify the OutAggregateNode for element orientation	Optional
	marketObjectStatus_status	Used to identify the action of the remedial action or the variation type	Optional
	resourceCapacity.maximumCapacity	Used to identify the maximum variation or the maximum target value of tap, generation or load	Optional
	resourceCapacity.minimumCapacity	Used to identify the minimum variation or the minimum target value of tap, generation or load	Optional
	resourceCapacity.defaultCapacity	Used to identify the variation or target value of tap, generation or load	Optional
	resourceCapacity.unitSymbol	Used to identify the unit of the target values described	Optional
Monitored_Series	mRID	Used to identify a given set of monitored elements	Mandatory
	name	Used as the name of the set of monitored elements	Optional
Series_Reason	code	Used to provide a reason code for AdditionalConstraint_Series, Contingency_Series, RemedialAction_Series and Monitored_Series.	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional

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Monitored_RegisteredResource	mRID	Used as the id of the Monitored element	Mandatory
	name	Used as the name of the Monitored element	Optional
	In_Domain.mRID	Used to identify InArea where the registered resource is located	Optional
	Out_Domain.mRID	Used to identify OutArea where the registered resource is located	Optional
	In_AggregateNode	Used to identify InAggregateNode for element orientation	Optional
	Out_AggregateNode	Used to identify OutAggregateNode for element orientation	Optional
RegisteredResource_Reason	code	Used to provide a reason code for the different registered resource classes.	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional
Analog	measurementType	Used to identify the type of measurement for a resource	Mandatory
	unitSymbol	Used to identify the unit of the measurement	Mandatory
	positiveFlowIn	It may be used to identify on which direction the element is monitored	Optional
	analogValues.value	Used to provide the measurement value	Mandatory
	analogValues.description	May be used to provide a free description/note of the measurement value	Optional
Party_MarketParticipant	mRID	May be sed to identify the owner of a set of contingencies, monitored elements or remedial actions	Mandatory

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644 ### 4.7.2 CRAC_MarketDocument Dependendency Table

645 Note: One TimeSeries is expected for each performed coordinated capacity computation.

646

647 #### 4.7.2.1 Rules governing the CRAC_MarketDocument for the configuration document

648 **Table 6 - CRAC_Market Document Dependency Table**

CRAC_MarketDocument					
Class	**Attribute**	**Network constraints and remedial actions**	**Network constraint situation anomaly report**	**Additional constraints**	**Merged network constraint situations**
CRAC_Market Document	mRID	Used			
	revisionNumber	Used (Incremented with each transmission of the same document)			
	type	A95: Configuration document B15: Network constraint document	A16: Anomaly report	B15: Network constraint document	B15: Network constraint document
	process.processType	Used A15: Capacity determination A43: Flow Based domain constraint day-ahead A44: Flow Based domain constraint intraday A48: Day-ahead capacity determination A49: Intraday capacity determination A50: Long term capacity determination A53: Common Grid Model Process			
	sender.mRID	Used EIC-X code of the sender Coding Scheme: A01			
	sender.roleType	Used A04: System operator A36: Capacity Coordinator			
	receiver.mRID	Used EIC-X code of the receiver Coding Scheme: A01			
	receiver.roleType	Used A04: System operator A36: Capacity Coordinator			
	createdDateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ			
	docstatus	May be used A40: Proposed	May be used A34: Rejected	May be used A40: Proposed	May be used A37: Confirmed

	status	Used A41: Individual Network Data	Used A41: Individual Network Data	Used A41: Individual Network Data	Used A42: Common Network Data
	time_Period.TimeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ			
	domain.mRID	Used EIC-Y code of the CCR Coding Scheme: A01			
	received_MarketDocument.mRID	May be used To provide the mRID of the GLSK to be used for redispatching compensation	May be used To provide the mRID of the rejected Market Document	Not used	May be used To provide the mRID of the GLSK to be used for redispatching compensation
	received_MarketDocument.revisionNumber	May be used To provide the revisionNumber of the GLSK to be used for redispatching compensation	May be used To provide the revisionNumber of the rejected Market Document	Not used	May be used To provide the revisionNumber of the GLSK to be used for redispatching compensation
	related_MarketDocument.mRID	May be used To provide the mRID of related EQ document			
	related_MarketDocument.revisionNumber	May be used To provide the version of related EQ document			
TimeSeries	mRID	Used			
	businessType	Used B54: Network constraint situation that constraints the market B59: Network Element B88: Base Case Network Situation C14: Network constraint situation that cannot limit the market C20: Common Grid Model Equipment			
	curveType	Used A01: Sequential fixed size block A03: Variable sized Block			

	in_Domain	Used only when the capacity computation is performed independently for each border EIC-Y code of the importing domain Coding Scheme: A01
	out_Domain	Used only when the capacity computation is performed independently for each border EIC-Y code of the exporting domain Coding Scheme: A01
	currency_Unit.name	May be used E.g. EUR (EURO)
	price_Measurement_Unit.name	May be used MWH: megawatt hours
Series_Period	timeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ
	resolution	Used PT60M
Point	position	Used Integer value > 0 The position must begin with 1
Series	mRID	Used
	businessType	Used B54: Network constraint situation that constraints the market B55: Contingency B56: Remedial Action B57: Monitored Network Element B59: Network Element B88: Base Case Network Situation C14: Network constraint situation that cannot limit the market C20: Common Grid Model Equipment
	Name	May be used
	optimization_MarketObjectStatus.status	May be used A48: To be optimized A49: To be monitored A52: For flow optimization A53: For voltage optimization
	Party_MarketParticipant.mRID	May be used EIC-X code of the Series owner Coding Scheme: A01
AdditionalConstraint_Series	mRID	Used
	businessType	Used A27: Net Transfer Capacity (NTC) A81: Total Transfer Capacity (TTC) B09: Net Position B54: Network constraint situation that constraints the market B87: Phase Shift Angle

		B92: Capacity ramping limitation
	name	May be used
	in_Domain.mRID	May be used If the additional constraint is an exchange or a net position constraint: used to identify area where the energy flows into
	out_Domain.mRID	May be used If the additional constraint is an exchange or a net position constraint: used to identify area where the energy comes from
	measurement_unit.name	May be used MAW: Megawatt DD: Degree (Unit of angle)
	quantity.quantity	May be used Value of the additional constraint
	Party_MarketParticipant.mRID	May be used EIC-X code of the additional constraint owner Coding Scheme: A01
AdditionalConstraint_RegisteredResource	mRID	Used CGM UUID of the additional constraint. An additional constraint can be any switching device of CGMES classes like Breaker, Disconnector, Switch, ACLineSegment, Line, SycnhronousMachine, PowerTransformer, EnergyConsumer, CsConverter, VsConverter, BusbarSection or TopologicalNode. Coding Scheme: A02
	name	May be used
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	marketObjectStatus.status	May be used A46: Importing element A47: Exporting element
Contingency_Series	mRID	Used
	name	May be used
	Party_MarketParticipant.mRID	May be used EIC-X code of the contingency owner Coding Scheme: A01
	Reason.code	May be used to identify the contingency type B43: Ordinary B44: Exceptional B45: Out of range
	Reason.text	May be used

Contingency_RegisteredResource	mRID	Used CGM UUID of the outage element. An outage can be any switching device of CGMES classes like Breaker, Disconnector, Switch, ACLineSegment, Line, SycnhronousMachine, PowerTransformer, EnergyConsumer, CsConverter, VsConverter, BusbarSection or TopologicalNode. Coding Scheme: A02
	name	May be used
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	marketObjectStatus.status	May be used to identify the state of the contingency A03: Deactivated A05: Active A21: Open A22: Close A23: Stop A24: Start A25: Relative A26: Absolute
	Party_MarketParticipant.mRID	May be used EIC-X code of the contingency owner Coding Scheme: A01
Measurements (Linked to Contingency_RegisteredResource)	measurementType	Used A01: Flow A19: Tap changer A20: Regulator mode A21: Regulator set-point
	unitSymbol	Used MAW: Megawatt AMP: Ampere …
	positiveFlowIn	May be used (the direction is described in the class) A01: Direct A02: Opposite
	analogValues.value	Used to provide the measurement value
	analogValues.description	May be used
RemedialAction_Series	mRID	Used
	name	May be used
	businessType	Used A27: Net Transfer Capacity (NTC)

		A81: Total Transfer Capacity (TTC) B58: Busbar B59: Network element B60: SPS
	applicationMode_marketObjectStatus.status	Used A18: Preventive A19: Curative A27: Curative or preventive A20: Automatic
	availability_MarketObjectStatus.status	May be used A38: Shall be used A39: Could be used
	in_Domain.mRID	Used if Business Type = TTC or NTC, used to identify the area where the energy is going to. EIC-Y code of the domain Coding Scheme: A01
	out_Domain.mRID	Used if Business Type = TTC or NTC Used to identify the area where the energy comes from. EIC-Y code of the domain Coding Scheme: A01
	measurement.unit.name	Used if Business Type = TTC or NTC e.g. MAW
	quantity.quantity	Used if Business Type = TTC or NTC Used to provide the value of the new bilateral exchange
	price.amount	May be used Expected cost of executing the remedial action
	Shared_Domain.mRID	May be used EIC-Y code of domain in which the Remedial Action is shared Coding Scheme: A01
	Party_MarketParticipant.mRID	May be used EIC-X code of the remedial action owner Coding Scheme: A01
RemedialAction_RegisteredResource	mRID	Used CGM UUID of the component on which the action takes place. If psrType = A01, A02, B21 or B22, the expected CGMES classes are ACLineSegment or Line. If psrType = A04 or B10, the expected CGMES class is SynchronousMachine. If psrType = A05, the expected CGMES classes are EnergyConsumer, CsConverter orVsConverter. If psrType = A06, the expected CGMES classes are PowerTransformer or PhaseTapChangerTabular. If psrType = A07, the expected CGMES classes are Breaker, Disconnector or Switch. Coding Scheme: A02
	name	May be used
	pSRType.psrType	Used A01: Tieline A02: Line

		A04: Generation A05: Load A06: Phase Shift Transformer A07: Circuit breaker B10: Hydro Pumped Storage B21: AC Link B22: DC link
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	in_AggregateNode.mRID	Used only for HVDC links CGM UUID of the in aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	out_AggregateNode.mRID	Used only for HVDC links CGM UUID of the out aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	marketObjectStatus_status	Used Codes to identify the action of the remedial action: A21: Open A22: Close A23: Stop A24: Start Codes to identify the variation of the remedial action: A25: Relative A26: Absolute
	resourceCapacity.maximumCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Maximum variation or target value remedial action
	resourceCapacity.minimumCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Minimum variation or target value of tap, generation or load
	resourceCapacity.defaultCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Default variation or target value remedial action
	resourceCapacity.unitSymbol	May be used MAW: Megawatt C62: One (No unit)
Analog (Linked to RemedialAction_RegisteredResource)	measurementType	Used A19: Tap changer A20: Regulator mode
	unitSymbol	Used AMP: Ampere P1: Percent MAW: MW
	positiveFlowIn	May be used A01: Direct (Same direction as the one described by the Aggregate Nodes)

		A02: Opposite (opposite direction as the one described by the Aggregate Nodes) Not used: Double
	analogValues.value	Used to provide the measurement value
	analogValues.description	May be used
Monitored_Series	mRID	Used
	name	May be used
	Party_MarketParticipant.mRID	May be used EIC-X code of the monitored element owner Coding Scheme: A01
Monitored_RegisteredResource	mRID	Used CGM UUID of the monitored element. A monitored element can be a CGMES PowerTransformer or ACLineSegment, Line, LinearShuntCompensator or VoltageLevel. Coding Scheme: A02
	name	May be used
	In_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	Out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	In_AggregateNode	Used only if the resource is monitored in one direction only CGM UUID of the in aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	Out_AggregateNode	Used only if the resource is monitored in one direction only CGM UUID of the out aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
Analog (Linked to Monitored_RegisteredResource)	measurementType	Used A02: Permanent admissible transmission limit (PATL) A07: Transitory admissible transmission limit (TATL) A10: Minimum voltage level A11: Maximum voltage level A12: TATL after automatic RA A13: TATL after curative RA
	unitSymbol	Used AMP: Ampere P1: Percent KVT: KV
	positiveFlowIn	May be used A01: Direct (Same direction as the one described by the Aggregate Nodes) A02: Opposite (opposite direction as the one described by the Aggregate Nodes)

		Not used: Double
	analogValues.value	Used to provide the measurement value
	analogValues.description	May be used

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4.8 GLSK_MarketDocument

4.8.1 GLSK_MarketDocument General Overview

Following table shows a description of the different attributes in GLSK_MarketDocument v2.1 to be used in this business process and the XSD requirements for each one of them.

Table 7 - GLSK_Market Document General Overview

GLSK_MarketDocument			
Class	**Attribute**	**Description**	**XSD Requirements**
GLSK_Market Document	mRID	Unique identification of the GLSK Market Document	Mandatory
	revisionNumber	Identification of version that distinguishes one version from another	Mandatory
	type	The coded type of a document	Mandatory
	process.processType	Identification of the nature of the process that the document addresses	Mandatory
	sender.mRID	Sender ID	Mandatory
	sender.roleType	Role played by the sender	Mandatory
	receiver.mRID	Receiver ID	Mandatory
	receiver.roleType	Role played by the receiver	Mandatory
	createdDateTime	Date and time of document creation	Mandatory
	docstatus	The identification of the condition or position of the document with regard to its standing	Optional
	status	The kind of network data provided in the document	Optional
	received_MarketDocument.mRID	The identification of an electronic document that is related to an electronic document header	Optional
	received_MarketDocument.revisionNumber	The version of an electronic document that is related to an electronic document header	Optional
	time_Period.TimeInterval	Start and end date time of a given period interval	Mandatory
	domain.mRID	The domain covered within the GLSK Document	Mandatory
TimeSeries	mRID	Sender's identification of the time series instance that uniquely identifies the GLSK time series.	Optional
	name	May be used as the name of the timeseries	Optional

	subject_Domain.mRID	The identification of the area, a, related to GSK and/or LSK	Mandatory
	curveType	The coded representation of the type of curve being described	Mandatory
Series_Period	timeInterval	The start and end date and time of the time interval of the period in question.	Mandatory
	resolution	The resolution defining the number of periods that the time interval is divided	Mandatory
Point	position	The relative position of a period within an interval	Mandatory
SKBlock_TimeSeries	businessType	Identifies the nature of the time series	Mandatory
	mktPSRType.psrType	Used to show if the document contains generation or load shift keys	Mandatory
	quantity.quantity	The shift key value applicable to all resources. This is a value in the range [0,1]. If not provided, it is assumed a 1 value	Optional
	flowDirection.direction	Used to show if the shift is positive or negative	Optional
	measurement_Unit.name	Used to provide the unit of measurement	Optional
	attributeInstanceComponent.position	A sequential value representing a relative sequence number. To be used only for merit order participation factor. This attribute provides the identification of order in which the groups are called (1 is the first, 2 the second, etc.)	Optional
	domain.mRID	May be used to identify a domain. For interconnection shift key, the domain is used to identify the area contributing to the GLSK.	Optional
	maximium_Quantity.quantity	The maximum quantity that can be exchanged for interconnection shift key	Optional
	maximum_Measurement_Unit.name	The unit of measure for the maximum quantity in SKBlock_TimeSeries	Optional
RegisteredResource	mRID	The identification of the resource	Mandatory
	name	A free human readable text to identify a resource	Optional
	sK_ResourceCapacity.defaultCapacity	Default capacity value of shift key	Optional
	resourceCapacity.maximumCapacity	The maximum capacity is used with the remaining available capacity, or merit order methods	Optional

	resourceCapacity.minimumCapacity	The minimum capacity is used with the remaining available capacity, or merit order methods	Optional
	marketObjectStatus.status	The status of the registered resource, e.g. connected, disconnected, outage, etc.	Optional
Reason	code	Used to provide a reason code for MarketDocument, Timeseries, SKBlock_TimeSeries and RegisteredResource	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional

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659 ### 4.8.2 GLSK_MarketDocument Dependendency Table

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GLSK_MarketDocument				
Class	Attribute	Individual GLSK	GLSK anomaly report	Merged GLSK
GLSK_MarketDocument	mRID	Used		
	revisionNumber	Used (Incremented with each transmission of the same document)		
	type	B22: Generation and load shift key document		
	process.processType	Used A15: Capacity determination A43: Flow Based domain constraint day-ahead A44: Flow Based domain constraint intraday A48: Day-ahead capacity determination A49: Intraday capacity determination A50: Long term capacity determination		
	sender.mRID	Used EIC-X code of the sender Coding Scheme: A01		
	sender.roleType	Used A04: System operator A36: Capacity Coordinator		
	receiver.mRID	Used EIC-X code of the receiver Coding Scheme: A01		
	receiver.roleType	Used A04: System operator A36: Capacity Coordinator		
	createdDateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ		
	docstatus	May be used A40: Proposed	May be used A34: Rejected	May be used A37: Confirmed
	status	Used A41: Individual Network Data	Used A41: Individual Network Data or A42 for “Common Network Data”	Used A42: Common Network Data
	received_MarketDocument.mRID	Not used	May be used To provide the mRID of the rejected Market Document	Not used
	received_MarketDocument.revisionNumber	Not used	May be used To provide the revisionNumber of the rejected Market Document	Not used

	time_Period.TimeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ						
	domain.mRID	Used EIC-Y code of the CCR Coding Scheme: A01						
TimeSeries	mRID	Used						
	name	May be used						
	subject_Domain.mRID	Used EIC-Y code on which the GLSKs apply to Coding Scheme: A01						
	curveType	Used A01: Sequential fixed size block A03: Variable sized block						
Series_Period	timeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ						
	resolution	Used PT60M						
Point	position	Used Integer value > 0 The position must begin with 1						
SKBlock_TimeSeries	businessType (To have more info about the different types of GLSKs, please check Annex A	Used	B42: Base case proportional shift key	B43: Proportional to participation factors shift key	B44: Proportional to the remaining capacity shift key Not used for load	B45: Merit order shift key Not used for load	B66: Interconnection shift key Not used for load	C15: Flat participation for all generators or loads	C16: Proportional to installed capacity of generators
	mktPSRType.psrType		A03: Resource Object (Generation and load) A04: Generation A05: Load	A03: Resource Object (Generation and load) A04: Generation A05: Load	A04: Generation	A04: Generation A05: Load	A04: Generation	A04: Generation A05: Load	A04: Generation
	quantity.quantity		May be used to provide the Value of G(a) or L(a) If not provided, it is	Value of G(a) or L(a). If not provided, it is assumed a 1 value.	Not used	Not used	Not used	Not used	Not used

		assumed a 1 value.						
	flowDirection.direction	Not used	Not used	A01: For positive shift A02: For negative shift	A01: For positive shift A02: For negative shift	Not used	Not used	Not used
	measurement_Unit.name	Not used	C62: One (Dimensionless quantities)	MAW: Megawatt	MAW: Megawatt	Not used	Not used	Not used
	attributeInstanceComponent.position	To be used when interconnection shift key is provided.	To be used when interconnection shift key is provided	To be used when interconnection shift key is provided	Order for merit order position (the first group should have the value 1, the second the value 2, etc.)	Used The order specifying from which area the change of generation is to be made (1 for the first, 2 for the second, etc.). It is recommended that the local generation shift key block be also given a position; if not it is assumed that it is the last one	May be used when interconnection shift key is provided.	May be used when interconnection shift key is provided.
	domain.mRID	Not used	Not used	Not used	Not used	EIC-Y code of the external area, b, where the change of generation pattern is performed to the benefit of area 'a'	Not used	Not used

						Coding Scheme: A01		
	maximium_ Quantity.quantity	Not used	Not used	Not used	Not used	Used Pmax(b)	Not used	Not used
	maximum_Measurement_ Unit.name	Not used	Not used	Not used	Not used	Used Unit of Pmax(b)	Not used	Not used
RegisteredResource	mRID	Identification of the resource If psrType = A04, the expected CGMES class are SynchronousMachine or ConnectivityNode. If psrType = A05, the expected CGMES class are EnergyConsumer or ConnectivityNode. Coding Scheme: A02	Identification of the resource If psrType = A04, the expected CGMES class are SynchronousMachine or ConnectivityNode. If psrType = A05, the expected CGMES class are EnergyConsumer or ConnectivityNode. Coding Scheme: A02	For generation (psrType = A04), Identification of the SynchronousMachine or ConnectivityNode as defined in CGM Coding Scheme: A02. Not used for Load (psrType = A05)	Identification of the resource If psrType = A04, the expected CGMES class are SynchronousMachine or ConnectivityNode. If psrType = A05, the expected CGMES class are EnergyConsumer or ConnectivityNode. Coding Scheme: A02	Not used	Identification of the resource If psrType = A04, the expected CGMES class are SynchronousMachine or ConnectivityNode. If psrType = A05, the expected CGMES class are EnergyConsumer or ConnectivityNode.. Coding Scheme: A02	For generation (psrType = A04), Identification of the SynchronousMachine or ConnectivityNode. as defined in CGM Coding Scheme: A02. Not used for Load (psrType = A05)
	name	May be used	May be used	May be used	May be used	Not used	May be used	May be used

		Name of the resource	Name of the resource	Name of the resource	Name of the resourc e		Name of the resource	Name of the resource
	sK_Resource Capacity.def aultCapacity	Not used	$k_g(n,a)$ or $k_l(n,a)$ of the resource	Not used	Not used	Not used	$k_g(n,a)$ or $k_l(n,a)$ of the resource. Not use d in case of zero-values	$k_g(n,a)$ or $k_l(n,a)$ of the resource. Not use d in case of zero-values
	resourceCap acity.maximu mCapacity	Not used	Not used	For generation, $P_{\max}(i,a)$ Not used for Load		Not used	Not used	Not used
	resourceCap acity.minimu mCapacity	Not used	Not used	For generation, $P_{\min}(i,a)$ Not used for Load		Not used	Not used	Not used
	marketObjec tStatus.statu s	Not used	Not used	Not used	For generati on (optiona l), A23 – Stop or A24 – Start Not used for Load	Not used	Not used	Not used

To have more information about the different types of GLSKs, please check Annex A.1.

4.9 AreaConfiguration_MarketDocument

4.9.1 AreaConfiguration_MarketDocument General Overview

Following table shows a description of the different attributes in AreaConfiguration_MarketDocument v1.1 to be used in this business process and the XSD requirements for each one of them.

Table 9 - AreaConfiguration_Market Document General Overview

AreaConfiguration_MarketDocument			
Class	**Attribute**	**Description**	**XSD Requirements**
AreaConfiguration_MarketDocument	mRID	Unique identification of the Area Configuration Market Document	Mandatory
	type	The coded type of a document	Mandatory
	process.processType	Identification of the nature of the process that the document addresses	Mandatory
	sender.mRID	Sender ID	Mandatory
	sender.roleType	Role played by the sender	Mandatory
	receiver.mRID	Receiver ID	Mandatory
	receiver.roleType	Role played by the receiver	Mandatory
	createdDateTime	Date and time of document creation	Mandatory
AreaSpecification_Series	mRID	Unique identification of the Area Specification Series	Mandatory
	marketParticipant.mRID	The unique identification of the DSO responsible for the MGA or the SO responsible for the MBA	Optional
	marketParticipant.marketRole.type	Role of the market participant	Optional
	area_Domain.mRID	ID of the bidding zone or metering grid area	Optional
	area_Domain.name	Name of the bidding zone or metering grid area	Optional
	objectAggregation	Used to specify the type of area	Optional
	country_Domain.mRID	The ID of the country the area is belonging to	Optional
	areaCharacteristics_Domain.name	Additional characteristics of the domain	Optional
	validityStart_DateAndOrTime.dateTime	The start of the validity period	Optional
	validityEnd_DateAndOrTime.dateTime	The end of the validity period	Optional
ConsistOf_Domain	mRID	ID of the consist of domain	Mandatory

		The "consists of domain" are the domains that are within a domain. e.g. A bidding zone consists of Metering grid area 1,2 and 3	
	name	Name of the connected domain	Optional
Connected_Domain	mRID	ID of the connected domain The “connected domains” are the domains that a domain has a border with	Mandatory
	name	Name of the connected domain	Optional
BorderConnection_Series	mRID	ID of the border connection series	Optional
	borderConnection_RegisteredResource.mRID	ID of the border interconnector	Mandatory
	borderComponentType_Mkt_PSRType.psrType	Type of the border interconnector	Mandatory
ConnectionDetail_RegisteredResource	mRID	ID of the end points of the Registered Resource	Mandatory
	areaIdentification_Domain.mRID	Area of the end point	Optional
	componentType_Mkt_PSRType.psrType	Type of the end point	Optional

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4.9.2 AreaConfiguration_MarketDocument Dependendency Table

Table 10 - AreaConfiguration_Market Document Dependency Table

AreaConfiguration_MarketDocument		
Class	**Attribute**	**Bidding zone master data**
AreaConfiguration_MarketDocument	mRID	Used
	type	B35: Area Configuration document
	process.processType	A55: Exchange of master data
	sender.mRID	Used EIC-X code of the sender Coding Scheme: A01
	sender.roleType	Used A04: System operator
	receiver.mRID	Used EIC-X code of the receiver Coding Scheme: A01
	receiver.roleType	Used A36: Capacity Coordinator
	createdDateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ
AreaSpecification_Series	mRID	Used
	marketParticipant.mRID	Used The unique identification of the SO responsible for the bidding zone
	marketParticipant.marketRole.type	Used A04: System operator
	area_Domain.mRID	Used EIC-Y code of the bidding zone Coding Scheme: A01
	area_Domain.name	Used Name of the bidding zone
	objectAggregation	Used A12: Bidding Zone (BZ) A13: Virtual Bidding Zone
	country_Domain.mRID	Used EIC-Y code of the country Coding Scheme: A01
	areaCharacteristics_Domain.name	May be used
	validityStart_DateAndOrTime.dateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ
	validityEnd_DateAndOrTime.dateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ

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ConsistOf_Domain	mRID	Used EIC-Y code of the bidding zone Coding Scheme: A01
	name	May be used
Connected_Domain	mRID	Used EIC-Y code of the bidding zone Coding Scheme: A01
	name	May be used
BorderConnection_Series	mRID	Not used
	borderConnection_RegisteredResource.mRID	Used UUID of the border interconnector Coding Scheme: A02
	borderComponentType_Mkt_PSRType.psrType	Used A01: Tie Line A02: Line
ConnectionDetail_RegisteredResource	mRID	Used UUID of the end point Coding Scheme: A02
	areaIdentification_Domain.mRID	Used EIC-Y code of the end point Coding Scheme: A01
	componentType_Mkt_PSRType.psrType	Used A01: Tie Line A02: Line A08: Busbar B23: Substation B24: Transformer

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4.10 CriticalNetworkElement_MarketDocument

4.10.1 CriticalNetworkElement_MarketDocument General Overview

Following table shows a description of the different attributes in CriticalNetworkElement_MarketDocument v2.4 to be used in this business process and the XSD requirements for each one of them.

Table 11 - CriticalNetworkElement_Market Document General Overview

CriticalNetworkElement_MarketDocument			
Class	**Attribute**	**Description**	**XSD Requirements**
CriticalNetworkElement_MarketDocument	mRID	Unique identification of the CNE Market Document	Mandatory
	revisionNumber	Identification of version that distinguishes one version from another	Mandatory
	type	The coded type of a document	Mandatory
	process.processType	Identification of the nature of the process that the document addresses	Mandatory
	sender.mRID	Sender ID	Mandatory
	sender.roleType	Role played by the sender	Mandatory
	receiver.mRID	Receiver ID	Mandatory
	receiver.roleType	Role played by the receiver	Mandatory
	createdDateTime	Date and time of document creation	Mandatory
	docstatus	The identification of the condition or position of the document with regard to its standing.	Optional
	time_Period.TimeInterval	Start and end date time of a given period interval	Mandatory
	domain.mRID	The domain covered within the CNE Document	Optional
MarketDocument	related_MarketDocument.mRID	mRID of a related MarketDocument within a given process	Mandatory
	related_MarketDocument.RevisionNumber	RevisionNumber of a related MarketDocument within a given process	Mandatory
TimeSeries	mRID	Sender's identification of the time series instance that uniquely identifies the CNE time series	Mandatory
	businessType	Identifies the nature of the time series	Mandatory
	curveType	The coded representation of the type of curve being described	Mandatory

	in_Domain	The area where the energy is to be put	Optional
	out_Domain	The area where the energy is coming from	Optional
	currency_Unit.name	Currency of the expected costs for the remedial action	Optional
	price_Measurement_Unit.name	The unit of measure in which the price in the time series is expressed	Optional
Series_Period	timeInterval	The start and end date and time of the time interval of the period in question.	Mandatory
	resolution	The resolution defining the number of periods that the time interval is divided	Mandatory
Point	position	The relative position of a period within an interval	Mandatory
Reason	code	Used to provide a reason code for MarketDocument, Timeseries, Point and Constraint_Series	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional
Border_Series	mRID	A mRID which identifies the border series	Mandatory
	businessType	The identification of the nature of the time series (e.g. Used to provide the Maximum power exchange or Maximum power exchange after remedial actions on interconnectors in some business processes)	Mandatory
	in_Domain.mRID	Used to identify the inArea of the flow	Optional
	out_Domain.mRID	Used to identify the outArea of the flow	Optional
	flow_Quantity.quantity	Used to specifiy the quantity of the specified businessType code	Optional
Constraint_Series	mRID	A mRID which identifies a constraint situation	Mandatory
	businessType	The identification of the nature of the time series	Mandatory
	name	May be used to provide the outage situation name	Optional
	referenceCalculation_DateAndOrTime.date	Used to provide the reference date that were used within the capacity calculation process to determine the constraint situation	Optional
	referenceCalculation_DateAndOrTime.time	Used to provide the reference time that were used within the capacity calculation process to determine the constraint situation	Optional

	quantity_Measurement_Unit.name	The unit of measure in which the quantity in the time series is expressed	Optional
	externalConstraint_Quantity.quantity	Used to provide External Constraint Quantity	Optional
	externalConstraint_Quantity.quality	The description of the quality of the external constraint quantity	Optional
	pTDF_Measurement_Unit.name	The unit of measure in which the PTDF quantities in the series are expressed	Optional
	shadowPrice_Measurement_Unit.name	The unit of measure in which the shadow prices in the series are expressed	Optional
	currency_Unit.name	Currency of the expected costs for the remedial action	Optional
	optimization_MarketObjectStatus.status	Describe the status of the constraint situation for a Remedial Action Optimization process (branch which margin must be optimized, constraint for the optimization…)	Optional
	constraintStatus_MarketObjectStatus.status	Used to show the status of the constraint (e.g. Presolved)	Optional
AdditionalConstraint_Series	mRID	A mRID which identifies the additional constraint series. An additional constraint identifies additional constraints which limits flows in the studied case	Mandatory
	businessType	The identification of the nature of the series (e.g. TTC, Net Position, NTC…)	Optional
	name	Used to identify the owner of the Additional Constraint	Optional
	in_Domain.mRID	Used to identify the inArea of the flow	Optional
	out_Domain.mRID	Used to identify the outArea of the flow	Optional
	measurement_Unit.name	The measurement unit of the additional constraint	Optional
	quantity.quantity	The value of the additional constraint	Optional
AdditionalConstraint_RegisteredResource	mRID	A mRID which identifies an additional constraint resource	Mandatory
	name	A free human readable text to identify a resource	Optional
	in_Domain.mRID	Used to identify the inArea of the flow	Optional
	out_Domain.mRID	Used to identify the outArea of the flow	Optional
	marketObjectStatus.status	May be used to provide the direction of the phase shift angle	Optional

Contingency_Series	mRID	A mRID which identifies the contingency series. A Contingency_Series identifies the network elements in outage for the studied case	Mandatory
	name	May be used to provide the name of the contingency series.	Optional
Contingency_RegisteredResource	mRID	mRID of the outage element	Mandatory
	name	Used as the name of the outage element	Optional
	in_Domain	Used to identify inArea	Optional
	out_Domain	Used to identify outArea	Optional
	pSRType.psrType	Used to identify the type of the outage element	Optional
	location.name	Used to identify the location of the outage element	Optional
RemedialAction_Series	mRID	A mRID which identifies the remedial action series. A RemedialAction_Series identifies the Remedial Actions which are performed to relieve the constraints for the studied case	Mandatory
	name	May be used to provide the name of the remedial action series	Optional
	businessType	The identification of the nature of the series (e.g. busbar, network element…)	Optional
	application_Mode_MarketObject.status	Used to identify the status of the remedial action	Optional
	in_Domain.mRID	Used to identify inArea	Optional
	out_Domain.mRID	Used to identify outArea	Optional
	measurement_Unit.name	Used to provide the measurement unit of the quantity	Optional
	quantity.quantity	Used to identify the value of the new bilateral exchange in case of business type TTC or NTC	Optional
	price.amount	Use to provide the cost of the remedial action	Optional
Shared_Domain	mRID	Code of the area which can use the remedial action	Mandatory
RemedialAction_RegisteredResource	mRID	mRID of the remedial action resource	Mandatory
	name	Used as the name of the remedial action resource	Optional

	pSRType.psrType	Used to identify the type of the remedial action resource	Mandatory
	in_Domain.mRID	Used to identify inArea	Optional
	out_Domain.mRID	Used to identify outArea	Optional
	in_AggregateNode.mRID	May be used to identify InAggregateNode for element orientation	Optional
	out_AggregateNode.mRD	May be used to identify OutAggregateNode for element orientation	Optional
	marketObjectStatus.status	Used to identify the status of the remedial action	Mandatory
	resourceCapacity.maximumCapacity	Used to identify the maximum variation or the maximum target value of tap, generation or load	Optional
	resourceCapacity.minimumCapacity	Used to identify the minimum variation or the minimum target value of tap, generation or load	Optional
	resourceCapacity.defaultCapacity	Used to identify the variation or target value of tap, generation or load	Optional
	resourceCapacity.unitSymbol	Used to identify the unit of the target values described	Optional
Monitored_Series	mRID	A mRID which identifies monitored series. A Monitored_Series identifies the sets of limiting network elements (so-called critical network elements) in the studied case	Mandatory
	name	May be used to provide the name of the remedial action series	Optional
Series_Reason	code	Used to provide a reason code for AdditionalConstraint_Series, Contingency_Series, RemedialAction_Series and Monitored_Series	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional
Party_MarketParticipant	mRID	Used to provide a party identification for Constraint_Series, AdditionalConstraint_Series, Contingency_Series, RemedialAction_Series and Monitored_Series	Mandatory
Monitored_RegisteredResource	mRID	mRID of the monitored resource	Mandatory
	name	Used as the name of the monitored resource	Optional

	in_Domain.mRID	Used to identify inArea	Optional
	out_Domain.mRID	Used to identify outArea	Optional
	in_AggregateNode.mRID	May be used to identify InAggregateNode for element orientation	Optional
	out_AggregateNode.mRD	May be used to identify OutAggregateNode for element orientation	Optional
	pSRType.psrType	Used to identify the type of the monitored resource	Optional
	location.name	Used to identify the location of the monitored element	Optional
	flowBasedStudy_Domain.mRID	ID of the flow-based Study Area	Optional
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quantity	Used to provide the RAM (Reliable Available Margin)	Optional
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quality	Not used	Optional
	marketCoupling_Domain.mRID	The identification of the flow-based market coupling area	Optional
	marketCoupling_Domain.shadow_Price.amount	The identification of the flow-based market coupling domain impacted by the critical network element	Optional
PTDF_Domain	mRID	The bidding zone impacted by the critical network element	Mandatory
	pTDF_Quantity.quantity	The PTDF factor value associated to the bidding zone for the critical network element	Optional
	pTDF_Quantity.quality	Not used	Optional
Analog	measurementType	Used to identify the type of measurement for a resource	Mandatory
	unitSymbol	Used to identify the unit of the measurement	Mandatory
	positiveFlowIn	May be used to identify on which direction the element is monitored	Optional
	analogValues.value	Used to provide the measurement value	Mandatory
	analogValues.timeStamp	May be used to provide the constraint duration	Optional
	analogValues.description	Free text used to identify the situation of the measurement point. e.g. ”Before outage”, “After curative action”	Optional

RegisteredResource_Reason	code	Used to provide a reason code for AdditionalConstraint_RegisteredResource, Contingency_RegisteredResource, RemedialAction_RegisteredResource and Monitored_RegisteredResource	Mandatory
	text	May be used to provide an explanation related to the reason code	Optional

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689 4.10.2 CriticalNetworkElement_MarketDocument Dependendency Table

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691 **Table 12 - CriticalNetworkElement_Market Document Dependency Table**

CriticalNetworkElement_MarketDocument		
Class	**Attribute**	**Values**
CriticalNetworkElement_MarketDocument	mRID	Used
	revisionNumber	Used (Incremented with each transmission of the same document)
	type	Used B06: Critical network element determination
	process.processType	Used A43: Flow Based domain constraint day-ahead A44: Flow Based domain constraint intraday A48: Day-ahead capacity determination A49: Intraday capacity determination A50: Long term capacity determination
	sender.mRID	Used EIC-X code of the sender Coding Scheme: A01
	sender.roleType	Used A04: System operator A36: Capacity Coordinator
	receiver.mRID	Used EIC-X code of the receiver Coding Scheme: A01
	receiver.roleType	Used A04: System operator A36: Capacity Coordinator
	createdDateTime	Used UTC as YYYY-MM-DDTHH:MM:SSZ
	docstatus	May be used A34: Rejected A37: Confirmed A40: Proposed
	time_Period.TimeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ

	domain.mRID	Used EIC-Y code of the CCR Coding Scheme: A01
	received_MarketDocument.mRID	May be used To provide the mRID of the GLSK to be used for redispatching compensation
	received_MarketDocument.version	May be used To provide the revision number of the GLSK to be used for redispatching compensation
	related_MarketDocument	May be used To provide the mRID of related EQ document
	related_MarketDocument.revisionNumber	May be used To provide the revision number of related EQ document or of associated CGM/CRAC/GLSK file
TimeSeries	mRID	Used
	businessType	Used B37: Constraint situation B39: Flow based domain adjusted to long term schedules B54: Network constraint situation that constraints the market C14: Network constraint situation that cannot limit the market
	curveType	Used A01: Sequential fixed size block A03: Variable sized Block
	in_Domain	Not used
	out_Domain	Not used
	currency_Unit.name	Used E.g. EUR (EURO)
	price_Measurement_Unit.name	Used MWH: megawatt hours
Series_Period	timeInterval	Used The start and end date and time must be expressed as YYYY-MM-DDTHH:MMZ/YYYY-MM-DDTHH:MMZ
	resolution	Used PT60M
Point	position	Used Integer value > 0 The position must begin with 1
Border_Series	mRID	Used to identify a given maximum flow situation
	businessType	Used C12: Maximum power exchange
	in_Domain.mRID	May be used EIC-Y code of the importer domain Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the exporter domain

		Coding Scheme: A01
	flow_Quantity.quantity	Used Flow value on the oriented border
ConnectingLine_registeredResource (Monitored_RegisteredResource) linked to Border_Series	mRID	Used EIC-T code of the interconnector Coding Scheme: A01
	name	May be used
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	in_AggregateNode.mRID	Used only if the resource is monitored in one direction only CGM UUID of the in aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	out_AggregateNode.mRD	Used only if the resource is monitored in one direction only CGM UUID of the out aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	pSRType.psrType	Not used
	location.name	Not used
	flowBasedStudy_Domain.mRID	Not used
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quantity	Not used
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quality	Not used
	marketCoupling_Domain.mRID	Not used
	marketCoupling_Domain.shadow_Price.amount	Not used
Measurements (Analog class linked to ConnectingLine_RegisteredResource)	measurementType	Used A02: Permanent admissible transmission limit (PATL)
	unitSymbol	Used MAW: MW
	positiveFlowIn	May be used A01: Direct (Same direction as the one described by the Aggregate Nodes) A02: Opposite (opposite direction as the one described by the Aggregate Nodes) Not used: Double

	analogValues.value	Used to provide the measurement value
	analogValues.timeStamp	Not used
	analogValues.description	May be used
Constraint_Series	mRID	Used
	businessType	Used B09: Net position (Only for external constraint situation) B40: Network Element Constraint B41: Calculation opposition (Red Flag) B54: Network constraint situation that constraints the market B56: Remedial Action B57: Monitored Network Element B88: Base Case Network Situation C14: Network constraint situation that cannot limit the market
	name	May be used
	referenceCalculation_DateAndOrTime.date	May be used to provide the reference calculation date for the constraint situation ISO 8601 UTC format: YYYY-MM-DD
	referenceCalculation_DateAndOrTime.time	May be used to provide the reference calculation time for the constraint situation ISO 8601 UTC format: HH:MM:00Z
	quantity_Measurement_Unit.name	Used MAW: Megawatt
	externalConstraint_Quantity.quantity	To be used in case the external constraint quantity is provided
	externalConstraint_Quantity.quality	Not used
	pTDF_Measurement_Unit.name	Used only for flow-based (The unit measurement of the PTDF) MAW
	shadowPrice_Measurement_Unit.name	Not used
	currency_Unit.name	Not used
	optimization_MarketObjectStatus.status	May be used A48: To be optimized A49: To be monitored A52: For flow optimization A53: For voltage optimization
	constraintStatus_MarketObjectStatus.status	Used only when the constraint is presolved A54: Presolved
	Party_MarketParticipant.mRID	May be used EIC-X code of the limiting System Operator

		Coding Scheme: A01
	Reason.code	May be used to indicate if a constraint is virtual B42: Constraint by the market
	Reason.text	May be used
AdditionalConstraint_Series	mRID	Used
	businessType	Used A27: Net transfer capacity (NTC) A81: Total Transfer Capacity (TTC) B09: Net position B87: Phase Shift Angle B92: Capacity ramping limitation
	name	May be used
	in_Domain.mRID	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position) EIC-Y code of the domain where the energy flows into Coding Scheme: A01
	out_Domain.mRID	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position) EIC-Y code of the domain where the energy comes from Coding Scheme: A01
	measurement_Unit.name	Used MAW: Megawatt DD: Degree
	quantity.quantity	Used Value of the additional constraint
	Party_MarketParticipant.mRID	May be used EIC-X code of the additional constraint owner Coding Scheme: A01
AdditionalConstraint_RegisteredResource	mRID	Used CGM UUID of the additional constraint. An additional constraint can be any switching device of CGMES classes like Breaker, Disconnector, Switch, ACLineSegment, Line, SycnhronousMachine, PowerTransformer, EnergyConsumer, CsConverter, VsConverter, BusbarSection or TopologicalNode. Coding Scheme: A02
	name	May be used
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01

	marketObjectStatus.status	Used only in combination with businessType code B87 to provide the direction of the phase shift angle A46: Importing element A47: Exporting element
Contingency_Series	mRID	Used
	name	May be used
	Party_MarketParticipant.mRID	May be used EIC-X code of the contingency owner Coding Scheme: A01
	Reason.code	May be used to identify the contingency type B43: Ordinary B44: Exceptional B45: Out of range
	Reason.text	May be used
Contingency_RegisteredResource	mRID	Used CGM UUID of the outage element. An outage can be any switching device of CGMES classes like Breaker, Disconnector, Switch, ACLineSegment, Line, SycnhronousMachine, PowerTransformer, EnergyConsumer, CsConverter, VsConverter, BusbarSection or TopologicalNode. Coding Scheme: A02
	name	May be used
	in_Domain	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	pSRType.psrType	Not used
	location.name	Not used
RemedialAction_Series	mRID	Used
	name	May be used
	businessType	Used A27: Net transfer capacity (NTC) A81: Total Transfer Capacity (TTC) B58: Busbar B59: Network Element B60: SPS
	application_Mode_MarketObject.status	Used A18: Preventive A19: Curative A20: Automatic

		A27: Curative or preventive
	in_Domain.mRID	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position) EIC-Y code of the domain where the energy flows into Coding Scheme: A01
	out_Domain.mRID	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position) EIC-Y code of the domain where the energy comes from Coding Scheme: A01
	measurement_Unit.name	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position) MAW: Megawatt
	quantity.quantity	Used only with business type codes A27 (NTC), A81 (TTC) and B09 (Net position)
	price.amount	May be used (Only when the price of the remedial action is specified)
	Party_MarketParticipant.mRID	May be used EIC-X code of the additional constraint owner Coding Scheme: A01
	Shared_Domain.mRID	May be used EIC-Y code of the area which can use the remedial action Coding Scheme: A01
RemedialAction_RegisteredResource	mRID	Used CGM UUID of the component on which the action takes place. If psrType = A01, A02 or B22, the expected CGMES classes are ACLineSegment or Line. If psrType = A04, the expected CGMES class is SynchronousMachine. If psrType = A05, the expected CGMES classes are EnergyConsumer, CsConverter orVsConverter. If psrType = A06, the expected CGMES classes are PowerTransformer or PhaseTapChangerTabular. If psrType = A07, the expected CGMES classes are Breaker, Disconnector or Switch. Coding Scheme: A02
	name	May be used
	pSRType.psrType	Used A01: Tieline A02: Line A04: Generation A05: Load A06: Phase Shift Transformer A07: Circuit Breaker B22: DC link
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01

	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	in_AggregateNode.mRID	Used only for HVDC links CGM UUID of the in aggregate node (CGMES Terminal or Topological Node object) Coding Scheme: A02
	out_AggregateNode.mRD	Used only for HVDC links CGM UUID of the out aggregate node (CGMES Terminal, PowerTransformerEnd, ConnectivityNode or Topological Node, VoltageLevel, Substation, SubgeographicalRegion, GeographicalRegion object) Coding Scheme: A02
	marketObjectStatus.status	Used Codes to identify the action of the remedial action: A21: Open A22: Close A23: Stop A24: Start Codes to identify the variation of the remedial action: A25: Relative A26: Absolute
	resourceCapacity.maximumCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Maximum variation or target value of remedial action
	resourceCapacity.minimumCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Minimum variation or target value of remedial action
	resourceCapacity.defaultCapacity	Used if Action_marketObjectStatus_status = Relative (A25) or Absolute (A26) Default variation or target value of remedial action
	resourceCapacity.unitSymbol	Used MAW: Megawatt C62: One (No unit)
Analog (Linked to RemedialAction_RegisteredResource)	Not used	
Monitored_Series	mRID	Used
	name	May be used
	Party_MarketParticipant.mRID	May be used EIC-X code of the monitored element owner Coding Scheme: A01
Monitored_RegisteredResource	mRID	Used CGM UUID of the monitored element. A monitored element can be a CGMES PowerTransformer or ACLineSegment, Line, LinearShuntCompensator or VoltageLevel. Coding Scheme: A02

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	name	May be used
	in_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	out_Domain.mRID	May be used EIC-Y code of the domain where the resource is located Coding Scheme: A01
	in_AggregateNode.mRID	Used only if the resource is monitored in one direction only CGM UUID of the in aggregate node (CGMES Terminal, PowerTransformerEnd, ConnectivityNode or Topological Node, VoltageLevel, Substation, SubgeographicalRegion, GeographicalRegion object) Coding Scheme: A02
	out_AggregateNode.mRD	Used only if the resource is monitored in one direction only CGM UUID of the out aggregate node (CGMES Terminal, PowerTransformerEnd, ConnectivityNode or Topological Node, VoltageLevel, Substation, SubgeographicalRegion, GeographicalRegion object) Coding Scheme: A02
	pSRType.psrType	Not used
	location.name	Not used
	flowBasedStudy_Domain.mRID	Not used
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quantity	May be used to provide the remaining available margin (RAM)
	flowBasedStudy_Domain.flowBasedMargin_Quantity.quality	Not used
	marketCoupling_Domain.mRID	Not used
	marketCoupling_Domain.shadow_Price.amount	Not used
	Reason.code	May be used B41: Exclusion for SoS[6] reasons (Used to indicate an AMR exclusion)
	Reason.text	May be used
PTDF_Domain (Only used with flow-based CC)	mRID	Used as PTDF domain/hub EIC-Y code of the bidding zone Coding Scheme: A01
	pTDF_Quantity.quantity	Used The PTDF factor for the bidding zone. The value may be positive or negative

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	pTDF_Quantity.quality	Not used
Analog	measurementType	Used A01: Flow A02: Permanent admissible transmission limit (PATL) A03: Flow reliability margin A04: Spanning margin value A05: Long term allocation margin A06: Final adjustment margin value A07: Transitory admissible transmission limit (TATL) A09: Negative Final adjustment margin value A10: Minimum voltage level A11: Maximum voltage level A12: TATL after automatic RA A13: TATL after curative RA A18: Adjustment for minimum RAM A22: Reference Flow
	unitSymbol	Used MAW: MW AMP: Ampere P1: Percent KVT: kV
	positiveFlowIn	May be used A01: Direct (Same direction as the one described by the Aggregate Nodes) A02: Opposite (opposite direction as the one described by the Aggregate Nodes) Not used: Double
	analogValues.value	Used to provide the measurement value
	analogValues.timeStamp	Not used
	analogValues.description	May be used

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Annex A: different types of GLSK

A.1 Background on GLSK types

Different modes to apply GSK and LSK are existing; the purpose of this annex is not to state the most suitable one but only to provide a way to exchange different types of GLSK. These types are described here after.

A.2 Proportional to base case generation or load (businessType B42)

Shift in defined generation/load nodes is proportional to the base case generation/load within an area “a”:

- $P_g(n,a)$ active generation in node n, belonging to area a (node n defined in GSK list);
- $P_l(n,a)$ active load in node n, belonging to area a (node n defined in LSK list).

The participation of node n in the shift, among selected generation nodes (GSK) is given by:

$$K_g(n,a) = G(a)\frac{P_g(n,a)}{\sum_i P_g(i,a)}$$

The participation of node n in the shift, among selected load nodes (LSK) is given by:

$$K_l(n,a) = L(a)\frac{P_l(n,a)}{\sum_i P_l(i,a)}$$

The sum of G(a) and L(a) for each area is to be equal to 1 (i.e. 100%).

A.3 Proportional to the participation factors (businessType B43)

It is possible to define participation factors for generation and load:

- G(a) Participation factor for generation nodes in area “a”;
- L(a) Participation factor for load nodes in area “a”.

The sum G(a) and L(a), for each area, is to be equal to 1 (i.e. 100%).

GSK factor could be defined for interconnections flow pattern change with other area, interconnection shift key. In such a case a maximum value of the increased flow on interconnections for each external areas (‘b’, ‘c’, …) is provided by the SO of area “a”, and the GSK of the corresponding area is used to define the change of generation in each area (‘b’, ‘c’, …).

For a list of generation nodes or load nodes in an area, a, individual participation factors are defined. The shift in generation/load node is computed as:

$K_g(n,a) = G(a)\frac{k_g(n,a)}{\sum_i k_g(i,a)}$ for generation;

And $K_l(n,a) = L(a)\frac{k_l(n,a)}{\sum_i k_l(i,a)}$ for load.

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A.4 Proportional to the remaining available capacity (businessType B44)

Depending upon the shift (up for positive shift or down for negative shift), the generation changes are computed proportionally to the remaining available generation margin:

- For a positive shift $P(n,a) = P_0(n,a) + \Delta E \frac{P_{\max}(n,a) - P_0(n,a)}{\sum_i (P_{\max}(i,a) - P_0(i,a))}$
- For a negative shift $P(n,a) = P_0(n,a) + \Delta E \frac{P_0(n,a) - P_{\min}(n,a)}{\sum_i (P_0(i,a) - P_{\min}(i,a))}$

Where:

- $P(n,a)$ is the generation output of unit n in area a following the shift;
- $P_0(n,a)$ is the actual generation output in the base case;
- ΔE is the generation shift;
- $P_{\max}(i,a)$ is the maximum output of generation i in area a;
- $P_{\min}(i,a)$ is the minimum output of generation I in area a.

A.5 Depending upon a merit order list (businessType B45)

The chosen generation nodes shifts up or down according to the merit order list defined in the group GSKup (GSK time series with a A01 flowDirection) or GSKdown (GSK time series with a A02 flowDirection), as described following:

- Upward list contains the generation nodes which performs the total positive shift in area a;
- Downward list contains the generation nodes which performs the total negative shift in area a.

The merit order position is defined in the attribute attributeInstanceComponent.position, i.e. it is the order to be applied to generation node to be shifted simultaneously. It means that the first group (number defined with merit order position) of generating nodes are shifted together and if it is not sufficient, the next group generating nodes are used to complete the total shift, and so on.

If the attribute marketStatus.status is defined, the generation nodes can also be disconnected or connected to the network in order to allow a higher generation shifting (negative or positive):

- for a negative shift, the value “stop” means that the output generation can be 0 MW, and that the generation unit can be disconnected to the network;
- for a positive shift, le value “start” means that the generation unit can be connected to the network (if it was initially disconnected), with a minimum output power of $P_{\min}(i,a)$.

The total shift is distributed to the last group of merit order position generation nodes proportionally to their available margin as defined for reserve shift.

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A.6 Interconnection shift key (businessType B66)

The shift is performed through a change of pattern on the interconnection flows from external areas ('b', 'c', …) to the benefit of the area 'a':

$P_{\max}(b)$ is the maximum increase of generation that can be requested from an external area 'b'.

The capacity coordinator uses the GLSK document defined by the SO of the area 'b' for moving the generation within the limits of $P_{\max}(b)$.

As many SKBlock_TimeSeries as there are external areas are to be provided. The attribute attributeInstanceComponent.position provides the order to call the "external generation" from different areas.

A.7 Flat participation for all generators or loads (businessType C15)

- Flat participation for all generators

  Flat GSK factors of all generators, independently of the size of the generator unit. $K_g(n,a)=1$, all n

- Flat participation for all loads

  Flat participation of all loads, independently of size of Load. $K_l(n,a)=1$, all n

A.8 Proportional to installed capacity of generators (businessType C16)

Generators participate relative to their maximum (installed) capacity (MW). $Kg(n,a)= Pmax_n$

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